Gaia DR3: preliminary catalogue data model

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Abstract

The preliminary data model for Gaia Data Release 3 is described in the following pages. This draft corresponds to DPAC Data Model configuration item 20.5.0. Please note that this is a draft only: the final published catalogue data model is subject to change with respect to that described herein without any public notification. Note also that this draft contains links to external resources (e.g. the body of the full documentation set for DR3) that are inactive presently. The document is provided for advance information and will be supported on a best–efforts basis only prior to the formal release.

Contents

Datamodel description

1 Main source catalogue

1.1 GAIA_SOURCE

This table has an entry for every Gaia observed source as published with this data release. It contains the basic source parameters, in their final state as processed by the Gaia Data Processing and Analysis Consortium from the raw data coming from the spacecraft. The table is complemented with others containing information specific to certain kinds of objects (e.g. Solar–system objects, non–single stars, variables etc.) and value–added processing (e.g. astrophysical parameters etc.). Further array data types (spectra, epoch measurements) are presented separately via ‘Datalink’ resources.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

DESIGNATION : Unique source designation (unique across all Data Releases) (string)

A source designation, unique across all Gaia Data Releases, that is constructed from the prefix ‘Gaia DRx ’ followed by a string of digits corresponding to `source_id` (3 space–separated words in total). Note that the integer source identifier `source_id` is **not** guaranteed to be unique across Data Releases; moreover it is not guaranteed that the same astronomical source will always have the same `source_id` in different Data Releases. Hence the only safe way to compare source records between different Data Releases in general is to check the records of proximal source(s) in the same small part of the sky.

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique numerical identifier of the source, encoding the approximate position of the source (roughly to the nearest arcmin), the provenance (data processing centre where it was created), a running number, and a component number.

The approximate equatorial (ICRS) position is encoded using the nested HEALPix scheme at level 12 (Nside = 4096), which divides the sky into ≃ 200 million pixels of about 0.7 arcmin^2.

The source ID consists of a 64-bit integer, least significant bit = 1 and most significant bit = 64, comprising:

- a HEALPix index number (sky pixel) in bits 36 - 63; by definition the smallest HEALPix index number is zero.
- a 3-bit Data Processing Centre code in bits 33 - 35; for example `MOD(source_id / 4294967296, 8)` can be used to distinguish between sources initialised via the Initial Gaia Source List (Smart & Nicastro 2014) by the Torino DPC (code = 0) and sources otherwise detected and assigned by Gaia observations (code > 0)
- a 25-bit plus 7 bit sequence number within the HEALPix pixel in bits 1 - 32 split into:
  - a 25 bit running number in bits 8 – 32; the running numbers are defined to be positive, i.e. never zero
  - a 7-bit component number in bits 1 – 7

This means that the HEALPix index at level 12 of a given source is contained in the most significant bits. HEALPix index of level 12 and lower can thus be retrieved as follows:

- HEALPix index at level 12 = source_id / 34359738368
- HEALPix index at level 11 = source_id / 137438953472
- HEALPix index level 10 = source_id / 549755813888
- HEALPix index at level n = source_id / $(2^{35} \times 4^{(12-n)})$ = source_id / $2^{(59-2n)}$

Additional details can be found in Bastian & Portell (2020).

RANDOM_INDEX : Random index for use when selecting subsets (long)

A random index which can be used to select smaller subsets of the data that are still representative. The column contains a random permutation of the numbers from 0 to $N - 1$, where N is the number of sources in the table.

The random index can be useful for validation (testing on 10 different random subsets), visualization (displaying 1% of the data), and statistical exploration of the data, without the need to download all the data.

REF_EPOCH : Reference epoch (double, Time[Julian Years])

Reference epoch to which the astrometric source parameters are referred, expressed as a Julian Year in TCB.

RA : Right ascension (double, Angle[deg])

Barycentric right ascension α of the source in ICRS at the reference epoch `ref_epoch`

RA_ERROR : Standard error of right ascension (float, Angle[mas])

Standard error $\sigma_{\alpha*} \equiv \sigma_\alpha \cos\delta$ of the right ascension of the source in ICRS at the reference epoch `ref_epoch`.

DEC : Declination (double, Angle[deg])

Barycentric declination δ of the source in ICRS at the reference epoch `ref_epoch`

DEC_ERROR : Standard error of declination (float, Angle[mas])

Standard error σ_δ of the declination of the source in ICRS at the reference epoch `ref_epoch`

PARALLAX : Parallax (double, Angle[mas])

Absolute stellar parallax ϖ of the source at the reference epoch `ref_epoch`

PARALLAX_ERROR : Standard error of parallax (float, Angle[mas])

Standard error σ_ϖ of the stellar parallax at the reference epoch `ref_epoch`

PARALLAX_OVER_ERROR : Parallax divided by its standard error (float)

Parallax divided by its standard error

PM : Total proper motion (float, Angular Velocity[mas yr^{-1}])

The total proper motion calculated as the magnitude of the resultant vector of the proper motion component vectors `pmra` and `pmdec`, i.e. $\texttt{pm}^2 = \texttt{pmra}^2 + \texttt{pmdec}^2$.

PMRA : Proper motion in right ascension direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in right ascension $\mu_{\alpha*} \equiv \mu_\alpha \cos\delta$ of the source in ICRS at the reference epoch `ref_epoch`. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension.

PMRA_ERROR : Standard error of proper motion in right ascension direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\alpha*}$ of the local tangent plane projection of the proper motion vector in the direction of increasing right ascension at the reference epoch `ref_epoch`

PMDEC : Proper motion in declination direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in declination μ_δ of the source at the reference epoch `ref_epoch`. This is the projection of the proper motion vector in the direction of increasing declination.

PMDEC_ERROR : Standard error of proper motion in declination direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\delta}$ of the proper motion component in declination at the reference epoch `ref_epoch`

RA_DEC_CORR : Correlation between right ascension and declination (float)

Correlation coefficient $\rho(\alpha, \delta)$ between right ascension and declination. This is a dimensionless quantity in the range [-1,+1].

RA_PARALLAX_CORR : Correlation between right ascension and parallax (float)

Correlation coefficient $\rho(\alpha, \varpi)$ between right ascension and parallax, a dimensionless quantity in the range [-1,+1].

RA_PMRA_CORR : Correlation between right ascension and proper motion in right ascension (float)

Correlation coefficient $\rho(\alpha, \mu_{\alpha*})$ between right ascension and proper motion in right ascension, a dimensionless quantity in the range [-1,+1].

RA_PMDEC_CORR : Correlation between right ascension and proper motion in declination (float)

Correlation coefficient $\rho(\alpha, \mu_{\delta})$ between right ascension and proper motion in declination, a dimensionless quantity in the range [-1,+1].

DEC_PARALLAX_CORR : Correlation between declination and parallax (float)

Correlation coefficient $\rho(\delta, \varpi)$ between declination and parallax, a dimensionless quantity in the range [-1,+1].

DEC_PMRA_CORR : Correlation between declination and proper motion in right ascension (float)

Correlation coefficient $\rho(\delta, \mu_{\alpha*})$ between declination and proper motion in right ascension, a dimensionless quantity in the range [-1,+1].

DEC_PMDEC_CORR : Correlation between declination and proper motion in declination (float)

Correlation coefficient $\rho(\delta, \mu_{\delta})$ between declination and proper motion in declination, a dimensionless quantity in the range [-1,+1].

PARALLAX_PMRA_CORR : Correlation between parallax and proper motion in right ascension (float)

Correlation coefficient $\rho(\varpi, \mu_{\alpha*})$ between parallax and proper motion in right ascension, a dimensionless quantity in the range [-1,+1].

PARALLAX_PMDEC_CORR : Correlation between parallax and proper motion in declination (float)

Correlation coefficient $\rho(\varpi, \mu_{\delta})$ between parallax and proper motion in declination, a dimensionless quantity in the range [-1,+1].

PMRA_PMDEC_CORR : Correlation between proper motion in right ascension and proper motion in declination (float)

Correlation coefficient $\rho(\mu_{\alpha*}, \mu_{\delta})$ between proper motion in right ascension and proper motion in declination, a dimensionless quantity in the range [-1,+1].

ASTROMETRIC_N_OBS_AL : Total number of observations in the along-scan (AL) direction (short)

Total number of AL observations (= CCD transits) used in the astrometric solution of the source, independent of their weight. Note that some observations may be strongly downweighted (see `astrometric_n_bad_obs_al`).

ASTROMETRIC_N_OBS_AC : Total number of observations in the across-scan (AC) direction (short)

Total number of AC observations (= CCD transits) used in the astrometric solution of the source, independent of their weight (note that some observations may be strongly downweighted). Nearly all sources having G < 13 will have AC observations from 2d windows, while fainter than that limit only ~ 1% of transit observations (the so–called 'calibration faint stars') are assigned 2d windows resulting in AC observations.

ASTROMETRIC_N_GOOD_OBS_AL : Number of good observations in the along-scan (AL) direction (short)

Number of AL observations (= CCD transits) that were not strongly downweighted in the astrometric solution of the source. Strongly downweighted observations (with downweighting factor $w < 0.2$) are instead counted in `astrometric_n_bad_obs_al`. The sum of `astrometric_n_good_obs_al` and `astrometric_n_bad_obs_al` equals `astrometric_n_obs_al`, the total number of AL observations used in the astrometric solution of the source.

ASTROMETRIC_N_BAD_OBS_AL : Number of bad observations in the along-scan (AL) direction (short)

Number of AL observations (= CCD transits) that were strongly downweighted in the astrometric solution of the source, and therefore contributed little to the determination of the astrometric parameters. An observation is considered to be strongly downweighted if its downweighting factor $w < 0.2$, which means that the absolute value of the astrometric residual exceeds 4.83 times the total uncertainty of the observation, calculated as the quadratic sum of the centroiding uncertainty, excess source noise, and excess attitude noise.

ASTROMETRIC_GOF_AL : Goodness of fit statistic of model wrt along-scan observations (float)

Goodness-of-fit statistic of the astrometric solution for the source in the along-scan direction. This is the 'gaussianized chi-square', which for good fits should approximately follow a normal distribution with zero mean value and unit standard deviation. Values exceeding, say, +3 thus indicate a bad fit to the data.

This statistic is computed according to the formula

$$\texttt{astrometric\_gof\_al} = (9\nu/2)^{1/2}[\texttt{ruwe}^{2/3} + 2/(9\nu) - 1]$$

where `ruwe` is the renormalised unit weight error and

$$\nu = \texttt{astrometric\_n\_good\_obs\_al} - N$$

is the number of degrees of freedom for a source update. Here $N = 5$ for 2-parameter and 5-parameter solutions (respectively `astrometric_params_solved` = 3 or 31) and 6 for 6-parameter solutions (`astrometric_params_solved` = 95). Note that only 'good' (i.e. not strongly downweighted) observations are included in ν. For further details please see Lindegren et al. (2021).

ASTROMETRIC_CHI2_AL : AL chi-square value (float)

Astrometric goodness-of-fit (χ^2) in the AL direction.

χ^2 values were computed for the 'good' AL observations of the source, without taking into account the `astrometric_excess_noise` (if any) of the source. They do however take into account the attitude excess noise (if any) of each observation.

ASTROMETRIC_EXCESS_NOISE : Excess noise of the source (float, Angle[mas])

This is the excess noise ϵ_i of the source. It measures the disagreement, expressed as an angle, between the observations of a source and the best-fitting standard astrometric model (using five astrometric parameters). The assumed observational noise in each observation is quadratically increased by ϵ_i in order to statistically match the residuals in the astrometric solution. A value of 0 signifies that the source is astrometrically well-behaved, i.e. that the residuals of the fit statistically agree with the assumed observational noise. A positive value signifies that the residuals are statistically larger than expected.

The significance of ϵ_i is given by `astrometric_excess_noise_sig` (D). If $D \leq 2$ then ϵ_i is probably not significant, and the source may be astrometrically well-behaved even if ϵ_i is large.

The excess noise ϵ_i may absorb all kinds of modelling errors that are not accounted for by the observational noise (image centroiding error) or the excess attitude noise. Such modelling errors include LSF and PSF calibration errors, geometric instrument calibration errors, and part of the high-frequency attitude noise. These modelling errors are particularly important in the early data releases, but should decrease as the astrometric modelling of the instrument and attitude improves over the years.

Additionally, sources that deviate from the standard five-parameter astrometric model (e.g. unresolved binaries, exoplanet systems, etc.) may have positive ϵ_i. Given the many other possible contributions to the excess noise, the user must study the empirical distributions of ϵ_i and D to make sensible cutoffs before filtering out sources for their particular application.

The excess source noise is further explained in Sections 3.6 and 5.1.2 of Lindegren et al. (2012).

ASTROMETRIC_EXCESS_NOISE_SIG : Significance of excess noise (float)

A dimensionless measure (D) of the significance of the calculated `astrometric_excess_noise` (ϵ_i). A value $D > 2$ indicates that the given ϵ_i is probably significant.

For good fits in the limit of a large number of observations, D should be zero in half of the cases and approximately follow the positive half of a normal distribution with zero mean and unit standard deviation for the other half. Consequently, D is expected to be greater than 2 for only a few percent of the sources with well-behaved astrometric solutions.

In the early data releases ϵ_i will however include instrument and attitude modelling errors that are statistically significant and could result in large values of ϵ_i and D. The user must study the empirical distributions of these statistics and make sensible cutoffs before filtering out sources for their particular application.

The excess noise significance is further explained in Section 5.1.2 of Lindegren et al. (2012).

ASTROMETRIC_PARAMS_SOLVED : Which parameters have been solved for? (byte)

The seven bits of `astrometric_params_solved` indicate which parameters have been estimated in AGIS for this source. A set bit means the parameter was updated, an unset bit means the parameter was not updated. The least-significant bit corresponds to `ra`. The table below shows the values of `astrometric_params_solved` for relevant combinations of the parameters.

The radial proper motion (μ_r) is formally considered to be one of the astrometric parameters of a source, and the sixth bit is therefore reserved for it. It is also in principle updatable in AGIS, but in practice it will always be computed from a spectroscopic radial velocity and the estimated parallax, in which case the bit is not set.

C is the `pseudocolour` of the source, i.e. the astrometrically estimated effective wavenumber.

`astrometric_params_solved`	`ra`	`dec`	`parallax`	`pmra`	`pmdec`	μ_r	C
$0000011_2 = 3$	✓	✓					
$0000111_2 = 7$	✓	✓	✓				
$0011011_2 = 27$	✓	✓		✓	✓		
$0011111_2 = 31$	✓	✓	✓	✓	✓		
$0111111_2 = 63$	✓	✓	✓	✓	✓	✓	
$1011111_2 = 95$	✓	✓	✓	✓	✓		✓

In practice all the sources in DR3 have only values of 3, 31 or 95 for the `astrometric_params_solved`, corresponding to two-parameter (position), five-parameter (position, parallax, and proper motion) and six-parameter (position, parallax, proper motion and astrometrically estimated effective wavenumber) solutions.

ASTROMETRIC_PRIMARY_FLAG : Primary or seconday (boolean)

Flag indicating if this source was used as a primary source (`true`) or secondary source (`false`). Only primary sources contribute to the estimation of attitude, calibration, and global parameters. The estimation of source parameters is otherwise done in exactly the same way for primary and secondary sources.

NU_EFF_USED_IN_ASTROMETRY : Effective wavenumber of the source used in the astrometric solution (float, Misc[μm^{-1}])

Effective wavenumber of the source, $\nu_{\rm eff}$, in μm^{-1}.

This $\nu_{\rm eff}$ is the value used in the image parameter determination and in the astrometric calibration if reliable mean BP and RP photometry were available. It is the photon-flux weighted inverse wavelength, as estimated from the BP and RP bands. The field is provided for astrometric solutions with five parameters but is empty for those with two or six parameters.

Due to cyclic processing of the astrometry and the photometry, this effective wavenumber might be different from the one computed using the latest available photometry. Moreover, if no reliable photometry was available at the time of the astrometric processing, this field is empty and an astrometrically estimated value of the effective wavenumber may instead be given in the `pseudocolour` field.

PSEUDOCOLOUR : Astrometrically estimated pseudocolour of the source (float, Misc[μm^{-1}])

Effective wavenumber of the source estimated in the final astrometric processing.

The `pseudocolour` is the astrometrically estimated effective wavenumber of the photon flux distribution in the astrometric (G) band, measured in μm^{-1}. The value in this field was estimated from the chromatic displacements of image centroids, calibrated by means of the photometrically determined effective wavenumbers ($\nu_{\rm eff}$) of primary sources.

The field is empty when chromaticity was instead taken into account using the photometrically determined $\nu_{\rm eff}$ given in the field `nu_eff_used_in_astrometry`.

PSEUDOCOLOUR_ERROR : Standard error of the pseudocolour of the source (float, Misc[μm^{-1}])

Standard error $\sigma_{\tt pseudocolour}$ of the astrometrically determined `pseudocolour` of the source.

RA_PSEUDOCOLOUR_CORR : Correlation between right ascension and pseudocolour (float)

Correlation coefficient $\rho(\alpha, \texttt{pseudocolour})$ between right ascension `ra` and `pseudocolour`, a dimensionless quantity in the range [-1,+1]

DEC_PSEUDOCOLOUR_CORR : Correlation between declination and pseudocolour (float)

Correlation coefficient $\rho(\delta, \texttt{pseudocolour})$ between declination `dec` and `pseudocolour`, a dimensionless quantity in the range [-1,+1]

PARALLAX_PSEUDOCOLOUR_CORR : Correlation between parallax and pseudocolour (float)

Correlation coefficient $\rho(\varpi, \texttt{pseudocolour})$ between `parallax` and `pseudocolour`, a dimensionless quantity in the range [-1,+1]

PMRA_PSEUDOCOLOUR_CORR : Correlation between proper motion in right asension and pseudocolour (float)

Correlation coefficient $\rho(\mu_{\alpha*}, \texttt{pseudocolour})$ between proper motion in right ascension `pmra` and `pseudocolour`, a dimensionless quantity in the range [-1,+1]

PMDEC_PSEUDOCOLOUR_CORR : Correlation between proper motion in declination and pseudocolour (float)

Correlation coefficient $\rho(\mu_{\delta}, \texttt{pseudocolour})$ between proper motion in declination `pmdec` and `pseudocolour`, a dimensionless quantity in the range [-1,+1]

ASTROMETRIC_MATCHED_TRANSITS : Matched FOV transits used in the AGIS solution (short)

The number of field–of–view transits matched to this source, counting only the transits containing CCD observations actually used to compute the astrometric solution.

This number will always be equal to or smaller than `matched_transits`, the difference being the FOV transits that were not used in the astrometric solution because of bad data or excluded time intervals.

VISIBILITY_PERIODS_USED : Number of visibility periods used in Astrometric solution (short)

Number of visibility periods used in the astrometric solution.

A visibility period is a group of observations separated from other groups by a gap of at least 4 days. A source may have from one to tens of field–of–view transits in a visibility period, but with a small spread in time, direction of scanning, and parallax factor. From one visibility period to the next these variables have usually changed significantly. A high number of visibility periods is therefore a better indicator of an astrometrically well–observed source than a large number of field–of–view transits (`matched_transits` or `astrometric_matched_transits`) or CCD observations (astrometric_n_obs_al). A small value (e.g. less than 10) indicates that the calculated parallax could be more vulnerable to errors, e.g. from the calibration model, not reflected in the formal uncertainties. See Lindegren et al. (2018) for a discussion of this and other astrometric quality indicators.

ASTROMETRIC_SIGMA5D_MAX : The longest semi-major axis of the 5-d error ellipsoid (float, Angle[mas])

The longest principal axis in the 5-dimensional error ellipsoid.

This is a 5-dimensional equivalent to the semi-major axis of the position error ellipse and is therefore useful for filtering out cases where one of the five parameters, or some linear combination of several parameters, is particularly ill-determined. It is measured in mas and computed as the square root of the largest singular value of the scaled 5×5 covariance matrix of the astrometric parameters. The matrix is scaled so as to put the five parameters on a comparable scale, taking into account the maximum along-scan parallax factor for the parallax and the time coverage of the observations for the proper motion components. If C is the unscaled covariance matrix, the scaled matrix is SCS, where $S = \mathrm{diag}(1, 1, \sin\xi, T/2, T/2)$, $\xi = 45°$ is the solar aspect angle in the nominal scanning law, and T the time coverage of the data used in the solution.

astrometric_sigma5d_max is given for all the solutions, as its size is one of the criteria for accepting or rejecting the 5 or 6-parameter solution. In case of a 2- parameter solution (astrometric_params_solved = 3) it gives the value for the rejected 5 or 6-parameter solution, and can then be arbitrarily large.

MATCHED_TRANSITS : The number of transits matched to this source (short)

The total number of field–of–view transits matched to this source.

NEW_MATCHED_TRANSITS : The number of transits newly incorporated into an existing source in the current cycle (short)

Individual field–of–view transits are crossmatched into unique sources at the start of each reprocessing cycle taking the source list from the previous cycle as a starting point. During that process a combination of appending, merging and splitting operations is performed to create a more complete and reliable map of unique sources given the available information. Existing individual sources may accrete further transits, may be merged into fewer unique sources, or may split into two or more new, unique sources as more measurements are accumulated. Field new_matched_transits logs the number of transits newly appended to an existing source during the most recent cyclic reprocessing crossmatch. It refers exclusively to the source_id.

MATCHED_TRANSITS_REMOVED : The number of transits removed from an existing source in the current cycle (short)

Individual field–of–view transits are crossmatched into unique sources at the start of each reprocessing cycle taking the source list from the previous cycle as a starting point. During that process a combination of appending, merging and splitting operations is performed to create a more complete and reliable map of unique sources given the available information. Existing individual sources may accrete further transits, may be merged into fewer unique sources, or may split into two or more new, unique sources as more measurements are accumulated. Field `matched_transits_removed` logs the number of transits removed during the most recent cyclic reprocessing crossmatch from those allocated to an existing source during all previous cycles. It refers exclusively to the `source_id`.

IPD_GOF_HARMONIC_AMPLITUDE : Amplitude of the IPD GoF versus position angle of scan (float)

This statistic measures the amplitude of the variation of the Image Parameter Determination (IPD) goodness–of–fit (GoF; reduced chi-square) as function of the position angle of the scan direction. A large amplitude indicates that the source has some non-isotropic spatial structure, for example a binary or galaxy, that is at least partially resolved by Gaia. The phase of the variation is given by the parameter `ipd_gof_harmonic_phase`.

Let ψ be the position angle of the scan direction. The following expression is fitted to the IPD GoF for the accepted AF observations of the source:

$$\ln(\mathrm{GoF}) = c_0 + c_2 \cos(2\psi) + s_2 \sin(2\psi)$$

The amplitude and phase of the variation are calculated as

$$\texttt{ipd\_gof\_harmonic\_amplitude} = \sqrt{c_2^2 + s_2^2}$$

$$\texttt{ipd\_gof\_harmonic\_phase} = \frac{1}{2}\,\mathrm{atan2}(s_2, c_2) \quad (+\ 180^\circ)$$

where atan2 returns the angle in degrees. In the last expression 180 is added for negative values, so that `ipd_gof_harmonic_phase` is always between 0 and 180°. Only the AF observations accepted by the astrometric solution are used to compute the amplitude and phase, thus for example outliers and observations in the early Ecliptic Pole Scanning Law phase are not used.

The GoF variation is modelled as a periodic function of 2ψ because a source with fixed structure is normally expected to give fits of similar quality when scanned in opposite directions (ψ differing by 180°). See `ipd_gof_harmonic_phase` for the interpretation of the phase.

IPD_GOF_HARMONIC_PHASE : Phase of the IPD GoF versus position angle of scan (float, Angle[deg])

This statistic measures the phase of the variation of the IPD GoF (reduced chi-square) as function of the position angle of the scan direction. See the description of `ipd_gof_harmonic_amplitude` for details on the computation of the phase.

The interpretation of this parameter is non-trivial because of the complex interaction between the source structure and the IPD. At least the following different scenarios could occur:

- For a binary with separation $\lesssim 0.1$ arcsec the GoF is expected to be higher when the scan is along the arc joining the components than in the perpendicular direction, in which case `ipd_gof_harmonic_phase` should indicate the position angle of the binary modulo 180°. Such a binary will normally have negligible `ipd_frac_multi_peak` (less than a few per cent).
- For a resolved binary the GoF may instead have a minimum when the scan is along the arc joining the two components, in which case `ipd_gof_harmonic_phase` differs from the position angle of the binary (modulo 180°) by approximately ±90°. Such a binary will normally have a large `ipd_frac_multi_peak`.
- For a bright binary ($G \lesssim 13$) the GoF refers to the fitting of a two-dimensional PSF, which could further complicate the intrepretation.
- For a galaxy with elongated intensity distribution, the IPD may give a smaller GoF when the scan is along the major axis of the image, resulting in an offset of approximately ±90° between the `ipd_gof_harmonic_phase` and the position angle of the major axis (modulo 180°).

IPD_FRAC_MULTI_PEAK : Percent of successful-IPD windows with more than one peak (byte)

This field provides information on the raw windows used for the astrometric processing of this source coming from the Image Parameters Determination (IPD) module in the core processing. It provides the fraction of windows (having a successful IPD result), as percentage (from 0 to 100), for which the IPD algorithm has identified a double peak, meaning that the detection may be a visually resolved double star (either just visual double or real binary). The quantity was computed using all transits where the IPD was successful.

IPD_FRAC_ODD_WIN : Percent of transits with truncated windows or multiple gate (byte)

This field is calculated during AGIS and provides information on the raw windows used for the astrometric processing of this source. It provides the fraction (as a percentage, from 0 to 100) of transits having either truncation or multiple gates flagged in one or more windows. Such a situation invariably means that the on-board video processing unit (VPU) detected some nearby source (which may be just a spurious detection, but typically could be some real nearby source — having another distinct transit and most probably assigned to a different source). So in general a non–zero fraction indicates that this source may be contaminated by another nearby source. The quantity was computed using all transits where the IPD was successful.

RUWE : Renormalised unit weight error (float)

The Renormalised Unit Weight Error is computed as

$$\texttt{ruwe} = \frac{\sqrt{\texttt{astrometric\_chi2\_al}/(\texttt{astrometric\_n\_good\_obs\_al} - m)}}{f(G, G_{\rm BP} - G_{\rm RP})}$$

where m is the number of parameters solved (the number of set bits in `astrometric_params_solved`) and f is a renormalising function.

In practice f is determined in an off-line statistical analysis of the secondary solutions — see for example 'Re-normalising the astrometric chi-square in Gaia DR2' (Lindegren 2018). Also note that this value is set to null for sources with only a two-parameter solution, since this value would be difficult to interpret in such cases.

SCAN_DIRECTION_STRENGTH_K1 : Degree of concentration of scan directions across the source (float)

The `scan_direction_strength_k1`...4 and `scan_direction_mean_k1`...4 quantify the distribution of AL scan directions across the source. `scan_direction_strength_k1` (and similarly 2,3,4) are the absolute value of the trigonometric moments $m_k = \langle \exp(ik\theta) \rangle$ for $k = 1, 2, 3, 4$ where θ is the position angle of the scan and the mean value is taken over the `astrometric_n_good_obs_al` observations contributing to the astrometric parameters of the source. θ is defined in the usual astronomical sense: $\theta = 0$ when the FoV is moving towards local North, and $\theta = 90^\circ$ towards local East.

N.B. When `astrometric_n_obs_ac` > 0 the scan direction attributes are not provided at Gaia DR3. Hence for all sources brighter than G $\approx$ 13, and for a tiny fraction of fainter sources ($\approx$ 1%), these 8 scan direction fields will be NULL.

The `scan_direction_strength_k1`...4 are numbers between 0 and 1, where 0 means that the scan directions are well spread out in different directions, while 1 means that they are concentrated in a single direction (given by the corresponding `scan_direction_mean_k1`...4).

The different orders k are statistics of the scan directions modulo $360°/k$. For example, at first order ($k = 1$), $\theta = 10°$ and $\theta = 190°$ count as different directions, but at second order ($k = 2$) they are the same. Thus, `scan_direction_strength_k1` is the degree of concentration when the sense of direction is taken into account, while `scan_direction_strength_k2` is the degree of concentration without regard to the sense of direction. A large value of `scan_direction_strength_k4` indicates that the scans are concentrated in two nearly orthogonal directions.

SCAN_DIRECTION_STRENGTH_K2 : Degree of concentration of scan directions across the source (float)

The `scan_direction_strength_k1...4` and `scan_direction_mean_k1...4` attributes quantify the distribution of AL scan directions across the source.

See the description for attribute `scan_direction_strength_k1` for further details.

SCAN_DIRECTION_STRENGTH_K3 : Degree of concentration of scan directions across the source (float)

The `scan_direction_strength_k1...4` and `scan_direction_mean_k1...4` attributes quantify the distribution of AL scan directions across the source.

See the description for attribute `scan_direction_strength_k1` for further details.

SCAN_DIRECTION_STRENGTH_K4 : Degree of concentration of scan directions across the source (float)

The `scan_direction_strength_k1...4` and `scan_direction_mean_k1...4` attributes quantify the distribution of AL scan directions across the source.

See the description for attribute `scan_direction_strength_k1` for further details.

SCAN_DIRECTION_MEAN_K1 : Mean position angle of scan directions across the source (float, Angle[deg])

The `scan_direction_strength_k1...4` and `scan_direction_mean_k1...4` attributes quantify the distribution of AL scan directions across the source. `scan_direction_mean_k1` (and similarly for $k = 2, 3, 4$) is $1/k$ times the argument of the trigonometric moments $m_k = \langle \exp(ik\theta) \rangle$, where θ is the position angle of the scan and the mean value is taken over the `astrometric_n_good_obs_al` observations contributing to the astrometric parameters of the source. θ is defined in the usual astronomical sense: $\theta = 0$ when the FoV is moving towards local North, and $\theta = 90°$ towards local East.

N.B. When astrometric_n_obs_ac > 0 the scan direction attributes are not provided at Gaia DR3. Hence for all sources brighter than G $\approx$ 13, and for a tiny fraction of fainter sources ($\approx$ 1%), these 8 scan direction fields will be NULL.

scan_direction_mean_k1 (and similarly for $k = 2, 3, 4$) is an angle between $-180°/k$ and $+180°/k$, giving the mean position angle of the scans at order k.

The different orders k are statistics of the scan directions modulo $360°/k$. For example, at first order ($k = 1$), $\theta = 10°$ and $\theta = 190°$ count as different directions, but at second order ($k = 2$) they are the same. Thus, scan_direction_mean_k1 is the mean direction when the sense of direction is taken into account, while scan_direction_mean_k2 is the mean direction without regard to the sense of the direction. For example, scan_direction_mean_k1 = 0 means that the scans preferentially go towards North, while scan_direction_mean_k2 = 0 means that they preferentially go in the North-South direction, and scan_direction_mean_k4 = 0 that they preferentially go either in the North-South or in the East-West direction.

SCAN_DIRECTION_MEAN_K2 : Mean position angle of scan directions across the source (float, Angle[deg])

The scan_direction_strength_k1...4 and scan_direction_mean_k1...4 attributes quantify the distribution of AL scan directions across the source.

See the description for attribute scan_direction_mean_k1 for further details.

SCAN_DIRECTION_MEAN_K3 : Mean position angle of scan directions across the source (float, Angle[deg])

The scan_direction_strength_k1...4 and scan_direction_mean_k1...4 attributes quantify the distribution of AL scan directions across the source.

See the description for attribute scan_direction_mean_k1 for further details.

SCAN_DIRECTION_MEAN_K4 : Mean position angle of scan directions across the source (float, Angle[deg])

The scan_direction_strength_k1...4 and scan_direction_mean_k1...4 attributes quantify the distribution of AL scan directions across the source.

See the description for attribute `scan_direction_mean_k1` for further details.

DUPLICATED_SOURCE : Source with multiple source identifiers (boolean)

During data processing, this source happened to be duplicated and only one source identifier has been kept. Observations assigned to the discarded source identifier(s) were not used. This may indicate observational, cross-matching or processing problems, or stellar multiplicity, and probable astrometric or photometric problems in all cases. The duplicity criterion used for Gaia E/DR3 is an angular distance of 0.18 arcsec, while a limit of 0.4 arcsec was used for Gaia DR2.

PHOT_G_N_OBS : Number of observations contributing to G photometry (short)

Number of observations (CCD transits) that contributed to the G mean flux (`phot_g_mean_flux`) and mean flux error (`phot_g_mean_flux_error`).

PHOT_G_MEAN_FLUX : G-band mean flux (double, Flux[e^{-} s^{-1}])

Mean flux in the G-band.

PHOT_G_MEAN_FLUX_ERROR : Error on G-band mean flux (float, Flux[e^{-} s^{-1}])

Standard deviation of the G-band fluxes divided by the square root of the number of observations (`phot_g_n_obs`).

PHOT_G_MEAN_FLUX_OVER_ERROR : G-band mean flux divided by its error (float)

Mean flux in the G-band `phot_g_mean_flux` divided by its error `phot_g_mean_flux_error`.

PHOT_G_MEAN_MAG : G-band mean magnitude (float, Magnitude[mag])

Mean magnitude in the G band. This is computed from the G-band mean flux (`phot_g_mean_flux`) applying the magnitude zero-point in the Vega scale (see Sect. **??**).

No error is provided for this quantity as the error distribution is only symmetric in flux space. This converts to an asymmetric error distribution in magnitude space which cannot be represented by a single error value.

PHOT_BP_N_OBS : Number of observations contributing to BP photometry (short)

Number of observations (CCD transits) that contributed to the integrated BP mean flux (`phot_bp_mean_flux`) and its mean flux error (`phot_bp_mean_flux_error`).

PHOT_BP_MEAN_FLUX : Integrated BP mean flux (double, Flux[e^{-} s^{-1}])

Mean flux in the integrated blue photometer (BP) band (see Chapter **??**).

PHOT_BP_MEAN_FLUX_ERROR : Error on the integrated BP mean flux (float, Flux[e^{-} s^{-1}])

Error on the mean flux in the integrated BP band `phot_bp_mean_flux` (errors are computed from the dispersion about the weighted mean of input calibrated photometry).

PHOT_BP_MEAN_FLUX_OVER_ERROR : Integrated BP mean flux divided by its error (float)

Integrated BP mean flux `phot_bp_mean_flux` divided by its error `phot_bp_mean_flux_error`.

PHOT_BP_MEAN_MAG : Integrated BP mean magnitude (float, Magnitude[mag])

Mean magnitude in the integrated BP band. This is computed from the BP-band mean flux (`phot_bp_mean_flux`) applying the magnitude zero-point in the Vega scale.

No error is provided for this quantity as the error distribution is only symmetric in flux space. This converts to an asymmetric error distribution in magnitude space which cannot be represented by a single error value.

PHOT_RP_N_OBS : Number of observations contributing to RP photometry (short)

Number of observations (CCD transits) that contributed to the integrated RP mean flux (`phot_rp_mean_flux`) and mean flux error (`phot_rp_mean_flux_error`).

PHOT_RP_MEAN_FLUX : Integrated RP mean flux (double, Flux[e^{-} s^{-1}])

Mean flux in the integrated red photometer (RP) band (see Chapter **??**).

PHOT_RP_MEAN_FLUX_ERROR : Error on the integrated RP mean flux (float, Flux[e^{-} s^{-1}])

Error on the mean flux in the integrated RP band `phot_rp_mean_flux` (errors are computed from the dispersion about the weighted mean of input calibrated photometry).

PHOT_RP_MEAN_FLUX_OVER_ERROR : Integrated RP mean flux divided by its error (float)

Integrated RP mean flux `phot_rp_mean_flux` divided by its error `phot_rp_mean_flux_error`.

PHOT_RP_MEAN_MAG : Integrated RP mean magnitude (float, Magnitude[mag])

Mean magnitude in the integrated RP band. This is computed from the RP-band mean flux (`phot_rp_mean_flux`) applying the magnitude zero-point in the Vega scale.

No error is provided for this quantity as the error distribution is only symmetric in flux space. This converts to an asymmetric error distribution in magnitude space which cannot be represented by a single error value.

PHOT_BP_RP_EXCESS_FACTOR : BP/RP excess factor (float)

BP/RP excess factor estimated from the comparison of the sum of integrated BP and RP fluxes with respect to the flux in the G band. This measures the excess of flux in the BP and RP integrated photometry with respect to the G band. A deviation from the norm means that there is a consistency issue between the fluxes. This could generally imply a problem with the G, BP or RP measurements. More details on how to best interpret this metric can be found in Riello et al. (2021).

PHOT_BP_N_CONTAMINATED_TRANSITS : Number of BP contaminated transits (short)

Number of BP transits that contributed to the mean photometry and were considered to be contaminated by one or more nearby sources. The contaminating sources may come from the other field of view.

PHOT_BP_N_BLENDED_TRANSITS : Number of BP blended transits (short)

Number of BP transits that contributed to the mean photometry and were flagged to be blends of more than one source (i.e. more than one source is present in the observing window). The blended sources may come from different fields of view.

PHOT_RP_N_CONTAMINATED_TRANSITS : Number of RP contaminated transits (short)

Number of RP transits that contributed to the mean photometry and were considered to be contaminated by one or more nearby sources. The contaminating sources may come from the other field of view.

PHOT_RP_N_BLENDED_TRANSITS : Number of RP blended transits (short)

Number of RP transits that contributed to the mean photometry and were flagged to be blends of more than one source (i.e. more than one source is present in the observing window). The blended sources may come from different fields of view.

PHOT_PROC_MODE : Photometry processing mode (byte)

This flag indicates the photometric calibration process used for the source. The process is determined by the availability of colour information derived from the internally calibrated mean BP and RP source spectra. The following values are defined for Gaia DR3:

- 0: this corresponds to the 'gold' photometric dataset. Sources in this dataset have complete colour information.
- 1: this corresponds to the 'silver' photometric dataset. Sources in this dataset have incomplete colour information and therefore were calibrated using an iterative process that estimated the missing colour information from the source mean G and either BP or RP photometry (depending on which band had full colour information available) using empirical relationships derived from the gold dataset.
- 2: this corresponds to the 'bronze' photometric dataset. Sources in this dataset had insufficient colour information and therefore were calibrated using default colour information derived from the gold dataset.

Because the process of generating the mean BP and RP spectra and the process of producing mean BP and RP integrated photometry are very different and have different requirements it is possible for gold sources to be missing any of the bands, i.e. gold does not imply anything about the availability of mean G, BP and RP photometry. Similarly for silver and bronze sources it is possible to have photometry available in any bands (and possible combinations).

More details about the different calibration procedures are available in Chapter **??** of the Gaia

DR3 on-line documentation and in Riello et al. (2021)

BP_RP : BP - RP colour (float, Magnitude[mag])

BP−RP colour (phot_bp_mean_mag – phot_rp_mean_mag).

BP_G : BP - G colour (float, Magnitude[mag])

BP−G colour (phot_bp_mean_mag – phot_g_mean_mag).

G_RP : G - RP colour (float, Magnitude[mag])

G−RP colour (phot_g_mean_mag – phot_rp_mean_mag).

RADIAL_VELOCITY : Radial velocity (float, Velocity[km s^{-1}])

Spectroscopic radial velocity in the Solar system barycentric reference frame.

The radial_velocity is the multi-epoch (or multi-transit) value obtained by combining the epoch (transit) data of these stars. The total number of epochs used is stored in rv_nb_transits. Both non-blended and deblended spectra are used, and the number of epochs having deblended spectra is stored in rv_nb_deblended_transits.

Two methods are used to obtain radial_velocity, depending on the magnitude grvs_mag of the star. The information on which method has been used is stored in rv_method_used.

For the bright stars (grvs_mag ≤12), radial_velocity is the median value of the epoch radial velocities. For the faint stars, for which the epoch radial velocities are imprecise, the epoch cross-correlation functions (obtained by comparing the RVS and the associated template spectrum) are combined and the radial_velocity is derived. The information on which of the two methods has been used is stored in rv_method_used.

See Sect. **??** for the complete list of the parameters containing information on the radial_velocity measurements.

In Gaia DR3, radial_velocity is provided for about 33.8 million of stars. See Katz & et al. (2022) for a description of the validation of the radial_velocity measurements, and Blomme & et al. (2022) for the specific treatments to obtain the hot star radial velocities and their validation.

RADIAL_VELOCITY_ERROR : Radial velocity error (float, Velocity[km s^{-1}])

The uncertainty associated with `radial_velocity`.

Two methods are used to obtain `radial_velocity` and `radial_velocity_error`, depending on the magnitude `grvs_mag` of the star. The information on which method has been used is stored in `rv_method_used`.

For the bright stars (`rv_method_used`= 1), `radial_velocity_error` is the uncertainty on the median of the epoch radial velocities ($\sigma_{\rm med}$), to which a constant shift of 0.11 km s^{-1} was added to take into account a calibration floor contribution:

$$\texttt{radial\_velocity\_error} = \sqrt{\sigma^2_{med} + 0.11^2}$$

$$\sigma_{\rm med} = \sqrt{\frac{\pi}{2}} . \frac{\sigma(V_j)}{\sqrt{\texttt{rv\_nb\_transits}}}$$

where $\sigma(V_j)$ is the standard deviation of the epoch radial velocity measurements and `rv_nb_transits` the number of transits for which an epoch radial velocity, V_j, has been obtained.

For the faint stars (`rv_method_used` = 2), the `radial_velocity_error` is derived from the combined cross-correlation functions:

$$\texttt{radial\_velocity\_error}^2 = -\frac{1 - C^2}{MNC''C}$$

where C and C'' are the values of the cross-correlation function and of its second derivative at the maximum. N is the number of bins of the input spectrum. M is the number of transits `rv_nb_transits` (see Zucker (2003), Sec.2.3).

RV_METHOD_USED : Method used to obtain the radial velocity (byte)

`rv_method_used` contains the information on the method used to obtain the `radial_velocity` and the associated uncertainty `radial_velocity_error`.

Two methods are used:

- `rv_method_used` = 1: This is the method used for the bright stars (in general `grvs_mag` ≤ 12). The `radial_velocity` is the median of the epoch radial velocities, and the associated uncertainty `radial_velocity_error` is the uncertainty on the median, to which a constant of 0.11 km s^{-1} is added.
- `rv_method_used` = 2 : This is the method used for the faint stars (`grvs_mag` > 12), but also for few bright stars not having grvs_mag information (grvs_mag is not estimated when the available transits are all deblended or reblended). The cross-correlation functions obtained at each epoch are combined to obtain a combined cross-correlation function which is used to estimate `radial_velocity` and `radial_velocity_error`.

RV_NB_TRANSITS : Number of transits used to compute the radial velocity (short)

The total number of epochs (transits) used to compute `radial_velocity`. In general, one transit in the RVS field-of-view includes 3 RVS CCD observations.

RV_NB_DEBLENDED_TRANSITS : Number of valid transits that have undergone deblending (short)

The number of epochs (transits) among `rv_nb_transits` for which at least one of the 3 RVS CCD spectra has undergone deblending. The deblending of the spectra is decribed in Seabroke & et al. (2022).

RV_VISIBILITY_PERIODS_USED : Number of visibility periods used to estimate the radial velocity (short)

Number of visibility periods used to obtain `radial_velocity`. A visibility period is a group of transits separated from other groups by a gap of at least 4 days.

RV_EXPECTED_SIG_TO_NOISE : Expected signal to noise ratio in the combination of the spectra used to obtain the radial velocity (float)

The expected signal to noise ratio is obtained by combining the information from the CCD spectra used for estimating `radial_velocity`:

$$\texttt{rv\_expected\_sig\_to\_noise} = \frac{S}{\sqrt{S + BCK + RN}}$$

where:

$$S = \frac{medianFlux \times N_{ValidStrips} \times \text{EXP\_TIME} \times \text{PIXEL\_WIDTH\_AL}}{\text{BAND\_WIDTH}}$$

$$BCK = medianBackground \times N_{ValidStrips} \times N_{ACpixels}$$

$$RN = RON^2 \times N_{ValidStrips} \times N_{ACsamples}$$

where:

• $medianFlux$ = the median of the integrated flux of the CCD spectra used to obtain the radial velocity [$e^{-}s^{-1}$]
• $N_{ValidStrips}$ = the total number of CCD spectra used to obtain the `radial_velocity` (in general there are 3 CCD spectra per transit)
• BAND_WIDTH = 870 - 846 [nm]
• EXP_TIME = 4.4167032 [s]
• PIXEL_WIDTH_AL = 0.02453 [nm]
• $medianBackground$ = the median background in one exposure of the CCD spectra used to obtain the `radial_velocity` [$e^{-}pixel^{-1}$]
• $N_{ACpixels}$ = 10 is the number of pixels in the AC direction of the non-truncated RVS window
• $N_{ACsamples}$ is the size in the AC direction of the non-truncated RVS window. $N_{ACsamples}$ = 10 for the 2D RVS windows (Window Class=0) and $N_{ACsamples}$ = 1 for the 1D windows (Window Class=1)
• RON (Read Out Noise) = 3.2 [e^{-}]

The SNR of the spectra combination used for `vbroad` determination can be estimated from: $\texttt{rv\_expected\_sig\_to\_noise}\sqrt{\frac{\texttt{vbroad\_nb\_transits}}{\texttt{rv\_nb\_transits}}}$, and similarly for `grvs_mag` from: $\texttt{rv\_expected\_sig\_to\_noise}\sqrt{\frac{\texttt{grvs\_mag\_nb\_transits}}{\texttt{rv\_nb\_transits}}}$

RV_RENORMALISED_GOF : Radial velocity renormalised goodness of fit (float)

The renormalised goodness of fit (see Perryman 1997, p. 112) is an empirical value computed using this source and all the other sources having `rv_template_teff` and `grvs_mag` in a given range. The scatter of the source epoch radial velocities is compared to the typical epoch uncertainty for the appropriate `grvs_mag` and `rv_template_teff` range.

$$\texttt{rv\_renormalised\_gof} = \sqrt{4.5\nu}\left(RUWE^{2/3} + \frac{2}{9\nu} - 1\right)$$

where:

$$\nu = \texttt{rv\_nb\_transits} - 1$$

$$RUWE = \frac{UWE}{\mathrm{mode}(UWE)}$$

$$UWE = \sqrt{\frac{1}{\nu}\sum_j \left(\frac{V_j - \texttt{radial\_velocity}}{\epsilon_j}\right)^2}$$

• `radial_velocity` is the median of the epoch radial velocities V_j (`rv_method_used`=1);
• V_j are the epoch radial velocities;
• ϵ_j is the uncertainty on V_j;
• mode(UWE) is the mode of the UWE distribution in the appropriate bin of the UWE(`rv_template_teff`,`gr`
look up table obtained by an off-line analysis (see Sect. ??);
• $RUWE$: Renormalised Unit Weight Error, UWE: Unit Weight Error.

`rv_renormalised_gof` is provided for the bright stars with 5.5 ≤ `grvs_mag` ≤ 12 and `rv_template_teff` < 14 500K. It is empty for the stars with `grvs_mag` outside this range.

To find potential radial velocity variable stars we suggest to take into account also `rv_nb_transits` and `rv_chisq_pvalue` and the following selection is suggested:
`rvChiSqPValue` < 0.01 and `rv_renormalised_gof` > 4 and `rv_nb_transits` ≥ 10.

RV_CHISQ_PVALUE : P-value for constancy based on a chi-squared criterion (float)

`rv_chisq_pvalue` is the p-value for constancy, defined as the probability that the observed χ^2_{obs} will exceed the expected value from a χ^2 distribution with significance level α. It takes values between [0,1] where, in the assumption of normal uncertainties being accurately known, 1 = strong probability of constancy, 0 = very low probability of constancy:

$$\chi^2_{obs} = \frac{\sum_j V_j \sum_j V_j^2 w_j - (\sum_j V_j w_j)^2}{\sum_j w_j}$$

where:
• V_j are the epoch radial velocities, where the outliers are excluded. The outliers are defined as the transits in the time-series having V_j smaller than Q1 - 3 x IQR or larger than Q3 + 3 x IQR, where Q1 and Q3 are the 25th and 75th percentiles, and where the IQR (inter quartile range) = Q3 - Q1;
• w_j is the weight: $w_j \equiv 1/(\epsilon_j)^2$; ϵ_j is the uncertainties associated to V_j.

This is a probability-based statistic with respect to the null hypothesis that the source is constant. It assumes that ϵ_i are normal uncertainties accurately known (which is not always the case). The intention is that if, for example, you select sources with `rv_chisq_pvalue` < 0.05 (i.e. α = 0.05), you know that you will get about 5% of constant sources contaminating your sample (of variables). If you want less contamination, then you select a smaller value.

To find potential radial velocity variable stars we suggest using also `rv_nb_transits` and `rv_renormalised_gof`. The following selection is suggested:
`rvChiSqPValue` < 0.01 and `rv_renormalised_gof` > 4 and `rv_nb_transits` ≥ 10.

This field is provided for the bright stars for which `rv_method_used`=1 and `rv_nb_transits` > 2 and it is empty otherwise.

RV_TIME_DURATION : Time coverage of the radial velocity time series (float, Time[day])

The difference between the first and last transit mean observing time. The transits are those used to compute `radial_velocity`, and their number is `rv_nb_transits`.

RV_AMPLITUDE_ROBUST : Total amplitude in the radial velocity time series after outlier removal (float, Velocity[km s^{-1}])

The total amplitude (maxRobust−minRobust) in the radial velocity time series after outlier removal.

The statistical outliers are the valid transits in the time-series having RV-values smaller than Q1 - 3 x IQR or larger than Q3 + 3 x IQR, where Q1 and Q3 are the 25th and 75th percentiles, and where IQR= Q3 - Q1. The outlying values fall outside of the lower and upper ‘fences’, and are being disregarded for calculating the so-called ‘Robust’ statistical parameters.

For the outlier calculations the fences are placed at Q1 - 3 x IQR and Q3 + 3 x IQR which are commonly used for detecting 'large' outliers, or also called the 'probable outliers'.

This field is provided for the bright stars for which `rv_method_used` = 1 and `rv_nb_transits` > 2 and it is empty otherwise.

RV_TEMPLATE_TEFF : Teff of the template used to compute the radial velocity (float, Temperature[K])

Effective temperature of the synthetic spectrum template used to determine `radial_velocity` and `vbroad`. N.B. the purpose of this parameter is to provide information on the synthetic template spectrum used, not to provide an estimate of the stellar effective temperature of this source. The available synthetic spectra are listed in Sect. **??**.

RV_TEMPLATE_LOGG : Logg of the template used to compute the radial velocity (float, GravitySurface[log cgs])

Surface gravity $\log g$ of the synthetic spectrum template used to determine `radial_velocity` and `vbroad`. N.B. the purpose of this parameter is to provide information on the synthetic template spectrum used, not to provide an estimate of the surface gravity of this source. The available synthetic spectra are listed in Sect. **??**.

RV_TEMPLATE_FE_H : [Fe/H] of the template used to compute the radial velocityy (float, Abundances[dex])

Metallicity (compared to solar) [Fe/H] of the synthetic spectrum template used to determine `radial_velocity` and `vbroad`. N.B. the purpose of this parameter is to provide information on the synthetic template spectrum used, not to provide an estimate of the metallicity of this source. The available synthetic spectra are listed in Sect. **??**.

RV_ATM_PARAM_ORIGIN : Origin of the atmospheric parameters associated to the template (short)

`rv_atm_param_origin` contains the information on the origin of the template atmospheric parameters (APs) in the following order: origin of `rv_template_teff`, origin of `rv_template_logg` and origin of `rv_template_fe_h`.

The possible origins of each template atmospheric parameter are:
• 0 : default. The template APs are set to their default value when no information is available

on the star APs and no attempt to estimate the APs is done in the spectroscopic pipeline. The default APs are:
Teff = 5500K (solar); $\log g$ = 4.5 dex (solar); [Fe/H] = 0 dex (solar) or = −2 dex (in the few cases when Teff origin=1)
• 1 : GspPhot. The template APs are the closest to the star APs obtained by a preliminary version of the atmospheric parameter pipeline GspPhot (Sect. **??**);
• 2 : Ground based. The template parameters are the closest to the star APs taken from ground based observations (Sect. **??**);
• 3 : DetermineAP. The template parameters are obtained using the spectroscopic pipeline internal method 'DetermineAP' (Sect. **??**);
• 4 : GspSpec. The template parameters are the closest to the star parameters computed by a preliminary version of the atmospheric parameter pipleine GspSpec (Sect. **??**);
• 5 : ReDetermineApHotStars. The template parameters are the closest to the star APs obtained using the spectroscopic pipeline internal method ReDetermineApHotStars. This method is described in Blomme & et al. (2022) and is used to determine the APs of the hot stars.

The possible values of `rv_atm_param_origin` are:

- 000 (The three parameters have their default value: Teff = 5500K, $\log g$ = 4.5 and [Fe/H] = 0);
- 111 (The origin of the three parameters is GspPhot)
- 110 (The origin of Teff and $\log g$ is GspPhot, default [Fe/H] = -2)
- 101 (The origin of Teff and [Fe/H] is GspPhot; default $\log g$ = 4.5)
- 100 (The origin of Teff is GspPhot; default $\log g$= 4.5; default [Fe/H]= -2)
- 222 (The origin of the three parameters is ground based)
- 333 (The origin of the three parameters is DetermineAP)
- 444 (The origin of the three parameters is GspSpec)
- 440 (The origin of Teff and $\log g$ is GspSpec; default [Fe/H] = 0)
- 555 (The origin of the three parameters is RedetermineApHotStars)

VBROAD : Spectral line broadening parameter (float, Velocity[km s^{-1}])

The spectral line broadening parameter. It is measured using a rotational broadening kernel; its value therefore includes $v \sin i$, but also any other source of line broadening (macroturbulence, residual instrumental effects, etc.)

`vbroad` is the median value of the epoch vbroad measurements, leaving aside the epoch vbroad values obtained using deblended spectra and those obtained at the beginning of the Gaia operations, when the optics were suffering from contamination from water resulting in broadening of the spectral lines. The total number of epochs used is stored in `vbroad_nb_transits`.

Due to technical and algorithmic limitations, values lower than ~10 km/s are known to be systematically overestimated, but they still can be used to identify slow rotators.

`vbroad` is provided for about 3.5 million bright stars. See Fremat & et al. (2022) for a description of the validation of the `vbroad` measurements.

VBROAD_ERROR : Uncertainty on the spectral line broadening (float, Velocity[km s^{-1}])

`vbroad_error` is the uncertainty associated to `vbroad`. It is the standard deviation of the epoch vbroad_j measurements.

Note: When `vbroad_error` > `vbroad`, the star vbroad estimation is: 0≤`vbroad`≤`vbroad`+`vbroad_error`.

VBROAD_NB_TRANSITS : Number of transits used to compute vbroad (short)

The number of transits (epochs) used to compute `vbroad`. Only non-blended transits acquired after the first decontamination (OBMT=1317 rev) have been used.

GRVS_MAG : Integrated Grvs magnitude (float, Magnitude[mag])

The magnitude `grvs_mag` is estimated using the flux in the RVS spectra. It is the median value of the epoch G^{t}_{RVS} measurements, leaving aside the epoch G^{t}_{RVS} values obtained using deblended spectra. The total number of epochs used is stored in `grvs_mag_nb_transits`.

`grvs_mag` is provided for about 32.2 million of sources. It is not provided for stars fainter than `grvs_mag`=14.1 mag.

For those stars where no `grvs_mag` is provided, an estimation of the magnitude in the RVS band can be obtained using the magnitudes `phot_g_mean_mag` and `phot_rp_mean_mag` and the transformation in Sartoretti & et al. (2022).

GRVS_MAG_ERROR : Grvs magnitude uncertainty (float, Magnitude[mag])

The `grvs_mag_error` is the uncertainty on the median (σ_{med}), to which a constant of 0.004 mag has been added to take into account a calibration floor contribution:

$$\texttt{grvs\_mag\_error} = \sqrt{\sigma_{med}^2 + 0.004^2}$$

$$\sigma_{\rm med} = \sqrt{\frac{\pi}{2}}.\frac{\sigma(G^{\rm t}_{\rm RVS})}{\sqrt{\texttt{grvs\_mag\_nb\_transits}}}$$

where $\sigma(G^{\rm t}_{\rm RVS})$ is the standard deviation of the epoch $G^{\rm t}_{\rm RVS}$ measurements and `grvs_mag_nb_transits` is the number of epochs for which a $G^{\rm t}_{\rm RVS}$ has been obtained.

GRVS_MAG_NB_TRANSITS : Number of transits used to compute Grvs (short)

The number of transits (epochs) used to compute `grvs_mag`. Only non-blended transits have been used.

`grvs_mag_nb_transits` includes a few non-blended transit data not included in `rv_nb_transits`, but still relevant for the `grvs_mag` estimation.

RVS_SPEC_SIG_TO_NOISE : Signal to noise ratio in the mean RVS spectrum (float)

The signal to noise ratio in the mean spectrum is calculated using the median of the ratio of the fluxes and flux uncertainties $\bar{f}_{\rm bin}/\sigma_{f,\rm bin}$ on all the individual bins.

The flux per wavelength bin in the mean spectrum is

$$\bar{f}_{\rm bin} = \frac{\sum_{j=0}^{n} f_j}{n}$$

where j is the jth CCD spectrum being combined out of a total of n in a particular wavelength bin.

The uncertainty on the flux per wavelength bin is

$$\sigma_{f,\rm bin} = \frac{\sigma_{f_n}}{\sqrt{n}}$$

where σ_{f_n} is the standard deviation of all the flux values contributing to an individual wavelength bin:

$$\sigma_{f_n} = \sqrt{\frac{1}{n}\sum_{j=0}^{n}(f_j - \bar{f}_{\rm bin})^2}$$

This field is provided only for the stars having the rvs_mean_spectrum published, which can be selected using the flag has_rvs=true.

PHOT_VARIABLE_FLAG : Photometric variability flag (string)

Flag indicating if variability was identified in the photometric data:

- 'NOT_AVAILABLE': source not processed and/or exported to catalogue;
- 'CONSTANT': Source not identified as variable;
- 'VARIABLE': source identified and processed as variable, see Vari* tables and Chapter **??**.

Note that for this data release only a subset of (variable) sources was processed and/or exported, so for many (known) variable sources this flag is set to 'NOT AVAILABLE'. No 'CONSTANT' sources were exported either.

L : Galactic longitude (double, Angle[deg])

Galactic Longitude of the object at reference epoch ref_epoch, see Section **??** of the release documentation for conversion details.

B : Galactic latitude (double, Angle[deg])

Galactic Latitude of the object at reference epoch ref_epoch, see Section **??** of the release documentation for conversion details.

ECL_LON : Ecliptic longitude (double, Angle[deg])

Ecliptic Longitude of the object at reference epoch ref_epoch, obtained from the equatorial coordinates using the transformation defined in Volume 1, Section 1.5.3 of ESA (1997).

Note that in the transformation applied here the ICRS origin is shifted in the equatorial plane from Γ by $\phi = 0.05542$ arcsec, positive from Γ to the ICRS origin (Chapront et al. 2002). The ICRS has an unambiguous definition with an origin in the ICRF equator defined by the realisation of the ICRF. The ecliptic system is less well-defined, potentially depending on additional conventions in dynamical theories. The transformation employed here corresponds to the inertial mean ecliptic with obliquity and Γ defined by reference to the ICRS equator. Both the obliquity and the position of Γ on the ICRS equator with respect to the ICRS origin have been obtained from Lunar Laser Ranging measurements. This has no time dependence – there is no secular variation of the obliquity and no precession – and it simply defines the relative situation of the various planes at J2000.

ECL_LAT : Ecliptic latitude (double, Angle[deg])

Ecliptic Latitude of the object at reference epoch `ref_epoch`. For further details see the description for attribute `ecl_lon`.

IN_QSO_CANDIDATES : Flag indicating the availability of additional information in the qso_candidates table (boolean)

This flag indicates that this source has been identified and/or processed as a QSO candidate by some of the DPAC processing chains. The information derived from this processing is provided in the separate `qso_candidates` table (see Chapter **??**.

IN_GALAXY_CANDIDATES : Flag indicating the availability of additional information in the galaxy_candidates table (boolean)

This flag indicates that this source has been identified and/or processed as a galaxy candidate by some of the DPAC processing chains. The information derived from this processing is provided in the separate `galaxy_candidates` table (see Chapter **??**.

NON_SINGLE_STAR : Flag indicating the availability of additional information in the various Non-Single Star tables (short)

This flag indicates that this source has been identified as a non-single star by some of the DPAC processing chains (see Chapter **??**). The additional parameters derived from this processing are provided separately in one of the tables from the Non-Single Star section.

The flag is organised in three bits informing about the nature of the non-single star model.

- bit 1 (least-significant bit) is set to 1 in case of an astrometric binary
- bit 2 is set to 1 in case of a spectroscopic binary
- bit 3 is set to 1 in case of an eclisping binary

Note that some models can be combinations of two of the non-single star natures coded in this flag.

HAS_XP_CONTINUOUS : Flag indicating the availability of mean BP/RP spectrum in continuous representation for this source (boolean)

This flag indicates that a mean BP/RP spectrum is available for this source in continuous representation.
For more information about this representation, see the table `xp_continuous_mean_spectrum` and **??** of the documentation.

HAS_XP_SAMPLED : Flag indicating the availability of mean BP/RP spectrum in sampled form for this source (boolean)

This flag indicates that a mean BP/RP spectrum is available for this source in sampled form.
For more information about this representation, see the table `xp_sampled_mean_spectrum` and **??** of the documentation.

HAS_RVS : Flag indicating the availability of mean RVS spectrum for this source (boolean)

This flag indicates that a mean RVS spectrum is available for this source.

HAS_EPOCH_PHOTOMETRY : Flag indicating the availability of epoch photometry for this source (boolean)

This flag indicates that epoch photometry is available for the source. Epoch photometry always contains G band integrated photometry, together with BP and/or RP integrated photometry when available.

HAS_EPOCH_RV : Flag indicating the availability of epoch radial velocity for this source (boolean)

This flag indicates that epoch radial velocities are provided for the source.

In DR3, this will concern only a small sub-set of variable stars that have been studied based on these epoch data, and they will be served in the archive through table `vari_epoch_radial_velocity`. For releases from DR4 onwards this interface will be changed to the DataLink protocol as many more sources will feature this product.

HAS_MCMC_GSPPHOT : Flag indicating the availability of GSP-Phot MCMC samples for this source (boolean)

This flag indicates that MCMC samples from the GSP-Phot processing are available for this source.

HAS_MCMC_MSC : Flag indicating the availability of MSC MCMC samples for this source (boolean)

This flag indicates that MCMC samples from the MSC processing are available for this source.

IN_ANDROMEDA_SURVEY : Flag indicating that the source is present in the Gaia Andromeda Photometric Survey (GAPS) (boolean)

This flag indicates that the source is present in the Gaia Andromeda Photometric Survey (or GAPS), and as such that photometric light curves are provided for this source. GAPS contains all the sources contained in a 5.5 degree radius field centred on the Andromeda galaxy (Evans et al. 2022).

CLASSPROB_DSC_COMBMOD_QUASAR : Probability from DSC-Combmod of being a quasar (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_GALAXY : Probability from DSC-Combmod of being a galaxy (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_STAR : Probability from DSC-Combmod of being a single star (but not a white dwarf) (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

TEFF_GSPPHOT : Effective temperature from GSP-Phot Aeneas best library using BP/RP spectra (float, Temperature[K])

Effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

TEFF_GSPPHOT_LOWER : Lower confidence level (16%) of effective temperature from GSP-Phot Aeneas best library using BP/RP spectra (float, Temperature[K])

Lower confidence level (16%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

TEFF_GSPPHOT_UPPER : Upper confidence level (84%) of effective temperature from GSP-Phot Aeneas best library using BP/RP spectra (float, Temperature[K])

Upper confidence level (84%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT : Surface gravity from GSP-Phot Aeneas best library using BP/RP spectra (float, GravitySurface[log cgs])

Surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

LOGG_GSPPHOT_LOWER : Lower confidence level (16%) of surface gravity from GSP-Phot Aeneas best library using BP/RP spectra (float, GravitySurface[log cgs])

Lower confidence level (16%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_UPPER : Upper confidence level (84%) of surface gravity from GSP-Phot Aeneas best library using BP/RP spectra (float, GravitySurface[log cgs])

Upper confidence level (84%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT : Iron abundance from GSP-Phot Aeneas best library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

MH_GSPPHOT_LOWER : Lower confidence level (16%) of iron abundance from GSP-Phot Aeneas best library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_UPPER : Upper confidence level (84%) of iron abundance from GSP-Phot Aeneas best library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

DISTANCE_GSPPHOT : Distance from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[pc])

Distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax(see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_LOWER : Lower confidence level (16%) of distance from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[pc])

Lower confidence level (16%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_UPPER : Upper confidence level (84%) of distance from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[pc])

Upper confidence level (84%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$

and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

AZERO_GSPPHOT : Monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AG_GSPPHOT : Extinction in G band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

AG_GSPPHOT_LOWER : Lower confidence level (16%) of extinction in G band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

AG_GSPPHOT_UPPER : Upper confidence level (84%) of extinction in G band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

EBPMINRP_GSPPHOT : Reddening $E(G_{\rm BP} - G_{\rm RP})$ from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Reddening $E(G_{\rm BP} - G_{\rm RP})$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Note that while $E(G_{\rm BP} - G_{\rm RP}) = A_{\rm BP} - A_{\rm RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the median values.

EBPMINRP_GSPPHOT_LOWER : Lower confidence level (16%) of reddening $E(G_{\rm BP} - G_{\rm RP})$ from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of reddening $E(G_{\rm BP} - G_{\rm RP})$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. Note that while $E(G_{\rm BP} - G_{\rm RP}) = A_{\rm BP} - A_{\rm RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the lower confidence levels.

EBPMINRP_GSPPHOT_UPPER : Upper confidence level (84%) of reddening $E(G_{\rm BP} - G_{\rm RP})$ from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of reddening $E(G_{\rm BP} - G_{\rm RP})$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. Note that while $E(G_{\rm BP} - G_{\rm RP}) = A_{\rm BP} - A_{\rm RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the upper confidence levels.

LIBNAME_GSPPHOT : Name of library that achieves the highest mean log-posterior in MCMC samples and was used to derive GSP-Phot parameters in this table (string)

Name of library of synthetic stellar spectra (one of A, MARCS, OB, PHOENIX) for which GSP-Phot achieves the highest goodness-of-fit score (i.e. the highest mean log-posterior in its MCMC samples), referred to as “best library”. This is the library used to derive GSP-Phot parameters in this table (`gaia_source`) and in table `astrophysical_parameters`. For more information on the synthetic libraries see Section **??**.

2 Astrophysical parameter tables

2.1 ASTROPHYSICAL_PARAMETERS

This is the main table containing the 1D astrophysical parameters produced by the Apsis processing chain developed in Gaia DPAC CU8 (see Chapter ??). Additional parameters can be found in table astrophysical_parameters_supp.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit https://gaia.esac.esa.int/decoder/solnDecoder.jsp

SOURCE_ID : Source Identifier (long)

A unique single numerical identifier of the source obtained from gaia_source (for a detailed description see gaia_source.source_id).

CLASSPROB_DSC_COMBMOD_QUASAR : Probability from DSC-Combmod of being a quasar (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_GALAXY : Probability from DSC-Combmod of being a galaxy (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_STAR : Probability from DSC-Combmod of being a single star (but not a white dwarf) (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_WHITEDWARF : Probability from DSC-Combmod of being a white dwarf (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_BINARYSTAR : Probability from DSC-Combmod of being a binary star (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_SPECMOD_QUASAR : Probability from DSC-Specmod of being a quasar (data used: BP/RP spectrum) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses the BP/RP spectrum (module DSC-Specmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_SPECMOD_GALAXY : Probability from DSC-Specmod of being a galaxy (data used: BP/RP spectrum) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses the BP/RP spectrum (module DSC-Specmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_SPECMOD_STAR : Probability from DSC-Specmod of being a single star (but not a white dwarf) (data used: BP/RP spectrum) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses the BP/RP spectrum (module DSC-Specmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_SPECMOD_WHITEDWARF : Probability from DSC-Specmod of being a white dwarf (data used: BP/RP spectrum) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses the BP/RP spectrum (module DSC-Specmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_SPECMOD_BINARYSTAR : Probability from DSC-Specmod of being a binary star (data used: BP/RP spectrum) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses the BP/RP spectrum (module DSC-Specmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_ALLOSMOD_QUASAR : Probability from DSC-Allosmod of being a quasar (data used: photometry, astrometry) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses various astrometric and photometric features (module DSC-Allosmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_ALLOSMOD_GALAXY : Probability from DSC-Allosmod of being a galaxy (data used: photometry, astrometry) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses various astrometric and photometric features (module DSC-Allosmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_ALLOSMOD_STAR : Probability from DSC-Allosmod of being a star (data used: photometry, astrometry) (float)

Probability that the object is of the named class. This is the probability from a classifier that uses various astrometric and photometric features (module DSC-Allosmod). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

TEFF_GSPPHOT : Effective temperature from GSP-Phot Aeneas best library using BP/RP spectra (float, Temperature[K])

Effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

TEFF_GSPPHOT_LOWER : Lower confidence level (16%) of effective temperature from GSP-Phot Aeneas best library using BP/RP spectra (float, Temperature[K])

Lower confidence level (16%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

TEFF_GSPPHOT_UPPER : Upper confidence level (84%) of effective temperature from GSP-Phot Aeneas best library using BP/RP spectra (float, Temperature[K])

Upper confidence level (84%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT : Surface gravity from GSP-Phot Aeneas best library using BP/RP spectra (float, GravitySurface[log cgs])

Surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

LOGG_GSPPHOT_LOWER : Lower confidence level (16%) of surface gravity from GSP-Phot Aeneas best library using BP/RP spectra (float, GravitySurface[log cgs])

Lower confidence level (16%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_UPPER : Upper confidence level (84%) of surface gravity from GSP-Phot Aeneas best library using BP/RP spectra (float, GravitySurface[log cgs])

Upper confidence level (84%) of surface gravity (assuming source is a single star) inferred by

GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT : Iron abundance from GSP-Phot Aeneas best library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

MH_GSPPHOT_LOWER : Lower confidence level (16%) of iron abundance from GSP-Phot Aeneas best library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_UPPER : Upper confidence level (84%) of iron abundance from GSP-Phot Aeneas best library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

DISTANCE_GSPPHOT : Distance from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[pc])

Distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax(see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_LOWER : Lower confidence level (16%) of distance from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[pc])

Lower confidence level (16%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_UPPER : Upper confidence level (84%) of distance from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[pc])

Upper confidence level (84%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

AZERO_GSPPHOT : Monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB:

This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AG_GSPPHOT : Extinction in G band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

AG_GSPPHOT_LOWER : Lower confidence level (16%) of extinction in G band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

AG_GSPPHOT_UPPER : Upper confidence level (84%) of extinction in G band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT : Extinction in $G_{\rm BP}$ band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

ABP_GSPPHOT_LOWER : Lower confidence level (16%) of extinction in G_{BP} band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_UPPER : Upper confidence level (84%) of extinction in G_{BP} band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT : Extinction in G_{RP} band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

ARP_GSPPHOT_LOWER : Lower confidence level (16%) of extinction in G_{RP} band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_UPPER : Upper confidence level (84%) of extinction in G_{RP} band from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

EBPMINRP_GSPPHOT : Reddening $E(G_{\mathrm{BP}} - G_{\mathrm{RP}})$ from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Reddening $E(G_{\mathrm{BP}} - G_{\mathrm{RP}})$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Note that while $E(G_{\mathrm{BP}} - G_{\mathrm{RP}}) = A_{\mathrm{BP}} - A_{\mathrm{RP}}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the median values.

EBPMINRP_GSPPHOT_LOWER : Lower confidence level (16%) of reddening $E(G_{\mathrm{BP}} - G_{\mathrm{RP}})$ from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of reddening $E(G_{\mathrm{BP}} - G_{\mathrm{RP}})$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. Note that while $E(G_{\mathrm{BP}} - G_{\mathrm{RP}}) = A_{\mathrm{BP}} - A_{\mathrm{RP}}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the lower confidence levels.

EBPMINRP_GSPPHOT_UPPER : Upper confidence level (84%) of reddening $E(G_{\mathrm{BP}} - G_{\mathrm{RP}})$ from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of reddening $E(G_{\mathrm{BP}} - G_{\mathrm{RP}})$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval. Note that while $E(G_{\mathrm{BP}} - G_{\mathrm{RP}}) = A_{\mathrm{BP}} - A_{\mathrm{RP}}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the upper confidence levels.

MG_GSPPHOT : Absolute magnitude M_{G} from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Absolute magnitude M_{G} (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples.

Taken from best library that achieves the highest goodness-of-fit value.

MG_GSPPHOT_LOWER : Lower confidence level (16%) of absolute magnitude M_G from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

MG_GSPPHOT_UPPER : Upper confidence level (84%) of absolute magnitude M_G from GSP-Phot Aeneas best library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT : Radius from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[Solar Radius])

Stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value.

RADIUS_GSPPHOT_LOWER : Lower confidence level (16%) of radius from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_UPPER : Upper confidence level (84%) of radius from GSP-Phot Aeneas best library using BP/RP spectra (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from best library that achieves the highest goodness-of-fit value. Lower and upper levels include 68% confidence interval.

LOGPOSTERIOR_GSPPHOT : Goodness-of-fit score (mean log-posterior of MCMC) of GSP-Phot Aeneas MCMC best library (float)

Goodness-of-fit score defined as the mean log-posterior of all MCMC samples of GSP-Phot Aeneas MCMC for best library. The higher the goodness-of-fit score, the better the fit. Values are usually negative. NB: This is not a Bayesian evidence!

MCMCACCEPT_GSPPHOT : MCMC acceptance rate of GSP-Phot Aeneas MCMC best library (float)

MCMC acceptance rate of GSP-Phot Aeneas MCMC best library. This is computed from all MCMC samples (before thinning the chain to 2000 or 100 samples).

LIBNAME_GSPPHOT : Name of library that achieves the highest mean log-posterior in MCMC samples and was used to derive GSP-Phot parameters in this table (string)

Name of library of synthetic stellar spectra (one of A, MARCS, OB, PHOENIX) for which GSP-Phot achieves the highest goodness-of-fit score (i.e. the highest mean log-posterior in its MCMC samples), referred to as “best library”. This is the library used to derive GSP-Phot parameters in this table (`astrophysical_parameters`). For more information on the synthetic libraries see Section **??**.

TEFF_GSPSPEC : Effective temperature from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Temperature[K])

Median value of the effective temperature (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra and Monte Carlo realisations.

TEFF_GSPSPEC_LOWER : 16th percentile of effective temperature from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Temperature[K])

Lower confidence level (16%) of the median effective temperature (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

TEFF_GSPSPEC_UPPER : 84th percentile of effective temperature from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Temperature[K])

Upper confidence level (84%) of the median effective temperature (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

LOGG_GSPSPEC : Logarithm of the stellar surface gravity from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, GravitySurface[log cgs])

Median value of logarithm of the stellar surface gravity (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra.

LOGG_GSPSPEC_LOWER : 16th percentile of the logarithm of the stellar surface gravity from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, GravitySurface[log cgs])

Lower confidence level (16%) of the median value of logarithm of the stellar surface gravity (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

LOGG_GSPSPEC_UPPER : 84th percentile of the logarithm of the stellar surface gravity from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, GravitySurface[log cgs])

Upper confidence level (84%) of the median value of logarithm of the stellar surface gravity (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

MH_GSPSPEC : Global metallicity [M/H] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Median global metallicity (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra.

MH_GSPSPEC_LOWER : 16th percentile of global metallicity [M/H] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median global metallicity (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

MH_GSPSPEC_UPPER : 84th percentile of global metallicity [M/H] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median global metallicity (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

ALPHAFE_GSPSPEC : Abundance of alpha-elements [alpha/Fe] with respect to iron from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Median abundance of alpha-elements with respect to iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. The considered alpha elements are: O, Ne, Mg, Si, S, Ar, Ca, Ti.

ALPHAFE_GSPSPEC_LOWER : 16th percentile of the abundance of alpha-elements [alpha/Fe] with respect to iron from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of alpha-elements with respect to iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

ALPHAFE_GSPSPEC_UPPER : 84th percentile of the abundance of alpha-elements [alpha/Fe] with respect to iron from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of alpha-elements with respect to iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

FEM_GSPSPEC : Abundance of neutral iron [Fe/M] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `fem_gspspec_nlines` (float, Abundances[dex])

Median abundance of neutral iron (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `fem_gspspec_nlines`. The neutral iron abundance [Fe/H] is obtained by [Fe/H]=[Fe/M]+[M/H].

FEM_GSPSPEC_LOWER : 16th percentile of the abundance of neutral iron [Fe/M] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of neutral iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval. The neutral iron abundance [Fe/H] is obtained by [Fe/H]=[Fe/M]+[M/H].

FEM_GSPSPEC_UPPER : 84th percentile of the abundance of neutral iron [Fe/M] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of neutral iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval. The neutral iron abundance [Fe/H] is obtained by [Fe/H]=[Fe/M]+[M/H].

FEM_GSPSPEC_NLINES : Number of lines used for [Fe/M] abundance estimation (int)

Number of lines used to compute the [Fe/M] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

FEM_GSPSPEC_LINESCATTER : Uncertainty estimation of [Fe/M] abundance using N lines of the element, given in `fem_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`fem_gspspec_nlines`) abundance results.

SIFE_GSPSPEC : Abundance of silicon [Si/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `sife_gspspec_nlines` (float, Abundances[dex])

Median abundance of silicon (assuming source is a single star) from RVS spectra and Monte

Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `sife_gspspec_nlines`.

SIFE_GSPSPEC_LOWER : 16th percentile of the abundance of silicon [Si/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of silicon (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

SIFE_GSPSPEC_UPPER : 84th percentile of the abundance of silicon [Si/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of silicon (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

SIFE_GSPSPEC_NLINES : Number of lines used for [Si/Fe] abundance estimation (int)

Number of lines used to compute the [Si/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

SIFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Si/Fe] abundance using N lines of the element, given in `sife_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`sife_gspspec_nlines`) abundance results.

CAFE_GSPSPEC : Abundance of calcium [Ca/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `cafe_gspspec_nlines` (float, Abundances[dex])

Median abundance of calcium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `cafe_gspspec_nlines`.

CAFE_GSPSPEC_LOWER : 16th percentile of the abundance of calcium [Ca/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of calcium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

CAFE_GSPSPEC_UPPER : 84th percentile of the abundance of calcium [Ca/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of calcium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

CAFE_GSPSPEC_NLINES : Number of lines used for [Ca/Fe] abundance estimation (int)

Number of lines used to compute the [Ca/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

CAFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Ca/Fe] abundance using N lines of the element, given in `cafe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`cafe_gspspec_nlines`) abundance results.

TIFE_GSPSPEC : Abundance of titanium [Ti/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `tife_gspspec_nlines` (float, Abundances[dex])

Median abundance of titanium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `tife_gspspec_nlines`.

TIFE_GSPSPEC_LOWER : 16th percentile of the abundance of titanium [Ti/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of titanium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

TIFE_GSPSPEC_UPPER : 84th percentile of the abundance of titanium [Ti/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of titanium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

TIFE_GSPSPEC_NLINES : Number of lines used for [Ti/Fe] abundance estimation (int)

Number of lines used to compute the [Ti/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

TIFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Ti/Fe] abundance using N lines of the element, given in `tife_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`tife_gspspec_nlines`) abundance results.

MGFE_GSPSPEC : Abundance of magnesium [Mg/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `mgfe_gspspec_nlines` (float, Abundances[dex])

Median abundance of magnesium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `mgfe_gspspec_nlines`.

MGFE_GSPSPEC_LOWER : 16th percentile of the abundance of magnesium [Mg/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of magnesium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

MGFE_GSPSPEC_UPPER : 84th percentile of the abundance of magnesium [Mg/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of magnesium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

MGFE_GSPSPEC_NLINES : Number of lines used for [Mg/Fe] abundance estimation (int)

Number of lines used to compute the [Mg/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

MGFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Mg/Fe] abundance using N lines of the element, given in `mgfe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`mgfe_gspspec_nlines`) abundance results.

NDFE_GSPSPEC : Abundance of neodymium [Nd/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `ndfe_gspspec_nlines` (float, Abundances[dex])

Median abundance of neodymium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `ndfe_gspspec_nlines`.

NDFE_GSPSPEC_LOWER : 16th percentile of the abundance of neodymium [Nd/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of neodymium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

NDFE_GSPSPEC_UPPER : 84th percentile of the abundance of neodymium [Nd/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of neodymium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

NDFE_GSPSPEC_NLINES : Number of lines used for [Nd/Fe] abundance estimation (int)

Number of lines used to compute the [Nd/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

NDFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Nd/Fe] abundance using N lines of the element, given in `ndfe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`ndfe_gspspec_nlines`) abundance results.

FEIIM_GSPSPEC : Abundance of ionised iron [FeII/M] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `feiim_gspspec_nlines` (float, Abundances[dex])

Median abundance of ionised iron (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `feiim_gspspec_nlines`. The ionised iron abundance [FeII/H] is obtained by [FeII/H]=[FeII/M]+[M/H].

FEIIM_GSPSPEC_LOWER : 16th percentile of the abundance of ionised iron [FeII/M] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of ionised iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval. The ionised iron abundance [FeII/H] is obtained by [FeII/H]=[FeII/M]+[M/H].

FEIIM_GSPSPEC_UPPER : 84th percentile of the abundance of ionised iron [FeII/M] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of ionised iron (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval. The ionised iron abundance [FeII/H] is obtained by [FeII/H]=[FeII/M]+[M/H].

FEIIM_GSPSPEC_NLINES : Number of lines used for [FeII/M] abundance estimation (int)

Number of lines used to compute the [FeII/M] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

FEIIM_GSPSPEC_LINESCATTER : Uncertainty estimation of [FeII/M] abundance using N lines of the element, given in `feiim_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`feiim_gspspec_nlines`) abundance results.

SFE_GSPSPEC : Abundance of sulphur [S/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `sfe_gspspec_nlines` (float, Abundances[dex])

Median abundance of sulphur (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `sfe_gspspec_nlines`.

SFE_GSPSPEC_LOWER : 16th percentile of the abundance of sulphur [S/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of sulphur (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

SFE_GSPSPEC_UPPER : 84th percentile of the abundance of sulphur [S/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of sulphur (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

SFE_GSPSPEC_NLINES : Number of lines used for [S/Fe] abundance estimation (int)

Number of lines used to compute the [S/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

SFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [S/Fe] abundance using N lines of the element, given in `sfe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`sfe_gspspec_nlines`) abundance results.

ZRFE_GSPSPEC : Abundance of zirconium [Zr/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `zrfe_gspspec_nlines` (float, Abundances[dex])

Median abundance of zirconium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `zrfe_gspspec_nlines`.

ZRFE_GSPSPEC_LOWER : 16th percentile of the abundance of zirconium [Zr/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of zirconium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

ZRFE_GSPSPEC_UPPER : 84th percentile of the abundance of zirconium [Zr/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of zirconium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

ZRFE_GSPSPEC_NLINES : Number of lines used for [Zr/Fe] abundance estimation (int)

Number of lines used to compute the [Zr/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

ZRFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Zr/Fe] abundance using N lines of the element, given in `zrfe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`zrfe_gspspec_nlines`) abundance results.

NFE_GSPSPEC : Abundance of nitrogen [N/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `nfe_gspspec_nlines` (float, Abundances[dex])

Median abundance of nitrogen (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `nfe_gspspec_nlines`.

NFE_GSPSPEC_LOWER : 16th percentile of the abundance of nitrogen [N/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of nitrogen (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

NFE_GSPSPEC_UPPER : 84th percentile of the abundance of nitrogen [N/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of nitrogen (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

NFE_GSPSPEC_NLINES : Number of lines used for [N/Fe] abundance estimation (int)

Number of lines used to compute the [N/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

NFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [N/Fe] abundance using N lines of the element, given in `nfe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`nfe_gspspec_nlines`) abundance results.

CRFE_GSPSPEC : Abundance of chromium [Cr/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in `crfe_gspspec_nlines` (float, Abundances[dex])

Median abundance of chromium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `crfe_gspspec_nlines`.

CRFE_GSPSPEC_LOWER : 16th percentile of the abundance of chromium [Cr/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of chromium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

CRFE_GSPSPEC_UPPER : 84th percentile of the abundance of chromium [Cr/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of chromium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

CRFE_GSPSPEC_NLINES : Number of lines used for [Cr/Fe] abundance estimation (int)

Number of lines used to compute the [Cr/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

CRFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Cr/Fe] abundance using N lines of the element, given in `crfe_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`crfe_gspspec_nlines`) abundance results.

CEFE_GSPSPEC : Abundance of cerium [Ce/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in cefe_gspspec_nlines (float, Abundances[dex])

Median abundance of cerium (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in cefe_gspspec_nlines.

CEFE_GSPSPEC_LOWER : 16th percentile of the abundance of cerium [Ce/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of cerium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

CEFE_GSPSPEC_UPPER : 84th percentile of the abundance of cerium [Ce/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of cerium (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

CEFE_GSPSPEC_NLINES : Number of lines used for [Ce/Fe] abundance estimation (int)

Number of lines used to compute the [Ce/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

CEFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Ce/Fe] abundance using N lines of the element, given in cefe_gspspec_nlines (float, Abundances[dex])

Standard deviation of the individual N lines (cefe_gspspec_nlines) abundance results.

NIFE_GSPSPEC : Abundance of nickel [Ni/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations, applied to the individual N lines of the element, given in nife_gspspec_nlines (float, Abundances[dex])

Median abundance of nickel (assuming source is a single star) from RVS spectra and Monte Carlo realisations derived using MatisseGauguin (Recio-Blanco 2022) atmospheric parameters and the Gauguin algorithm, applied to the individual N lines of the element, where the number of lines is given in `nife_gspspec_nlines`.

NIFE_GSPSPEC_LOWER : 16th percentile of the abundance of nickel [Ni/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of the median abundance of nickel (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

NIFE_GSPSPEC_UPPER : 84th percentile of the abundance of nickel [Ni/Fe] from GSP-Spec MatisseGauguin using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of the median abundance of nickel (assuming source is a single star) inferred by GSP-Spec MatisseGauguin (Recio-Blanco 2022) using RVS spectra. Lower and upper levels include 68% confidence interval.

NIFE_GSPSPEC_NLINES : Number of lines used for [Ni/Fe] abundance estimation (int)

Number of lines used to compute the [Ni/Fe] abundance. Lines with interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo line abundance distribution higher than 0.5 dex have been excluded.

NIFE_GSPSPEC_LINESCATTER : Uncertainty estimation of [Ni/Fe] abundance using N lines of the element, given in `nife_gspspec_nlines` (float, Abundances[dex])

Standard deviation of the individual N lines (`nife_gspspec_nlines`) abundance results.

CN0EW_GSPSPEC : Equivalent witdh of cyanogen absorption line, derived from RVS spectra (float, Length & Distance[nm])

Equivalent width of the residual feature (computed as the observed RVS spectrum divided by a synthetic one with the MatisseGauguin parameters) around the cyanogen line at 849 nm.

CN0EW_GSPSPEC_UNCERTAINTY : Uncertainty of equivalent witdh of cyanogen absorption line, derived from RVS spectra (float, Length & Distance[nm])

Interquartile difference (84th quantile value - 16th quantile value) in the Monte Carlo distribution of `cn0ew_gspspec`, derived from RVS spectra.

CN0_GSPSPEC_CENTRALLINE : Central wavelength of cyanogen line, derived from RVS spectra using DIB algorithm (float, Length & Distance[nm])

Central wavelength of the Gaussian fit applied to the residual feature (computed as the observed RVS spectrum divided by a synthetic one with the MatisseGauguin parameters) around the cyanogen line at 849 nm.

CN0_GSPSPEC_WIDTH : Width of cyoanogen line, derived from RVS spectra using DIB algorithm (float, Length & Distance[nm])

Width of the Gaussian fit applied to the residual feature (computed as the observed RVS spectrum divided by a synthetic one with the MatisseGauguin parameters) around the cyanogen line at 849 nm.

DIB_GSPSPEC_LAMBDA : DIB central wavelength from GSP-Spec MatisseGauguin using RVS spectra (float, Length & Distance[nm])

Central wavelength of the DIB feature in the RVS spectrum derived by GSP-Spec MatisseGauguin (Recio-Blanco 2022).

DIB_GSPSPEC_LAMBDA_UNCERTAINTY : Uncertainty on DIB central wavelength from GSP-Spec MatisseGauguin using RVS spectra (float, Length & Distance[nm])

Uncertainty on central wavelength of the DIB feature in the RVS spectrum derived by GSP-Spec MatisseGauguin (Recio-Blanco 2022).

DIBEW_GSPSPEC : Equivalent width of the DIB from GSP-Spec MatisseGauguin using RVS spectra (float, Length & Distance[Å])

Equivalent width of the DIB feature in the RVS spectrum derived by GSP-Spec MatisseGauguin (Recio-Blanco 2022).

DIBEW_GSPSPEC_UNCERTAINTY : Global uncertainty on DIB equivalent width value using DIB algorithm (float, Length & Distance[Å])

Global uncertainty on equivalent width of the DIB feature in the RVS spectrum derived by GSP-Spec MatisseGauguin (Recio-Blanco 2022).

DIBEWNOISE_GSPSPEC_UNCERTAINTY : Uncertainty on DIB equivalent width value occuring from noise part (float, Length & Distance[Å])

Uncertainty on DIB equivalent width value based on the noise level.

DIBP0_GSPSPEC : Depth (p_0 parameter) of the DIB derived from a Gaussian model fit (float)

Depth (p_0 parameter) of the DIB defined from a Gaussian model fit. The flux is modelled as $p_0 \times \exp\left(-\frac{(x-p_1)^2}{2p_2^2}\right)$, where p_0 and p_2 are the depth and width of the DIB profile, p_1 is the central wavelength and x is the spectral wavelength, cf. Zhao et al. (2021).

DIBP2_GSPSPEC : Width (p_2 parameter) of the DIB derived from a Gaussian model fit (float, Length & Distance[Å])

Width (p_2 parameter) of the DIB defined from a Gaussian model fit. The flux is modelled as $p_0 \times \exp\left(-\frac{(x-p_1)^2}{2p_2^2}\right)$, where p_0 and p_2 are the depth and width of the DIB profile, p_1 is the central wavelength and x is the spectral wavelength, cf. Zhao et al. (2021).

DIBP2_GSPSPEC_UNCERTAINTY : Uncertainty on the `dibp2_gspspec` parameter (float, Length & Distance[Å])

Uncertainty on the p_2 parameter from the Gaussian fitting, given in `dibp2_gspspec`.

DIBQF_GSPSPEC : Quality flag of the DIB computation (int)

Quality flag on DIB computation: QF=−1 means that there is not a preliminary detection where sources are only measured if the detection threshold is above the 3-sigma level, QF=−2 means outside the considered temperature range, i.e., $T_{\rm eff} < 3500$ K, or flux values are NaN in the DIB wavelength range between 860.5 and 864.0 nm.

FLAGS_GSPSPEC : Catalogue flags for GSP-Spec MatisseGauguin (string)

Definitions of each character in the GSP-Spec MatisseGauguin (Recio-Blanco 2022) quality flag chain. In this chain, value '0' is the best, and '9' is the worst. Flag names are split in three categories: parameter flags (green), individual abundance flags (blue) and equivalent width flags (maroon):

Chain character number - name	Considered quality aspect	Possible adopted values
1 **vbroadT**	vbroad induced bias in $T_{\rm eff}$	0,1,2,9
2 **vbroadG**	vbroad induced bias in $\log g$	0,1,2,9
3 **vbroadM**	vbroad induced bias in [M/H]	0,1,2,9
4 **vradT**	vrad induced bias in $T_{\rm eff}$	0,1,2,9
5 **vradG**	vrad induced bias in $\log g$	0,1,2,9
6 **vradM**	vrad induced bias in [M/H]	0,1,2,9
7 **fluxNoise**	flux noise uncertainties	0,1,2,3,4,5,9
8 **extrapol**	extrapolation	0,1,2,3,4,9
9 **neg_flux**	negative flux pixels	0,9
10 **nanFlux**	NaN flux pixels	0,1,9
11 **emission**	emission line	0,1,9
12 **nullFluxErr**	null uncertainties	0,1,9
13 **KMgiantPar**	KM-type giant stars	0,1,2,9
14 **NUpLim**	nitrogen abundance upper limit	0,1,2,9
15 **NUncer**	nitrogen abundance uncertainty quality	0,1,2,9
16 **MgUpLim**	magnesium abundance upper limit	0,1,2,9
17 **MgUncer**	magnesium abundance uncertainty quality	0,1,2,9
18 **SiUpLim**	silicon abundance upper limit	0,1,2,9
19 **SiUncer**	silicon abundance uncertainty quality	0,1,2,9
20 **SUpLim**	sulphur abundance upper limit	0,1,2,9
21 **SUncer**	sulphur abundance uncertainty quality	0,1,2,9
22 **CaUpLim**	calcium abundance upper limit	0,1,2,9
23 **CaUncer**	calcium abundance uncertainty quality	0,1,2,9
24 **TiUpLim**	titanium abundance upper limit	0,1,2,9
25 **TiUncer**	titanium abundance uncertainty quality	0,1,2,9
26 **CrUpLim**	chromium abundance upper limit	0,1,2,9
27 **CrUncer**	chromium abundance uncertainty quality	0,1,2,9
28 **FeUpLim**	neutral iron abundance upper limit	0,1,2,9
29 **FeUncer**	neutral iron abundance uncertainty quality	0,1,2,9
30 **FeIIUpLim**	ionised iron abundance upper limit	0,1,2,9
31 **FeIIUncer**	ionised iron abundance uncertainty quality	0,1,2,9
32 **NiUpLim**	nickel abundance upper limit	0,1,2,9
33 **NiUncer**	nickel abundance uncertainty quality	0,1,2,9
34 **ZrUpLim**	zirconium abundance upper limit	0,1,2,9
35 **ZrUncer**	zirconium abundance uncertainty quality	0,1,2,9
36 **CeUpLim**	cerium abundance upper limit	0,1,2,9
37 **CeUncer**	cerium abundance uncertainty quality	0,1,2,9
38 **NdUpLim**	neodymium abundance upper limit	0,1,2,9
39 **NdUncer**	neodymium abundance uncertainty quality	0,1,2,9
40 **DeltaCNq**	cyanogen differential equivalent width quality	0,1,2,9
41 **DIBq**	DIB quality flag	0,1,2,3,4,5,9

Definition of parameter flags considering potential biases due to rotational velocity and macro-turbulence:

Flag name	Condition	Flag value
vbroadT	$\Delta T_{\rm eff}$>2000 K	Filter all Flag = 9
	500< $\Delta T_{\rm eff}$≤2000 K	Flag = 2
	250< $\Delta T_{\rm eff}$≤500 K	Flag = 1
	$\Delta T_{\rm eff}$≤250 K	Flag = 0
vbroadG	$\Delta\log g$>2 dex	Filter all *except $T_{\rm eff}$ and DIB if $T_{\rm eff}$>7000 K* Flag = 9
	1< $\Delta\log g$≤2 dex	Flag = 2
	0.5< $\Delta\log g$≤1 dex	Flag = 1
	$\Delta\log g$≤0.5 dex	Flag = 0
vbroadM	Δ[M/H]>2 dex	Filter [M/H] and [X/Fe] Flag = 9
	0.5< Δ[M/H]≤2 dex	Flag = 2
	0.25< Δ[M/H]≤0.5 dex	Flag = 1
	Δ[M/H]≤0.25 dex	Flag = 0

Definition of parameter flags considering potential biases due to uncertainties in the radial velocity shift correction:

Flag name	Condition	Flag value
vradT	$\Delta T_{\rm eff}$>2000 K	Filter all Flag = 9
	500< $\Delta T_{\rm eff}$≤2000 K	Flag = 2
	250< $\Delta T_{\rm eff}$≤500 K	Flag = 1
	$\Delta T_{\rm eff}$≤250 K	Flag = 0
vradG	$\Delta\log g$>2 dex	Filter all *except $T_{\rm eff}$ and DIB if $T_{\rm eff}$>7000 K* Flag = 9
	1< $\Delta\log g$≤2 dex	Flag = 2
	0.5< $\Delta\log g$≤1 dex	Flag = 1
	$\Delta\log g$≤0.5 dex	Flag = 0
vradM	Δ[M/H]>2 dex	Filter [M/H] and [X/Fe] Flag = 9
	0.5< Δ[M/H]≤2 dex	Flag = 2
	0.25< Δ[M/H]≤0.5 dex	Flag = 1
	Δ[M/H]≤0.25 dex	Flag = 0

Definition of parameter flags considering potential biases due to uncertainties in the RVS flux:

Flag name	Condition	Flag value
fluxNoise	$\sigma T_{\rm eff}$>2000 K or $\sigma \log g$>2 dex	Filter all Flag = 9
	$\sigma T_{\rm eff}$≤2000 K and $\sigma \log g$≤2 dex and σ[M/H]>2 dex	Filter [M/H], [X/Fe] Flag = 5
	$\sigma T_{\rm eff}$≤2000 K and $\sigma \log g$≤2 dex and σ[M/H]≤2 dex and $\sigma[\alpha$/Fe]>0.8 dex	Filter [α/Fe], [X/Fe] Flag = 4
	500< $\sigma T_{\rm eff}$≤2000 K and 1< $\sigma \log g$≤2 dex and 0.5< σ[M/H]≤2 dex and 0.2< $\sigma[\alpha$/Fe]≤0.8 dex	Flag = 3
	250< $\sigma T_{\rm eff}$≤500 K and 0.5< $\sigma \log g$≤1 dex and 0.25< σ[M/H]≤0.5 dex and 0.1< $\sigma[\alpha$/Fe]≤0.2 dex	Flag = 2
	100< $\sigma T_{\rm eff}$≤250 K and 0.2< $\sigma \log g$≤0.5 dex and 0.1< σ[M/H]≤0.25 dex and 0.05< $\sigma[\alpha$/Fe]≤0.1 dex	Flag = 1
	$\sigma T_{\rm eff}$≤100 K and $\sigma \log g$≤0.2 dex and σ[M/H]≤0.1 dex and $\sigma[\alpha$/Fe]≤0.05 dex	Flag = 0

Definition of parameter flags considering potential biases due to extrapolated parameters:

Flag name	Condition	Flag value
extrapol	gof=NaN and ($T_{\rm eff}$>9000 K or $T_{\rm eff}$<2500 K or $\log g$>6 dex or $\log g< -1$ dex)	Filter all *except DIB if $T_{\rm eff}$>7000 K* Flag = 9
	gof=NaN and 2500≤$T_{\rm eff}$≤9000 K and −1 ≤$\log g$≤6 dex and ([M/H]< −6 dex or [M/H]>1.5 dex)	Filter [M/H],[X/Fe] Flag = 4
	gof=NaN and 2500≤$T_{\rm eff}$<9000 K and −1 ≤$\log g$≤6 dex and −6 ≤[M/H]≤1.5 dex and [α/Fe] out from standard by ± 0.8	Filter [X/Fe] Flag = 3
	gof=NaN and 2500≤$T_{\rm eff}$≤9000 K and −1 ≤$\log g$≤6 dex and −6 ≤[M/H]≤1.5 dex and [α/Fe] within ± 0.8 from standard	Flag = 2
	gof≠NaN and ($T_{\rm eff}$≥7625 or $T_{\rm eff}$≤3500 K or $\log g$≥4.75 or $\log g$≤0.25 dex or [M/H]≤ −3 or [M/H]≥0.75 dex or [α/Fe] out from standard by ± 0.35)	Flag = 1
	gof≠NaN and 3500<$T_{\rm eff}$<7625 K and 0.25<$\log g$<4.75 dex and −3 <[M/H]<0.75 dex and [α/Fe] within ± 0.35 from standard	Flag = 0

Definition of parameter flags considering RVS flux problems or emission line probability:

Flag name	Condition	Flag value
nanFlux	Flux=NaN	Filter all *except DIB if $T_{\rm eff}$>7000 K* Flag = 9
emission	*CU6_is_emission*	Filter all *except DIB if $T_{\rm eff}$>7000 K* Flag = 9
neg_flux	> 2 pixels with flux<0	Filter all *except DIB if $T_{\rm eff}$>7000 K* Flag = 9
	1 or 2 pixels with flux<0	Flag = 1
	flux>0	Flag = 0
nullFluxErr	$\sigma T_{\rm eff}$=0 K or $\sigma \log g$=0 dex or σ[M/H]=0 dex or $\sigma[\alpha/{\rm Fe}]$=0 dex	Filter all Flag = 9

Definition of parameter flags considering problems in the parameterisation of KM-type giants. $F_{\rm min}$ is the minumum flux value in the corresponding RVS spectrum:

Flag name	Condition	Flag value
KMgiantPar	$T_{\rm eff}$<4000 K and $\log g$<3.5 and (gof> −3.0 or $F_{\rm min}$>0.22)	Filter $[\alpha/{\rm Fe}]$ Flag = 2
	$T_{\rm eff}$<4000 K and $\log g$<3.5 and (−3.4 <gof< −3.0 or (gof> −3.0 and $F_{\rm min}$<0.22) or (gof< −3.4 and $F_{\rm min}$>0.22))	Filter $[\alpha/{\rm Fe}]$ Flag = 1
	($T_{\rm eff}$<4000 K and $\log g$<3.5 and (gof< −3.4 or $F_{\rm min}$<0.22)) or $T_{\rm eff}$<4000 or $\log g$>3.5	Flag = 0

Definition of individual abundance upper limit flags. Xfe_gspspec_upper is the upper confidence value of the abundance, corresponding to the 84th quantile of the Monte Carlo distribution. σ[X/Fe] is the 84th−16th interquantile abundance uncertainty. XfeUpperLimit is the mean value of the abundance upper limit for the considered lines of element X in the spectrum, depending on the mean signal-to-noise ratio (SNR) in the line pixels and on the stellar parameters. X_MAD_UpperLimit is the median absolute deviation of the upper limit in the line pixels; the coefficients c1 to c8 are reported in a table further below:

Flag name	Condition	Flag value
XUpLim	vbroadT≥2 or vbroadG≥2 or vbroadM≥2 or σ[X/Fe]=0 or (Xfe_gspspec_upper−Xfe_gspspec)= 0 or $T_{\rm eff}$≤c1 or $T_{\rm eff}$≥c2 or log g≤c3 or log g≥c4 or ((2− XfeUpperLimit)/σ[X/Fe])≤c5 or (SNR≤c6 and gof≥c7) or (Xfe_gspspec+[M/H])≤c8	Filter [X/Fe] Flag = 9
	vbroadT<2 and vbroadG<2 and vbroadM<2 and σ[X/Fe]≠0 and (Xfe_gspspec_upper− Xfe_gspspec)≠ 0 and c1<$T_{\rm eff}$<c2 and c3<log g<c4 and ((2− XfeUpperLimit)/σ[X/Fe])>c5 and (SNR>c6 or (SNR≤c6 and gof<c7)) and (Xfe_gspspec+[M/H])<c8 and ((Xfe_gspspec− XfeUpperLimit)/(1.48·X_MAD_UpperLimit))<1.5	Flag = 2
	vbroadT<2 and vbroadG<2 and vbroadM<2 and σ[X/Fe]≠0 and (Xfe_gspspec_upper− Xfe_gspspec)≠ 0 and c1<$T_{\rm eff}$<c2 and c3<log g<c4 and ((2− XfeUpperLimit)/σ[X/Fe])>c5 and (SNR>c6 or (SNR≤c6 and gof<c7)) and (Xfe_gspspec+[M/H])<c8 and 1.5≤((Xfe_gspspec− XfeUpperLimit)/(1.48·X_MAD_UpperLimit))<2.5	Flag = 1
	vbroadT<2 and vbroadG<2 and vbroadM<2 and σ[X/Fe]≠0 and (Xfe_gspspec_upper− Xfe_gspspec)≠ 0 and c1<$T_{\rm eff}$<c2 and c3<log g<c4 and ((2− XfeUpperLimit)/σ[X/Fe])>c5 and (SNR>c6 or (SNR≤c6 and gof<c7)) and (Xfe_gspspec+[M/H])<c8 and ((Xfe_gspspec− XfeUpperLimit)/(1.48·X_MAD_UpperLimit))≥2.5	Flag = 0

Definition of individual abundance uncertainty flags. Xfe_gspspec_upper is the upper confidence value of the abundance, corresponding to the 84th quantile of the Monte Carlo distribution. σ[X/Fe] is the 84th−16th interquantile abundance uncertainty. XfeUpperLimit is the mean value of the abundance upper limit for the considered lines of element X in the spectrum, depending on the mean SNR in the line pixels and the stellar parameters. X_MAD_UpperLimit is the median absolute deviation of the upper limit in the line pixels; the coefficients c1 to c8 are reported in a table further below:

Flag name	Condition	Flag value
XUncer	vbroadT≥2 or vbroadG≥2 or vbroadM≥2 or σ[X/Fe]=0 or (Xfe_gspspec_upper−Xfe_gspspec)= 0 or $T_{\rm eff}$≤c1 or $T_{\rm eff}$≥c2 or log g≤c3 or log g≥c4 or ((2−XfeUpperLimit)/σ[X/Fe])≤c5 or (SNR≤c6 and gof≥c7) or (Xfe_gspspec+[M/H])≤c8	Filter [X/Fe] Flag = 9
	vbroadT<2 and vbroadG<2 and vbroadM<2 and σ[X/Fe]≠0 and (Xfe_gspspec_upper−Xfe_gspspec)≠ 0 and c1<$T_{\rm eff}$<c2 and c3<log g<c4 and c5<((2−XfeUpperLimit)/σ[X/Fe])<7 and (SNR>c6 or (SNR≤c6 and gof<c7)) and (Xfe_gspspec+[M/H])<c8	Flag = 2
	vbroadT<2 and vbroadG<2 and vbroadM<2 and σ[X/Fe]≠0 and (Xfe_gspspec_upper−Xfe_gspspec)≠ 0 and c1<$T_{\rm eff}$<c2 and c3<log g<c4 and 7≤((2−XfeUpperLimit)/σ[X/Fe])<10 and (SNR>c6 or (SNR≤c6 and gof<c7)) and (Xfe_gspspec+[M/H])<c8	Flag = 1
	vbroadT<2 and vbroadG<2 and vbroadM<2 and σ[X/Fe]≠0 and (Xfe_gspspec_upper−Xfe_gspspec)≠ 0 and c1<$T_{\rm eff}$<c2 and c3<log g<c4 and ((2−XfeUpperLimit)/σ[X/Fe])≥10 and (SNR>c6 or (SNR≤c6 and gof<c7)) and (Xfe_gspspec+[M/H])<c8	Flag = 0

Coefficients for individual chemical abundance filtering used in the previous two tables:

Chemical abundance	c1	c2	c3	c4	c5	c6	c7	c8
[N/Fe]	4200	8000	0.0	5.5	4.5	100	−3.6	99
[Mg/Fe]	3500	8000	−1.0	5.5	5.5	80	−3.5	99
[Si/Fe]	4000	8000	−1.0	5.5	6.0	110	−3.8	99
[S/Fe]	5500	8000	3.0	5.5	5.0	120	−3.7	99
[Ca/Fe]	3500	8000	−1.0	5.5	10.0	60	−3.2	99
[Ti/Fe]	4000	6500	−1.0	5.5	6.0	110	−3.65	99
[Cr/Fe]	3500	6000	−1.0	5.5	6.0	1000	−3.65	1.5
[Fe/M]	3500	8000	−1.0	5.5	5.0	1000	−3.4	1.5
[FeII/M]	5700	8000	3.5	5.5	5.0	70	−3.5	1.5
[Ni/Fe]	4000	6500	−1.0	5.5	6.0	100	−3.6	1.5
[Zr/Fe]	3500	8000	−1.0	5.5	1.0	100	−3.4	99
[Ce/Fe]	3500	8000	−1.0	5.5	5.0	100	−3.5	99
[Nd/Fe]	3500	5500	−1.0	5.5	2.0	100	−3.5	99

Definition of the quality flag of the CN equivalent width difference with respect to the standard C and N abundances. CN_EW_err is the uncertainty of equivalent witdh of the cyanogen absorption line (`cn0ew_gspspec_uncertainty`); CN_p1 is the measured central wavelength of the cyanogen absorption line (`cn0_gspspec_centralline`); CN_p2 is the width of the cyoanogen line (`cn0_gspspec_width`):

Flag name	Condition	Flag value
DeltaCNq	vbroadT≥1 or vbroadG≥1 or vbroadM≥1 or CN_EW_err = 0 or SNR≤80 or gof≥ −3.5 or $T_{\rm eff}$≥4800 K or log g≥3.8 or abs(CN_p1 − 849.037)≥0.05 or CN_p2≥0.25	Filter CN Flag = 9
	vbroadT<1 or vbroadG<1 or vbroadM<1 or CN_EW_err≠0 or SNR>80 or gof< −3.5 or $T_{\rm eff}$<4800 K or log g<3.8 or abs(CN_p1 − 849.037)<0.05 or CN_p2<0.25	Flag = 0

Definition of the quality flag for the diffuse interstellar band parameterisation. p_0 is the depth of the DIB (`dibp0_gspspec`); p_1 is the measured central wavelength of the DIB (`dib_gspspec_lambda`); p_2 is the width of the DIB (`dibp2_gspspec`); R_a is the standard deviation of the data–model residuals between 860.5 and 864.0 nm; R_b is the local noise level within the DIB profile :

Flag name	Condition	Flag value
DIBq	SNR≤50 or `radial_velocity_error`>5 km/s or $T_{\rm eff}$<3500 K or $T_{\rm eff}$>10^6 K or $flux < 0$ or $p_0 < 3/\mathrm{SNR}$	Filter DIB Flag = 9
	$p_1 < 861.66$ nm or $p_1 > 862.81$ nm or $p_0 > 0.15$	Flag = 5
	861.66 nm $< p_1 <$ 862.81 nm and $p_0 < R_b$ and $0.6 < p_2 < 1.2$	Flag = 4
	861.66 nm $< p1 <$ 862.81 nm and $p_0 > R_b$ and $0.6 < p_2 < 1.2$	Flag = 3
	861.66 nm $< p_1 <$ 862.81 nm and $p_0 > \max(R_a, R_b)$ and $0.6 < p_2 < 1.2$	Flag = 2
	861.66 nm $< p1 <$ 862.81 nm and $p_0 > R_b$ and $1.2 < p_2 < 3.2$	Flag = 1
	861.66 nm $< p1 <$ 862.81 nm and $p_0 > \max(R_a, R_b)$ and $1.2 < p_2 < 3.2$	Flag = 0

LOGCHISQ_GSPSPEC : Logarithm of the goodness-of-fit for the GSP-Spec MatisseGauguin parameters (float)

Logarithm to the base 10 of the chi-squared between input spectrum rebinned to 800 pixels and solution synthetic spectrum computed from GSP-Spec MatisseGauguin (Recio-Blanco 2022).

EW_ESPELS_HALPHA : Halpha pseudo-equivalent width from ESP-ELS (float, Length & Distance[nm])

Pseudo-equivalent width of the Hα line measured on the RP spectra (Sect. **??**). The value is expected to be negative when emission is present. To try to compensate for the existence of blends with species other than hydrogen in the cooler stars and assuming that no photospheric Hα absorption is expected for K and M stars, we subtracted at $T_{\rm eff}$ < 5 000 K the pseudo-equivalent width measured on a synthetic spectrum with astrophysical parameters close to those derived by GSP-Phot for the target. The value that was subtracted (i.e. when $T_{\rm eff}$ < 5 000 K) is stored in `ew_espels_halpha_model`. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

EW_ESPELS_HALPHA_UNCERTAINTY : Uncertainty of the Halpha pseudo-equivalent width from ESP-ELS (float, Length & Distance[nm])

Uncertainty estimated on the pseudo-equivalent width of the Hα line. It is computed by propagating the RP flux uncertainties through the integration over the considered Hα window. Correlations between samples were ignored. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

EW_ESPELS_HALPHA_FLAG : Quality flag of the Halpha pseudo-equivalent width from ESP-ELS (string)

Quality flag of the Hα pseudo-equivalent width. It takes the following values:

- 0: if the value stored in `ew_espels_halpha_model` was not subtracted ($T_{\mathrm{eff}} \geq 5\,000$ K).
- 1: if the value stored in `ew_espels_halpha_model` was subtracted ($T_{\mathrm{eff}} < 5\,000$ K).

ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

EW_ESPELS_HALPHA_MODEL : Halpha pseudo-equivalent width from ESP-ELS measured on the synthetic spectrum (float, Length & Distance[nm])

Hα pseudo-equivalent width measured on the synthetic spectrum having the nearest astrophysical parameters to those derived by GSP-Phot (best library value, before post-processing). The value is available even when no ELS classification was provided and even when the value was not subtracted from the pseudo-equivalent width measured on the observed spectrum. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSLABEL_ESPELS : Adopted ELS class label from ESP-ELS (string)

The emission-line star class is based on the analysis of the BP/RP spectrum. Two random forest algorithms were used to classify the ELS targets. The first classifier is aimed to identify Wolf-Rayet stars and planetary nebulæ, and was trained on a subset of Gaia spectra chosen to be representative of each class. The second classifier is applied once significant Hα emission was detected in order to identify Be, Herbig Ae/Be, T Tauri, and active M dwarf stars. It was trained on Gaia BP/RP spectra and on the astrophysical parameters. The astrophysical parameters adopted during the training and the processing are those obtained by GSP-Phot (best library value, taken before any post-processing filter or calibration was applied) for the target. The class label corresponds to the one having the highest probability and can take the following values:

- **beStar** (Be star)
- **HerbigStar** (Herbig Ae/Be star)
- **PlanetaryNebula** (Planetary Nebula)
- **RedDwarfEmStar** (active M dwarf star)
- **TTauri** (T Tauri star)
- **wC** (Wolf-Rayet star of type WC)
- **wN** (Wolf-Rayet star of type WN)

When no emission was found or when the spectrum could not be classified, the field is empty. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSLABEL_ESPELS_FLAG : Quality flag of the adopted ELS class label from ESP-ELS (string)

The quality flag provided with the ELS class label (`classlabel_espels`) indicates better quality for lower values of the flag. In a first instance, the quality assessment is based on the difference (Δp) between the 2 highest probabilities. The flag therefore takes the following values:

$\Delta p \geq 0.8$: 0

$\Delta p \geq 0.6$: 1

$\Delta p \geq 0.4$: 2

$\Delta p \geq 0.2$: 3

$\Delta p < 0.2$: 4

It is important to note that the identification of Be stars, Herbig Ae/Be stars, T Tauri stars, and active M dwarf stars also relies on the astrophysical parameters (APs) derived by GSP-Phot. After validation and during the post-processing, a significant fraction of APs that were suspected of being wrong or inaccurate have been removed or changed. On the other hand part of the APs that survived the post-processing disagree significantly with the spectal type tag provided by ESP-ELS and may point towards issues with the APs, the spectral type tag, or/and with the input data. To identify both cases, the quality flag was updated after processing as follows:

`classlabel_espels_flag`+10: APs and spectral type tag are not consistent.

`classlabel_espels_flag`+20: APs were removed during the post-processing.

ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_WCSTAR : Probability from ESP-ELS of being a Wolf-Rayet star of type WC (float)

The probability of being a Wolf-Rayet star of type WC is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of the WC stellar class. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_WNSTAR : Probability from ESP-ELS of being a Wolf-Rayet star of type WN (float)

The probability of being a Wolf-Rayet star of type WN is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of the WN stellar class. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_BESTAR : Probability from ESP-ELS of being a Be Star (float)

The probability of being a Be star is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of the Be stellar class, as well as on the corresponding astrophysical parameters provided by GSP-Phot (best library estimate before post-processing). ESP-ELS module was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_TTAURISTAR : Probability from ESP-ELS of being a T Tauri Star (float)

The probability of being a T Tauri star is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of the T Tauri stellar class, as well as on the corresponding astrophysical parameters provided by GSP-Phot (best library estimate before post-processing). ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_HERBIGSTAR : Probability from ESP-ELS of being a Herbig Ae/Be Star (float)

The probability of being a Herbig Ae/Be star is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of the Herbig Ae/Be stellar class, as well as on the corresponding astrophysical parameters provided by GSP-Phot (best library estimate before post-processing). ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_DMESTAR : Probability from ESP-ELS of being an active M dwarf Star (float)

The probability of being an active M dwarf (dMe) star is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of the dMe stellar class, as well as on the corresponding astrophysical parameters provided by GSP-Phot (best library estimate before post-processing). ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

CLASSPROB_ESPELS_PNE : Probability from ESP-ELS of being a planetary nebula (float)

The probability of being a planetary nebula (PN/PNe) is derived on the BP/RP spectra by applying a random forest algorithm trained on a subset of Gaia spectra chosen to be representative of PNe. ESP-ELS was only applied on targets brighter than magnitude G=17.65. More information on the module can be found in Sect. **??** and Sect. **??**.

AZERO_ESPHS : Monochromatic interstellar extinction, A_0, from ESP-HS (float, Magnitude[mag])

Monochromatic interstellar extinction, A_0, derived at 547.7 nm by ESP-HS from the comparison of the observed BP/RP and, when available, RVS spectra to simulations. ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged `O`, `B`, or `A` in the `spectraltype_esphs` field. A more detailed description of the module is provided in Sect. **??** and Sect. **??**.

AZERO_ESPHS_UNCERTAINTY : Uncertainty at a 68% confidence level on A_0 from ESP-HS (float, Magnitude[mag])

Uncertainty on A_0 derived by ESP-HS. The value is provided by the diagonal of the covariance matrix. At all steps, the correlation between flux samples is ignored. Uncertainties were found to be underestimated by a factor 5 to 10 in the BP/RP+RVS processing mode (i.e. first digit/character of flags_esphs has value 0). ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged O, B, or A in the spectraltype_esphs field. A more detailed description of the module is provided in Sect. ?? and Sect. ??.

AG_ESPHS : Intersterstellar extinction in G band from ESP-HS (float, Magnitude[mag])

Interstellar extinction in G band, A_G, derived by ESP-HS from the comparison of the observed BP/RP and, when available, RVS spectra to simulations. ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged O, B, or A in the spectraltype_esphs field. A more detailed description of the module is provided in Sect. ?? and Sect. ??.

AG_ESPHS_UNCERTAINTY : Uncertainty on A_G from ESP-HS (float, Magnitude[mag])

Uncertainty on A_G derived by ESP-HS. The value is inferred from the uncertainty of A_0. Uncertainties were found to be underestimated by a factor 5 to 10 in the BP/RP+RVS processing mode (i.e. first digit/character of flags_esphs has value 0). ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged O, B, or A in the spectraltype_esphs field. A more detailed description of the module is provided in Sect. ?? and Sect. ??.

EBPMINRP_ESPHS : Reddening $E(G_{BP} - G_{RP})$ from ESP-HS (float, Magnitude[mag])

Interstellar reddening, $E(G_{BP} - G_{RP})$, derived by ESP-HS from the comparison of the observed BP/RP and, when available, RVS spectra to simulations. ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged O, B, or A in the spectraltype_esphs field. A more detailed description of the module is provided in Sect. ?? and Sect. ??.

EBPMINRP_ESPHS_UNCERTAINTY : Uncertainty on $E(G_{BP} - G_{RP})$ from ESP-HS (float, Magnitude[mag])

Uncertainty on $E(G_{BP} - G_{RP})$ derived by ESP-HS. The value is inferred from the uncertainty of A_0. Uncertainties were found to be underestimated by a factor 5 to 10 in the BP/RP+RVS processing mode (i.e. first digit/character of flags_esphs has value 0). ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged O, B, or A in the spectraltype_esphs field. A more detailed description of the module is provided in Sect. ?? and Sect. ??.

TEFF_ESPHS : Effective temperature from ESP-HS (float, Temperature[K])

Effective temperature derived by fitting the BP/RP and, when available, the RVS spectra with synthetic spectra. The module assumes a solar chemical composition. ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged `O`, `B`, or `A` in the `spectraltype_esphs` field. A more detailed description of the module is provided in Sect. **??** and Sect. **??**.

TEFF_ESPHS_UNCERTAINTY : Uncertainty at a 68% confidence level on the effective temperature from ESP-HS (float, Temperature[K])

Uncertainty on the effective temperature derived by ESP-HS. The value is extracted from the diagonal of the covariance matrix. At all steps, the correlation between flux samples is ignored. Uncertainties were found to be underestimated by a factor 5 to 10 in the BP/RP+RVS processing mode (i.e. first digit/character of `spectraltype_esphs` has value 0). A more detailed description of ESP-HS is provided in Sect. **??** and Sect. **??**.

LOGG_ESPHS : Surface gravity from ESP-HS (float, GravitySurface[log cgs])

Surface gravity derived by fitting the BP/RP and, when available, the RVS spectra with synthetic spectra. The module assumes a solar chemical composition. ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged `O`, `B`, or `A` in the `spectraltype_esphs` field. A more detailed description of the module is provided in Sect. **??** and Sect. **??**.

LOGG_ESPHS_UNCERTAINTY : Uncertainty at a 68% confidence level on the surface gravity from ESP-HS (float, GravitySurface[log cgs])

Uncertainty on the surface gravity derived by ESP-HS. The value is extracted from the diagonal of the covariance matrix. At all steps, the correlation between flux samples is ignored. Uncertainties were found to be underestimated by a factor 5 to 10 in the BP/RP+RVS processing mode (i.e. first digit/character of `flags_esphs` has value 0). A more detailed description of ESP-HS is provided in Sect. **??** and Sect. **??**.

VSINI_ESPHS : Projected rotational velocity from ESP-HS (float, Velocity[km s^{-1}])

The line broadening of the RVS spectrum is derived by assuming that it is due to stellar rotation and by adopting the same method as described in Fremat & et al. (2022). Therefore, we named it $v \sin i$. A value is only provided in the BP/RP+RVS mode (i.e. first digit/character of `flags_esphs` has value 0). ESP-HS is processing targets brighter than magnitude G=17.65, and which are tagged `O`, `B`, or `A` in the `spectraltype_esphs` field. A more detailed description of the module is provided in Sect. **??** and Sect. **??**.

VSINI_ESPHS_UNCERTAINTY : Uncertainty on the projected rotational velocity from ESP-HS (float, Velocity[km s^{-1}])

The uncertainty on $v \sin i$ was derived by adopting the approach described in Zucker (2003).

FLAGS_ESPHS : Quality flag of the ESP-HS parametrisation (string)

The quality flag usually has 2 digits. The first digit tells what processing mode was used to derive the effective temperature, surface gravity, interstellar extinction and reddening, and $v \sin i$. It takes the following values:

0: when both BP/RP and RVS spectra were used.

1: when BP/RP only was used. In this mode no $v \sin i$ is available.

The second digit is relative to the spectral type (`spectraltype_esphs`) that is derived from the analysis of the BP/RP spectrum only. During the processing a probability was assigned, and used for the quality assessment of the spectral type tagging. Therefore, the second digit of `flags_esphs` ranges from 1 to 5, depending on the first (p1) and second (p2) highest probability as follows:

p1 > 0.5 and p2 ≤ 0.1: second digit of `flags_esphs` = 1

p1 > 0.5 and p2 ≤ 0.2: second digit of `flags_esphs` = 2

p1 > 0.5 and p2 ≤ 0.3: second digit of `flags_esphs` = 3

p1 > 0.5 and p2 ≤ 0.4: second digit of `flags_esphs` = 4

p1 ≤ 0.5: second digit of `flags_esphs` = 5

target brighter than G=17.65, but no spectral type tag was derived: `flags_esphs` = 999

During the validation of the `CSTAR` spectral type tag used to identify candidate carbon stars (Creevey 2022), it was noted that only a fraction of these had significantly stronger than normal C_2 and CN molecular bands. We flagged these targets by setting the second digit of `flags_esphs` to 0.

When the algorithm was not able to properly set the quality flag (for 2.7 % of the targets with a spectral type tag) it received the value '999'. In these cases, no parameters nor classification was derived but the corresponding spectral type tag was kept.

SPECTRALTYPE_ESPHS : Spectral type from ESP-ELS (string)

The spectral type tag is obtained by ESP-ELS. At the origin it was obtained by ESP-HS (we kept the module name), but the corresponding algorithm was later moved to the upstream module ESP-ELS. It is derived from the analysis of the BP/RP spectrum only, and takes the following values: `CSTAR`,`M`,`K`,`G`,`F`,`A`,`B`,`O`. ESP-ELS is processing targets brighter than magnitude G=17.65. A more detailed description of the module is provided in Sect. **??** and Sect. **??**.

ACTIVITYINDEX_ESPCS : Chromospheric activity index from ESP-CS, measured on the calcium triplet using RVS spectra (float, Length & Distance[nm])

The activity index from the Apsis module ESP-CS is computed by comparing the observed RVS spectrum with a purely photospheric template spectrum obtained by interpolating in a grid of synthetic spectra. The atmospheric parameters (APs) adopted in the interpolation are taken from the output of either GSP-Spec or GSP-Phot. GSP-Spec APs are adopted when all three parameters `teff_gspspec`, `logg_gspspec`, and `mh_gspspec` are provided. Otherwise `teff_gspphot`, `logGspphot`, and `mh_gspphot` are adopted, if they are all provided. The activity index gives the excess equivalent width factor in the cores of the Ca II infrared triplet lines with respect to the template inactive spectrum. The excess equivalent width is computed for each of the Ca II infrared triplet lines and the three values obtained are averaged. When the projected rotational velocity `vbroad` in table `gaia_source` is provided, rotational broadening is taken into account. See Section **??** for details.

ACTIVITYINDEX_ESPCS_UNCERTAINTY : Uncertainty in the chromospheric activity index from ESP-CS (float, Length & Distance[nm])

Uncertainty in the activity index from ESP-CS (`activityindex_espcs`). The uncertainty is computed by considering the standard deviation of the excess equivalent width factor in each of the Ca II infrared triplet lines, taking spectrum noise into account, and applying error propagation. See Section **??** for details.

ACTIVITYINDEX_ESPCS_INPUT : Source of input stellar parameters for the computation of the activity index by ESP-CS (string)

Flag indicating the source of the stellar atmospheric parameters used by ESP-CS in deriving the activity index. The flag has the value “M1” if the source is GSP-Spec, and “M2” if the source is GSP-Phot. See the description of `activityindex_espcs`.

TEFF_ESPUCD : Effective temperature estimate from ESP-UCD based on the RP spectrum (float, Temperature[K])

Effective temperature estimate from ESP-UCD inferred from the RP spectrum. The prediction module is based on a Gaussian Process trained with empirical examples. See Section **??** for details.

TEFF_ESPUCD_UNCERTAINTY : Uncertainty of the effective temperature estimate produced by ESP-UCD (float, Temperature[K])

Standard deviation of 10 effective temperature predictions obtained by the ESP-UCD module for 10 RP spectra generated using random sampling from Gaussian distributions centred at the observed fluxes and with standard deviations given by the flux uncertainties. The value thus obtained is rescaled (multiplied by 7) to match the root-mean-square error of the module predictions for a set of well-known ultracool dwarfs (see Section **??** for further details).

FLAGS_ESPUCD : Quality flags of the ESP-UCD parameter estimates (string)

Two-digits ESP-UCD parameters quality flag. The first digit (0, 1 or 2) is based on the goodness-of-fit estimate and the RP spectrum signal-to-noise ratio, 0 being the best quality. The second digit is 1 for sources with inconsistent $T_{\rm eff}$ predictions given the value of $G+5\cdot\log_{10}(\varpi)+5$. It is 0 for all other sources. See Section **??** for a quantitative definition of the three quality categories for the first digit and of the inconsistency criterion for the second digit.

RADIUS_FLAME : Radius of the star from FLAME using `teff_gspphot` and `lum_flame` (float, Length & Distance[Solar Radius])

The radius of the star from FLAME, derived from `teff_gspphot` and `lum_flame` using the Stefan-Boltzmann law with a solar effective temperature of 5772 K, see Section **??**, and associated uncertainties. It is defined as the median value (50^{th} percentile) of the distribution from sampling.

RADIUS_FLAME_LOWER : Lower confidence level (16%) of `radius_flame` (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of the radius of the star from FLAME, see description for `radius_flame`. It is derived from `teff_gspphot`, `lum_flame` and associated uncertainties. It is defined as the

16^{th} percentile value of the distribution from sampling. Upper and lower levels include 68% confidence interval.

RADIUS_FLAME_UPPER : Upper confidence level (84%) of `radius_flame` (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of the radius of the star from FLAME, see description for `radius_flame`. It is derived from `teff_gspphot`, `lum_flame` and associated uncertainties. It is defined as the 84^{th} percentile value of the distribution from sampling. Upper and lower levels include 68% confidence interval.

LUM_FLAME : Luminosity of the star from FLAME using G band magnitude, extinction (`ag_gspphot`), parallax or distance, and a bolometric correction `bc_flame` (float, Luminosity[Solar Luminosity])

Luminosity of the star from FLAME using G band magnitude, extinction from GSP-Phot (`ag_gspphot`), parallax or `distance_gspphot`, and a bolometric correction `bc_flame`. It is defined as the median value (50^{th} percentile) of the distribution from sampling. The bolometric correction depends on the effective temperature, metallicity and surface gravity, and these are based on GSP-Phot values. The bolometric magnitude of the Sun = 4.74 mag, see Section **??** and the reference absolute G-band magnitude of the Sun is 4.66 mag, see Section **??**.

LUM_FLAME_LOWER : Lower confidence level (16%) of `lum_flame` (float, Luminosity[Solar Luminosity])

Lower confidence level (16%) of the luminosity of the star from FLAME, see description for `lum_flame`. It is defined as the 16^{th} percentile value of the distribution from sampling. Upper and lower levels contain the 68% confidence interval.

LUM_FLAME_UPPER : Upper confidence level (84%) of `lum_flame` (float, Luminosity[Solar Luminosity])

The upper confidence level (84%) of the luminosity of the star from FLAME, see description for `lum_flame`. It is defined as the 84^{th} percentile value of the distribution from sampling. Upper and lower levels contain the 68% confidence interval.

MASS_FLAME : Mass of the star from FLAME using stellar models, `lum_flame`, and `teff_gspphot` (float, Mass[Solar Mass])

Mass of the star from FLAME. It is defined as the median value (50^{th} percentile) of the 1D projected distribution from sampling in mass and age. It is derived by comparing `teff_gspphot` and `lum_flame` to the BASTI solar metallicity stellar evolution models (Hidalgo et al. 2018), see Section ?? for details.

MASS_FLAME_LOWER : Lower confidence level (16%) of `mass_flame` (float, Mass[Solar Mass])

Lower confidence level (16%) of the mass of the star from FLAME, see description for `mass_flame`. It is defined as the 16^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

MASS_FLAME_UPPER : Upper confidence level (84%) of `mass_flame` (float, Mass[Solar Mass])

Upper confidence level (84%) of the mass of the star from FLAME, see description for `mass_flame`. It is defined as the 84^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

AGE_FLAME : Age of the star from FLAME using stellar models, see `mass_flame` for details (float, Time[Gyr])

Age of the star from FLAME. It is defined as the median value (50^{th} percentile) of the 1D projected distribution from sampling in mass and age, see `mass_flame` for details.

AGE_FLAME_LOWER : Lower confidence level (16%) of `age_flame` (float, Time[Gyr])

Lower confidence level (16%) of the age of the star from FLAME, see description for `age_flame`. It is defined as the 16^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

AGE_FLAME_UPPER : Upper confidence level (84%) of `age_flame` (float, Time[Gyr])

Upper confidence level (84%) of the age of the star from FLAME, see description for `age_flame`. It is defined as the 84^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

FLAGS_FLAME : Flags indicating quality and processing information from FLAME (string)

This field contains the quality and processing flags from FLAME and takes the form 'AB'. The first digit refers to the quality of the mass and age determination (A = 0, 1, 2) and the second digit (B) informs the user if the parallax or `distance_gspphot` was used for deriving all FLAME stellar parameters (`lum_flame`, `radius_flame`,...). Concerning the quality of the mass and age (first digit, A), the following is adopted:

A=0 nothing to report

A=1 the star is a giant and the mass and age should be considered with an uncertainty on the order of 20% - 30%

A=2 the mass and age are not available

We note that while the `evolstage_flame` parameter is related to mass and age, this flag is not applicable to this parameter.

For the second digit, B, the following is adopted:

B=0 parallax is used

B=1 `distance_gspphot` is used

B=2 parallax is used due to convergence issues with `distance_gspphot`

See Section **??** of the online documentation for details.

EVOLSTAGE_FLAME : Evolutionary stage of the star from FLAME using stellar models, see `mass_flame` for details (int)

Evolution stage of the star from FLAME. It is an integer value typically between 100 and 1300 and defined using the median value (50^{th} percentile) of the 1D projected distribution from sampling in mass and age, see `mass_flame` for details. The value is adapted from the BASTI model grid (Hidalgo et al. 2018) adopting the following convention:

- 100 = zero age main sequence (ZAMS)
- 300 = first minimum of $T_{\rm eff}$ for massive stars or central hydrogen mass fraction = 0.30 for low-mass stars
- 360 = main sequence turn-off

- 420 = central hydrogen mass fraction = 0.00
- 490 = base of the red giant branch (RGB)
- 860 = maximum $\mathcal{L}$ along the RGB bump
- 890 = minimum $\mathcal{L}$ along the RGB bump
- 1290 = tip of the RGB

GRAVREDSHIFT_FLAME : Gravitational redshift from FLAME using `radius_flame` and `logg_gspphot` (float, Velocity[km s^{-1}])

Gravitational redshift, in velocity, from FLAME using `radius_flame` and `logg_gspphot`.

GRAVREDSHIFT_FLAME_LOWER : Lower confidence level (16%) of `gravredshift_flame` (float, Velocity[km s^{-1}])

Lower confidence level (16%) of the gravitational redshift of the star from FLAME, see description for `gravredshift_flame`. It is defined as the 16th percentile value of the distribution from sampling. Upper and lower levels contain the 68% confidence interval.

GRAVREDSHIFT_FLAME_UPPER : Upper confidence level (84%) of `gravredshift_flame` (float, Velocity[km s^{-1}])

Upper confidence level (84%) of the gravitational redshift of the star from FLAME, see description for `gravredshift_flame`. It is defined as the 84th percentile value of the distribution from sampling. Upper and lower levels contain the 68% confidence interval.

BC_FLAME : Bolometric correction used to derive `lum_flame` (float, Magnitude[mag])

Bolometric correction for the G-band magnitude (BC$_G$) used to derive `lum_flame`. It is defined as the median value (50th percentile) of the distribution from sampling. It is a function of effective temperature, surface gravity, and metallicity, and has been derived from MARCS models, see Section **??** of the online documentation. The bolometric correction for the Sun is defined as +0.08 mag, see Section **??**, where $M_{\mathrm{bol},\odot}$ = 4.74 mag, see Section **??**, i.e. $M_{G\odot}$ = 4.66 mag.

MH_MSC : Metallicity of the source treated as a binary system from MSC using BP/RP spectra and parallax (float, Abundances[dex])

Decimal logarithm of the ratio of the average number abundance of elements heavier than helium compared to hydrogen relative to the same ratio of solar abundances ([M/H]) (assuming source is a binary system) from MSC using BP/RP spectra and parallax. Because MSC uses an empirical BPRP forward model trained on APOGEE astrophysical parameters the results are tied to the metallicity scale of the set of APOGEE targets used as the training set. The metallicity value is the median of the MCMC samples. It is assumed that both components of the binary system have the same metallicity. For details see Section **??**.

MH_MSC_UPPER : Upper confidence level (84%) of the metallicity from MSC using BP/RP spectra and parallax (float, Abundances[dex])

Upper confidence level of the metallicity inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

MH_MSC_LOWER : Lower confidence level (16%) of the metallicity from MSC using BP/RP spectra and parallax (float, Abundances[dex])

Lower confidence level of the metallicity inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

AZERO_MSC : Monochromatic extinction A_0 at 547.7nm of the source treated as a binary system from MSC using BP/RP spectra and parallax (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm of the source (assuming source is a binary system) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_MSC_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from MSC using BP/RP spectra and parallax (float, Magnitude[mag])

Upper confidence level of A_0 inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

AZERO_MSC_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from MSC using BP/RP spectra and parallax (float, Magnitude[mag])

Lower confidence level of A_0 inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

DISTANCE_MSC : Distance from MSC using BP/RP spectra and parallax (float, Length & Distance[pc])

Distance of the source (assuming source is a binary system) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. For details see Section **??**.

DISTANCE_MSC_UPPER : Upper confidence level (84%) of distance from MSC using BP/RP spectra and parallax (float, Length & Distance[pc])

Upper confidence level of distance inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

DISTANCE_MSC_LOWER : Lower confidence level (16%) of distance from MSC using BP/RP spectra and parallax (float, Length & Distance[pc])

Lower confidence level of distance inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

TEFF_MSC1 : Effective temperature of the primary from MSC using BP/RP spectra and parallax (float, Temperature[K])

Effective temperature of the primary (assuming source is a binary system and the primary is the component with more flux in the BP and RP spectra combined) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. For details see Section **??**.

TEFF_MSC1_UPPER : Upper confidence level (84%) of effective temperature of the primary from MSC using BP/RP spectra and parallax (float, Temperature[K])

Upper confidence level of effective temperature of the primary inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

TEFF_MSC1_LOWER : Lower confidence level (16%) of effective temperature of the primary from MSC using BP/RP spectra and parallax (float, Temperature[K])

Lower confidence level of effective temperature of the primary inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

TEFF_MSC2 : Effective temperature of the secondary from MSC using BP/RP spectra and parallax (float, Temperature[K])

Effective temperature of the secondary (assuming source is a binary system and the secondary is the component with less flux in the BP and RP spectra combined) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. For details see Section **??**.

TEFF_MSC2_UPPER : Upper confidence level (84%) of effective temperature of the secondary from MSC using BP/RP spectra and parallax (float, Temperature[K])

Upper confidence level of effective temperature of the secondary inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

TEFF_MSC2_LOWER : Lower confidence level (16%) of effective temperature of the secondary from MSC using BP/RP spectra and parallax (float, Temperature[K])

Lower confidence level of effective temperature of the secondary inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

LOGG_MSC1 : Surface gravity of the primary from MSC using BP/RP spectra and parallax (float, GravitySurface[log cgs])

Surface gravity of the primary (assuming source is a binary system and the primary is the component with more flux in the BP and RP spectra combined) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. For details see Section **??**.

LOGG_MSC1_UPPER : Upper confidence level (84%) of surface gravity of the primary from MSC using BP/RP spectra and parallax (float, GravitySurface[log cgs])

Upper confidence level of surface gravity of the primary inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

LOGG_MSC1_LOWER : Lower confidence level (16%) of surface gravity of the primary from MSC using BP/RP spectra and parallax (float, GravitySurface[log cgs])

Lower confidence level of surface gravity of the primary inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

LOGG_MSC2 : Surface gravity of the secondary from MSC using BP/RP spectra and parallax (float, GravitySurface[log cgs])

Surface gravity of the secondary (assuming source is a binary system and the secondary is the component with less flux in the BP and RP spectra combined) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. For details see Section **??**.

LOGG_MSC2_UPPER : Upper confidence level (84%) of surface gravity of the secondary from MSC using BP/RP spectra and parallax (float, GravitySurface[log cgs])

Upper confidence level of surface gravity of the secondary inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

LOGG_MSC2_LOWER : Lower confidence level (16%) of surface gravity of the secondary from MSC using BP/RP spectra and parallax (float, GravitySurface[log cgs])

Lower confidence level of surface gravity of the secondary inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

AG_MSC : Extinction in G band of the source treated as a binary system from MSC using BP/RP spectra and parallax (float, Magnitude[mag])

G band extinction of the source (assuming source is a binary system) inferred by MSC from BP/RP spectra and parallax. This is the median of the MCMC samples. For details see Section **??**.

AG_MSC_UPPER : Upper confidence level (84%) of extinction in G band from MSC using BP/RP spectra and parallax (float, Magnitude[mag])

Upper confidence level of G band extinction inferred by MSC from BP/RP spectra and parallax. This is the 84th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

AG_MSC_LOWER : Lower confidence level (16%) of extinction in G band from MSC using BP/RP spectra and parallax (float, Magnitude[mag])

Lower confidence level of G band extinction inferred by MSC from BP/RP spectra and parallax. This is the 16th percentile. Lower and upper levels include 68% confidence (corresponding to a conventional 1-sigma interval).

LOGPOSTERIOR_MSC : Goodness-of-fit score (normalised log-posterior) of MSC MCMC (float)

Goodness-of-fit score of MSC MCMC. This was calculated as the mean log-posterior of all MCMC samples normalised with the uncertainty of the data. A higher value corresponds to a better fit.

MCMCACCEPT_MSC : Mean MCMC acceptance rate of MSC MCMC (float)

Mean acceptance rate of MSC MCMC chain for all walkers.

MCMCDRIFT_MSC : Mean drift of the MSC MCMC chain in units of parameter standard deviation (float)

Drift of the MCMC chain in units of parameter standard deviation, averaged over all parameters. Computed as the mean value of each parameter in the first MCMC ensemble state minus the mean value in the last MCMC ensemble state divided by the standard deviation of values in the last MCMC ensemble state. This is then averaged over all MSC parameters to provide a single value. If the MCMC chain has not converged, the first and last ensemble states will have low or zero overlap. In such a case, their mean values will show a large difference, larger than the standard deviation in the final ensemble state. Therefore, large values of this quantity indicate poor MCMC convergence, whereas values close to zero indicate good MCMC convergence.

FLAGS_MSC : Flag indicating quality information from MSC (string)

Catalogue flag for MSC. This is set to '0' if `logposterior_msc` ≥ -1000 & `mcmcdrift_msc` ≤ 1. In all other cases it is set to '1' indicating an unreliable inference result.

NEURON_OA_ID : Identifier of the OA SOM map neuron that represents the source (long)

A unique identifier for the neuron that represents the source in the SOM map produced by the OA module. If the source was not considered as an outlier according to DSC classification or if it was discarded by OA module, then this field will be null. See Section **??** for further details.

NEURON_OA_DIST : Distance between the source XP spectra and the OA neuron XP prototype that represents the source (float)

Squared Euclidean distance between the source XP spectra (preprocessed) and the neuron XP prototype (`xp_spectrum_prototype_flux` in table `oa_neuron_xp_spectra`) that represents such a source. If the source was not considered as an outlier according to DSC classification or if it was discarded by the OA module, then this field will be null. See Section **??** for further details.

NEURON_OA_DIST_PERCENTILE_RANK : Percentile rank according to the distance distribution of the OA neuron that represents the source (int)

Percentile rank according to the squared Euclidean distance distribution of the OA neuron that represents the source. If the source was not considered an outlier according to DSC classification or if it was discarded by the OA module, then this field will be null. See Section **??** for further details.

FLAGS_OA : Flags indicating quality and processing information from OA (string)

Processing flags related to the quality of the classification and source processing performed by the OA module, which is encoded as follows:

$$ABCD$$

where:

Code	Description	Value range	
A	Number of gaps with negative fluxes in BP spectrum	$[0, 2]$	*
B	Number of gaps with negative fluxes in RP spectrum	$[0, 2]$	*
C	Source classification quality category	$[0, 5]$	
D	Neuron quality category	$[0, 6]$	

(*) A and B flags taking value 2 means two or more gaps taking negative flux values.

2.2 ASTROPHYSICAL_PARAMETERS_SUPP

This table contains additional parameters from the Apsis processing chain, compared to the main table `astrophysical_parameters` (see Chapter ??), from modules that produce more than one result for a parameter. It contains (1) the individual library results from GSP-Phot (see Section ??), (2) FLAME results from processing GSP-Spec parameters given in the `astrophysical_parameters` table (see Section ??), and (3) results from the GSP-Spec ANN algorithm (see Section ??).

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Source Identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

LIBNAME_BEST_GSPPHOT : Name of library that achieves the highest mean log-posterior in MCMC samples from GSP-Phot Aeneas (string)

Name of library of synthetic stellar spectra (one of A, MARCS, OB, PHOENIX) for which GSP-Phot achieves the highest goodness-of-fit score (i.e. the highest mean log-posterior in its MCMC samples), referred to as “best library”. This is the library used to derive GSP-Phot parameters included in table `astrophysical_parameters`. For more information on the synthetic libraries see Section ??. This field is the same as field `libname_gspphot` in tables `astrophysical_parameters` and `gaia_source`.

TEFF_GSPPHOT_MARCS : Effective temperature from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Temperature[K])

Effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section ?? of the online documentation). This is the median of the MCMC samples. Taken from MARCS library.

TEFF_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of effective temperature from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Temperature[K])

Lower confidence level (16%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

TEFF_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of effective temperature from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Temperature[K])

Upper confidence level (84%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_MARCS : Surface gravity from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, GravitySurface[log cgs])

Surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section ?? of the online documentation). This is the median of the MCMC samples. Taken from MARCS library.

LOGG_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of surface gravity from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, GravitySurface[log cgs])

Lower confidence level (16%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of surface gravity from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, GravitySurface[log cgs])

Upper confidence level (84%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_MARCS : Iron abundance from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from MARCS library.

MH_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of iron abundance from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of iron abundance from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

DISTANCE_GSPPHOT_MARCS : Distance from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Length & Distance[pc])

Distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from MARCS library. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is

1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of distance from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Length & Distance[pc])

Lower confidence level (16%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of distance from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Length & Distance[pc])

Upper confidence level (84%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

AZERO_GSPPHOT_MARCS : Monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AG_GSPPHOT_MARCS : Extinction in G band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library.

AG_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of extinction in G band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

AG_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of extinction in G band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_MARCS : Extinction in G_{BP} band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library.

ABP_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of extinction in G_{BP} band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of extinction in G_{BP} band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_MARCS : Extinction in G_{RP} band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library.

ARP_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of extinction in G_{RP} band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of extinction in G_{RP} band from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

EBPMINRP_GSPPHOT_MARCS : Reddening $E(BP - RP)$ from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Reddening $E(BP - RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library. Note that while $E(BP - RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the median values.

EBPMINRP_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of reddening $E(BP - RP)$ from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of reddening $E(BP - RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval. Note that while $E(BP - RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the lower confidence levels.

EBPMINRP_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of reddening $E(BP - RP)$ from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of reddening $E(BP - RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval. Note that while $E(BP - RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the upper confidence levels.

MG_GSPPHOT_MARCS : Absolute magnitude M_G from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library.

MG_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of absolute magnitude M_G from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

MG_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of absolute magnitude M_G from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_MARCS : Radius from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Length & Distance[Solar Radius])

Stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from MARCS library.

RADIUS_GSPPHOT_MARCS_LOWER : Lower confidence level (16%) of radius from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_MARCS_UPPER : Upper confidence level (84%) of radius from GSP-Phot Aeneas for MARCS library using BP/RP spectra (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from MARCS library. Lower and upper levels include

68% confidence interval.

LOGPOSTERIOR_GSPPHOT_MARCS : Goodness-of-fit score (mean log-posterior of MCMC) of GSP-Phot Aeneas MCMC for MARCS library (float)

Goodness-of-fit score defined as the mean log-posterior of all MCMC samples of GSP-Phot Aeneas MCMC for MARCS library. The higher the goodness-of-fit score, the better the fit. Values are usually negative. NB: This is not a Bayesian evidence!

MCMCACCEPT_GSPPHOT_MARCS : MCMC acceptance rate of GSP-Phot Aeneas MCMC for MARCS library (float)

MCMC acceptance rate of GSP-Phot Aeneas MCMC for MARCS library. This is computed from all MCMC samples (before thinning the chain to 2000 or 100 samples).

TEFF_GSPPHOT_PHOENIX : Effective temperature from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Temperature[K])

Effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from PHOENIX library.

TEFF_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of effective temperature from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Temperature[K])

Lower confidence level (16%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

TEFF_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of effective temperature from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Temperature[K])

Upper confidence level (84%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_PHOENIX : Surface gravity from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, GravitySurface[log cgs])

Surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from PHOENIX library.

LOGG_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of surface gravity from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, GravitySurface[log cgs])

Lower confidence level (16%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of surface gravity from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, GravitySurface[log cgs])

Upper confidence level (84%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_PHOENIX : Iron abundance from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from PHOENIX library.

MH_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of iron abundance from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 16th percentile of the MCMC samples. Taken from

PHOENIX library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of iron abundance from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

DISTANCE_GSPPHOT_PHOENIX : Distance from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Length & Distance[pc])

Distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from PHOENIX library. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of distance from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Length & Distance[pc])

Lower confidence level (16%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of distance from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Length & Distance[pc])

Upper confidence level (84%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

AZERO_GSPPHOT_PHOENIX : Monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AG_GSPPHOT_PHOENIX : Extinction in G band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library.

AG_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of extinction in G band from

GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

AG_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of extinction in G band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_PHOENIX : Extinction in G_{BP} band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library.

ABP_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of extinction in G_{BP} band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of extinction in G_{BP} band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_PHOENIX : Extinction in G_{RP} band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library.

ARP_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of extinction in G_{RP} band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of extinction in G_{RP} band from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

EBPMINRP_GSPPHOT_PHOENIX : Reddening $E(BP-RP)$ from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Reddening $E(BP-RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the median values.

EBPMINRP_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of reddening $E(BP-RP)$ from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of reddening $E(BP-RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the lower confidence levels.

EBPMINRP_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of reddening $E(BP-RP)$ from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of reddening $E(BP-RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the upper confidence levels.

MG_GSPPHOT_PHOENIX : Absolute magnitude M_G from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library.

MG_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of absolute magnitude M_G from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

MG_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of absolute magnitude M_G from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_PHOENIX : Radius from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Length & Distance[Solar Radius])

Stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from PHOENIX library.

RADIUS_GSPPHOT_PHOENIX_LOWER : Lower confidence level (16%) of radius from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_PHOENIX_UPPER : Upper confidence level (84%) of radius from GSP-Phot Aeneas for PHOENIX library using BP/RP spectra (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from PHOENIX library. Lower and upper levels include 68% confidence interval.

LOGPOSTERIOR_GSPPHOT_PHOENIX : Goodness-of-fit score (mean log-posterior of MCMC) of GSP-Phot Aeneas MCMC for PHOENIX library (float)

Goodness-of-fit score defined as the mean log-posterior of all MCMC samples of GSP-Phot Aeneas MCMC for PHOENIX library. The higher the goodness-of-fit score, the better the fit. Values are usually negative. NB: This is not a Bayesian evidence!

MCMCACCEPT_GSPPHOT_PHOENIX : MCMC acceptance rate of GSP-Phot Aeneas MCMC for PHOENIX library (float)

MCMC acceptance rate of GSP-Phot Aeneas MCMC for PHOENIX library. This is computed from all MCMC samples (before thinning the chain to 2000 or 100 samples).

TEFF_GSPPHOT_OB : Effective temperature from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Temperature[K])

Effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from OB library.

TEFF_GSPPHOT_OB_LOWER : Lower confidence level (16%) of effective temperature from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Temperature[K])

Lower confidence level (16%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

TEFF_GSPPHOT_OB_UPPER : Upper confidence level (84%) of effective temperature from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Temperature[K])

Upper confidence level (84%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_OB : Surface gravity from GSP-Phot Aeneas for OB library using BP/RP spectra (float, GravitySurface[log cgs])

Surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from OB library.

LOGG_GSPPHOT_OB_LOWER : Lower confidence level (16%) of surface gravity from GSP-Phot Aeneas for OB library using BP/RP spectra (float, GravitySurface[log cgs])

Lower confidence level (16%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_OB_UPPER : Upper confidence level (84%) of surface gravity from GSP-Phot Aeneas for OB library using BP/RP spectra (float, GravitySurface[log cgs])

Upper confidence level (84%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_OB : Iron abundance from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from OB library.

MH_GSPPHOT_OB_LOWER : Lower confidence level (16%) of iron abundance from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_OB_UPPER : Upper confidence level (84%) of iron abundance from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

DISTANCE_GSPPHOT_OB : Distance from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Length & Distance[pc])

Distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples (see Section **??** of the online documentation). Taken from OB library. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_OB_LOWER : Lower confidence level (16%) of distance from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Length & Distance[pc])

Lower confidence level (16%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_OB_UPPER : Upper confidence level (84%) of distance from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Length & Distance[pc])

Upper confidence level (84%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

AZERO_GSPPHOT_OB : Monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_OB_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_OB_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AG_GSPPHOT_OB : Extinction in G band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library.

AG_GSPPHOT_OB_LOWER : Lower confidence level (16%) of extinction in G band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

AG_GSPPHOT_OB_UPPER : Upper confidence level (84%) of extinction in G band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_OB : Extinction in G_{BP} band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library.

ABP_GSPPHOT_OB_LOWER : Lower confidence level (16%) of extinction in G_{BP} band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_OB_UPPER : Upper confidence level (84%) of extinction in G_{BP} band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_OB : Extinction in G_{RP} band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library.

ARP_GSPPHOT_OB_LOWER : Lower confidence level (16%) of extinction in G_{RP} band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_OB_UPPER : Upper confidence level (84%) of extinction in G_{RP} band from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

EBPMINRP_GSPPHOT_OB : Reddening E(BP-RP) from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Reddening $E(BP - RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the median values.

EBPMINRP_GSPPHOT_OB_LOWER : Lower confidence level (16%) of reddening E(BP-RP) from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of reddening $E(BP - RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval. Note that while $E(BP - RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the lower confidence levels.

EBPMINRP_GSPPHOT_OB_UPPER : Upper confidence level (84%) of reddening E(BP-RP) from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of reddening $E(BP - RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval. Note that while $E(BP - RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the upper confidence levels.

MG_GSPPHOT_OB : Absolute magnitude M_G from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library.

MG_GSPPHOT_OB_LOWER : Lower confidence level (16%) of absolute magnitude M_G from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

MG_GSPPHOT_OB_UPPER : Upper confidence level (84%) of absolute magnitude M_G from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_OB : Radius from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Length & Distance[Solar Radius])

Stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from OB library.

RADIUS_GSPPHOT_OB_LOWER : Lower confidence level (16%) of radius from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_OB_UPPER : Upper confidence level (84%) of radius from GSP-Phot Aeneas for OB library using BP/RP spectra (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from OB library. Lower and upper levels include 68% confidence interval.

LOGPOSTERIOR_GSPPHOT_OB : Goodness-of-fit score (mean log-posterior of MCMC) of GSP-Phot Aeneas MCMC for OB library (float)

Goodness-of-fit score defined as the mean log-posterior of all MCMC samples of GSP-Phot Aeneas MCMC for OB library. The higher the goodness-of-fit score, the better the fit. Values are usually negative. NB: This is not a Bayesian evidence!

MCMCACCEPT_GSPPHOT_OB : MCMC acceptance rate of GSP-Phot Aeneas MCMC for OB library (float)

MCMC acceptance rate of GSP-Phot Aeneas MCMC for OB library. This is computed from all MCMC samples (before thinning the chain to 2000 or 100 samples).

TEFF_GSPPHOT_A : Effective temperature from GSP-Phot Aeneas for A library using BP/RP spectra (float, Temperature[K])

Effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from A library.

TEFF_GSPPHOT_A_LOWER : Lower confidence level (16%) of effective temperature from GSP-Phot Aeneas for A library using BP/RP spectra (float, Temperature[K])

Lower confidence level (16%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

TEFF_GSPPHOT_A_UPPER : Upper confidence level (84%) of effective temperature from GSP-Phot Aeneas for A library using BP/RP spectra (float, Temperature[K])

Upper confidence level (84%) of effective temperature (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_A : Surface gravity from GSP-Phot Aeneas for A library using BP/RP spectra (float, GravitySurface[log cgs])

Surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from A library.

LOGG_GSPPHOT_A_LOWER : Lower confidence level (16%) of surface gravity from GSP-Phot Aeneas for A library using BP/RP spectra (float, GravitySurface[log cgs])

Lower confidence level (16%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

LOGG_GSPPHOT_A_UPPER : Upper confidence level (84%) of surface gravity from GSP-Phot Aeneas for A library using BP/RP spectra (float, GravitySurface[log cgs])

Upper confidence level (84%) of surface gravity (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_A : Iron abundance from GSP-Phot Aeneas for A library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from A library.

MH_GSPPHOT_A_LOWER : Lower confidence level (16%) of iron abundance from GSP-Phot Aeneas for A library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

MH_GSPPHOT_A_UPPER : Upper confidence level (84%) of iron abundance from GSP-Phot Aeneas for A library using BP/RP spectra (float, Abundances[dex])

Decimal logarithm of the ratio of the number abundance of iron to the number abundance of hydrogen relative to the same ratio of solar abundances inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax, assuming source is a single star (see Section **??** of the online documentation). This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

DISTANCE_GSPPHOT_A : Distance from GSP-Phot Aeneas for A library using BP/RP spectra (float, Length & Distance[pc])

Distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax (see Section **??** of the online documentation). This is the median of the MCMC samples. Taken from A library. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_A_LOWER : Lower confidence level (16%) of distance from GSP-Phot Aeneas for A library using BP/RP spectra (float, Length & Distance[pc])

Lower confidence level (16%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

DISTANCE_GSPPHOT_A_UPPER : Upper confidence level (84%) of distance from GSP-Phot Aeneas for A library using BP/RP spectra (float, Length & Distance[pc])

Upper confidence level (84%) of distance (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval. NB: The actual fit parameter is $\log_{10} d$ and a prior is imposed to ensure a value between [0,5], thus the minimum possible distance is 1 pc and the maximum is 100 kpc.

AZERO_GSPPHOT_A : Monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_A_LOWER : Lower confidence level (16%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AZERO_GSPPHOT_A_UPPER : Upper confidence level (84%) of monochromatic extinction A_0 at 547.7nm from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of monochromatic extinction A_0 at 547.7 nm (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

AG_GSPPHOT_A : Extinction in G band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library.

AG_GSPPHOT_A_LOWER : Lower confidence level (16%) of extinction in G band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

AG_GSPPHOT_A_UPPER : Upper confidence level (84%) of extinction in G band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_A : Extinction in G_{BP} band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library.

ABP_GSPPHOT_A_LOWER : Lower confidence level (16%) of extinction in G_{BP} band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

ABP_GSPPHOT_A_UPPER : Upper confidence level (84%) of extinction in G_{BP} band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{BP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_A : Extinction in G_{RP} band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library.

ARP_GSPPHOT_A_LOWER : Lower confidence level (16%) of extinction in G_{RP} band from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

ARP_GSPPHOT_A_UPPER : Upper confidence level (84%) of extinction in G_{RP} band from GSP-

Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of broadband extinction in G_{RP} band (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

EBPMINRP_GSPPHOT_A : Reddening $E(BP-RP)$ from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Reddening $E(BP-RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the median values.

EBPMINRP_GSPPHOT_A_LOWER : Lower confidence level (16%) of reddening $E(BP-RP)$ from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of reddening $E(BP-RP)$ (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the lower confidence levels.

EBPMINRP_GSPPHOT_A_UPPER : Upper confidence level (84%) of reddening $E(BP-RP)$ from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of reddening E(BP-RP) (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval. Note that while $E(BP-RP) = A_{BP} - A_{RP}$, this was computed at the level of MCMC samples. Hence, this relation is not exactly true for the upper confidence levels.

MG_GSPPHOT_A : Absolute magnitude M_G from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library.

MG_GSPPHOT_A_LOWER : Lower confidence level (16%) of absolute magnitude M_G from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Lower confidence level (16%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

MG_GSPPHOT_A_UPPER : Upper confidence level (84%) of absolute magnitude M_G from GSP-Phot Aeneas for A library using BP/RP spectra (float, Magnitude[mag])

Upper confidence level (84%) of absolute magnitude M_G (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_A : Radius from GSP-Phot Aeneas for A library using BP/RP spectra (float, Length & Distance[Solar Radius])

Stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the median of the MCMC samples. Taken from A library.

RADIUS_GSPPHOT_A_LOWER : Lower confidence level (16%) of radius from GSP-Phot Aeneas for A library using BP/RP spectra (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 16th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

RADIUS_GSPPHOT_A_UPPER : Upper confidence level (84%) of radius from GSP-Phot Aeneas for A library using BP/RP spectra (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of stellar radius (assuming source is a single star) inferred by GSP-Phot Aeneas from BP/RP spectra, apparent G magnitude and parallax. This is the 84th percentile of the MCMC samples. Taken from A library. Lower and upper levels include 68% confidence interval.

LOGPOSTERIOR_GSPPHOT_A : Goodness-of-fit score (mean log-posterior of MCMC) of GSP-Phot Aeneas MCMC for A library (float)

Goodness-of-fit score defined as the mean log-posterior of all MCMC samples of GSP-Phot Aeneas MCMC for A library. The higher the goodness-of-fit score, the better the fit. Values are usually negative. NB: This is not a Bayesian evidence!

MCMCACCEPT_GSPPHOT_A : MCMC acceptance rate of GSP-Phot Aeneas MCMC for A library (float)

MCMC acceptance rate of GSP-Phot Aeneas MCMC for A library. This is computed from all MCMC samples (before thinning the chain to 2000 or 100 samples).

TEFF_GSPSPEC_ANN : Effective temperature from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Temperature[K])

Median effective temperature (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra.

TEFF_GSPSPEC_ANN_LOWER : Lower confidence level (16%) of effective temperature from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Temperature[K])

Lower confidence level (16%) of median effective temperature (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

TEFF_GSPSPEC_ANN_UPPER : Upper confidence level (84%) of effective temperature from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Temperature[K])

Upper confidence level (84%) of median effective temperature (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

LOGG_GSPSPEC_ANN : Surface gravity from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, GravitySurface[log cgs])

Median surface gravity (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra.

LOGG_GSPSPEC_ANN_LOWER : Lower confidence level (16%) of surface gravity from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, GravitySurface[log cgs])

Lower confidence level (16%) of median surface gravity (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

LOGG_GSPSPEC_ANN_UPPER : Upper confidence level (84%) of surface gravity from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, GravitySurface[log cgs])

Upper confidence level (84%) of median surface gravity (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

MH_GSPSPEC_ANN : Global metallicity from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Median global metallicity (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra.

MH_GSPSPEC_ANN_LOWER : Lower confidence level (16%) of global metallicity from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of median global metallicity (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

MH_GSPSPEC_ANN_UPPER : Upper confidence level (84%) of global metallicity from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of median global metallicity (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

ALPHAFE_GSPSPEC_ANN : Abundance of alpha-elements with respect to iron from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Median abundance of alpha-elements with respect to iron (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. The considered alpha elements are: O, Ne, Mg, Si, S, Ar, Ca, Ti.

ALPHAFE_GSPSPEC_ANN_LOWER : Lower confidence level (16%) of alpha-elements with respect to iron from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Lower confidence level (16%) of median abundance of alpha-elements with respect to iron (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

ALPHAFE_GSPSPEC_ANN_UPPER : Upper confidence level (84%) of alpha-elements with respect to iron from GSP-Spec ANN using RVS spectra and Monte Carlo realisations (float, Abundances[dex])

Upper confidence level (84%) of median abundance of alpha-elements with respect to iron (assuming source is a single star) inferred by GSP-Spec ANN (Recio-Blanco 2022) from RVS spectra. Lower and upper levels include 68% confidence interval.

LOGCHISQ_GSPSPEC_ANN : Logarithm of the goodness-of-fit for the GSP-Spec ANN parameters (float)

Logarithm to the base 10 of the chi-squared between input spectrum rebinned to 800 pixels and solution synthetic spectrum computed from GSP-Spec ANN (Recio-Blanco 2022).

FLAGS_GSPSPEC_ANN : Catalogue flags for GSP-Spec ANN (string)

Catalogue flags for GSP-Spec ANN (Recio-Blanco 2022), used to indicate the quality of the estimated parameters of this source. In this chain, value ‘0’ represents the best quality, and ‘9’ the worst:

Chain character number - name	Considered quality aspect	Possible adopted values
1 **vbroadT**	vbroad induced bias in T_{eff}	0,1,2,9
2 **vbroadG**	vbroad induced bias in $\log g$	0,1,2,9
3 **vbroadM**	vbroad induced bias in [M/H]	0,1,2,9
4 **vradT**	vrad induced bias in T_{eff}	0,1,2,9
5 **vradG**	vrad induced bias in $\log g$	0,1,2,9
6 **vradM**	vrad induced bias in [M/H]	0,1,2,9
7 **fluxNoise**	flux noise uncertainties	0,1,2,3,9
8 **extrapol**	extrapolation	0,1,9
9 **neg_flux**	negative flux pixels	0,9
10 **nanFlux**	NaN flux pixels	0,1,9
11 **emission**	emission line	0,1,9
12 **nullFluxErr**	null uncertainties	0,1,9

Definition of parameter flags considering potential biases due to rotational velocity and macro-turbulence:

Flag name	Condition	Flag value
vbroadT	ΔT_{eff}>2000 K	Filter all Flag=9
	500< $\Delta T_{\mathrm{eff}}\leq$2000 K	Flag=2
	250< $\Delta T_{\mathrm{eff}}\leq$500 K	Flag=1
	$\Delta T_{\mathrm{eff}}\leq$250 K	Flag=0
vbroadG	$\Delta\log g$>2 dex	Filter all Flag=9
	1< $\Delta\log g\leq$2 dex	Flag=2
	0.5< $\Delta\log g\leq$1 dex	Flag=1
	$\Delta\log g\leq$0.5 dex	Flag=0
vbroadM	Δ[M/H]>2 dex	Filter [M/H] and [X/Fe] Flag=9
	0.5< Δ[M/H]≤2 dex	Flag=2
	0.25< Δ[M/H]≤0.5 dex	Flag=1
	Δ[M/H]≤0.25 dex	Flag=0

Definition of parameter flags considering potential biases due to uncertainties in the radial velocity shift correction:

Flag name	Condition	Flag value
vradT	$\Delta T_{\rm eff}$>2000 K	Filter all Flag=9
	500< $\Delta T_{\rm eff}\leq$2000 K	Flag=2
	250< $\Delta T_{\rm eff}\leq$500 K	Flag=1
	$\Delta T_{\rm eff}\leq$250 K	Flag=0
vradG	$\Delta\log g$>2 dex	Filter all Flag=9
	1< $\Delta\log g\leq$2 dex	Flag=2
	0.5< $\Delta\log g\leq$1 dex	Flag=1
	$\Delta\log g\leq$0.5 dex	Flag=0
vradM	Δ[M/H]>2 dex	Filter [M/H] and [X/Fe] Flag=9
	0.5< Δ[M/H]$\leq$2 dex	Flag=2
	0.25< Δ[M/H]$\leq$0.5 dex	Flag=1
	Δ[M/H]$\leq$0.25 dex	Flag=0

Definition of parameter flags considering potential biases due to uncertainties in the RVS flux:

Flag name	Condition	Flag value
fluxNoise	$\sigma T_{\rm eff}$>527 K or $\sigma\log g$>0.916 dex or σ[M/H]>0.498 dex or $\sigma[\alpha$/Fe]>0.163 dex	Filter all Flag = 9
	224< $\sigma T_{\rm eff}\leq$527 K and 0.427< $\sigma\log g\leq$0.916 dex or 0.185< σ[M/H]$\leq$0.498 dex or 0.093< $\sigma[\alpha$/Fe]$\leq$0.163 dex	Flag = 3
	138< $\sigma T_{\rm eff}\leq$224 K and 0.3< $\sigma\log g\leq$0.427 dex or 0.119< σ[M/H]$\leq$0.185 dex or 0.064< $\sigma[\alpha$/Fe]$\leq$0.093 dex	Flag = 2
	102< $\sigma T_{\rm eff}\leq$138 K and 0.24< $\sigma\log g\leq$0.3 dex or 0.09< σ[M/H]$\leq$0.119 dex or 0.05< $\sigma[\alpha$/Fe]$\leq$0.064 dex	Flag = 1
	$\sigma T_{\rm eff}\leq$102 K and $\sigma\log g\leq$0.24 dex and σ[M/H]$\leq$0.09 dex and $\sigma[\alpha$/Fe]$\leq$0.05 dex	Flag = 0

Definition of parameter flags considering potential biases due to extrapolated parameters:

Flag name	Condition	Flag value
extrapol	$T_{\rm eff}$>8318 K or $T_{\rm eff}$<3682 K or log g>6.06 dex or log g< −1.06 dex or [M/H]>1.38 dex or [M/H]< −5.38 dex or [α/Fe]>0.96 dex or [α/Fe]< −0.56 dex	Filter all Flag = 9
	7682<$T_{\rm eff}$≤8318 K or 3682≤$T_{\rm eff}$<4318 K or 4.94<log g≤6.06 dex or −1.06 ≤log g<0.06 dex or 0.62<[M/H]≤1.38 dex or −5.38 ≤[M/H]< −4.62 dex or 0.64<[α/Fe]≤0.96 dex or −0.56 ≤[α/Fe]< −0.24 dex	Flag = 1
	4318≤$T_{\rm eff}$≤7682 K and 0.06≤log g≤4.94 dex and −4.62 ≤[M/H]≤0.62 dex and −0.24 ≤[α/Fe]≤0.64 dex	Flag = 0

Definition of parameter flags considering RVS flux problems or emission line probability:

Flag name	Condition	Flag value
nanFlux	Flux=NaN	Filter all Flag = 9
emission	*CU6_is_emission*	Filter all Flag = 9
neg_flux	> 2 pixels with flux<0	Filter all Flag = 9
	1 or 2 pixels with flux<0	Flag = 1
	flux>0	Flag = 0
nullFluxErr	$\sigma T_{\rm eff}$=0 K or σlog g=0 dex or σ[M/H]=0 dex or σ[α/Fe]=0 dex	Filter all Flag = 9

RADIUS_FLAME_SPEC : Radius of the star from FLAME using `teff_gspspec` and `lum_flame_spec` (float, Length & Distance[Solar Radius])

The radius of the star from FLAME, derived from `teff_gspspec` and `lum_flame_spec` using the Stefan-Boltzmann law with a solar effective temperature of 5772 K, see Section **??**, and associated uncertainties. It is defined as the median value (50^{th} percentile) of the distribution from sampling.

RADIUS_FLAME_SPEC_LOWER : Lower confidence level (16%) of `radius_flame_spec` (float, Length & Distance[Solar Radius])

Lower confidence level (16%) of the radius of the star from FLAME, see description for radius_flame_spec. It is derived from teff_gspspec, lum_flame_spec and associated uncertainties. It is defined as the 16^{th} percentile value of the distribution from sampling. Upper and lower levels include 68% confidence interval.

RADIUS_FLAME_SPEC_UPPER : Upper confidence level (84%) of radius_flame_spec (float, Length & Distance[Solar Radius])

Upper confidence level (84%) of the radius of the star from FLAME, see description for radius_flame_spec. It is derived from teff_gspspec, lum_flame_spec and associated uncertainties. It is defined as the 84^{th} percentile value of the distribution from sampling. Upper and lower levels include 68% confidence interval.

LUM_FLAME_SPEC : Luminosity of the star from FLAME using G band magnitude, extinction (ag_gspphot), parallax and a bolometric correction bc_flame_spec (float, Luminosity[Solar Luminosity])

Luminosity of the star from FLAME using G band magnitude, extinction from GSP-Phot (ag_gspphot), parallax and a bolometric correction bc_flame_spec. It is defined as the median value (50^{th} percentile) of the distribution from sampling. The bolometric correction depends on the effective temperature, metallicity and surface gravity, and these are based on GSP-Spec values in table astrophysical_parameters. The bolometric magnitude of the Sun = 4.74 mag, see Section **??** and the reference absolute G-band magnitude of the Sun is 4.66 mag, see Section **??**.

LUM_FLAME_SPEC_LOWER : Lower confidence level (16%) of lum_flame_spec (float, Luminosity[Solar Luminosity])

Lower confidence level (16%) of the luminosity of the star from FLAME, see description for lum_flame_spec. It is defined as the 16^{th} percentile value of the distribution from sampling. Upper and lower levels contain the 68% confidence interval.

LUM_FLAME_SPEC_UPPER : Upper confidence level (84%) of lum_flame_spec (float, Luminosity[Solar Luminosity])

The upper confidence level (84%) of the luminosity of the star from FLAME, see description for lum_flame_spec. It is defined as the 84^{th} percentile value of the distribution from sampling. Upper and lower levels contain the 68% confidence interval.

MASS_FLAME_SPEC : Mass of the star from FLAME using stellar models, lum_flame_spec and teff_gspspec (float, Mass[Solar Mass])

Mass of the star from FLAME using GSP-Spec based parameters in table astrophysical_parameters. It is defined as the median value (50^{th} percentile) of the 1D projected distribution from sampling in mass and age. It is derived by comparing teff_gspspec and lum_flame_spec to the BASTI solar metallicity stellar evolution models (Hidalgo et al. 2018), see Section **??** for details.

MASS_FLAME_SPEC_LOWER : Lower confidence level (16%) of mass_flame_spec (float, Mass[Solar Mass])

Lower confidence level (16%) of the mass of the star from FLAME, see description for mass_flame_spec. It is defined as the 16^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

MASS_FLAME_SPEC_UPPER : Upper confidence level (84%) of mass_flame_spec (float, Mass[Solar Mass])

Upper confidence level (84%) of the mass of the star from FLAME, see description for mass_flame_spec. It is defined as the 84^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

AGE_FLAME_SPEC : Age of the star from FLAME using stellar models, see mass_flame_spec for details (float, Time[Gyr])

Age of the star from FLAME using GSP-Spec based parameters in the AstrophysicalParameter table. It is defined as the median value (50^{th} percentile) of the 1D projected distribution from sampling in mass, age, and metallicity, see mass_flame_spec for details.

AGE_FLAME_SPEC_LOWER : Lower confidence level (16%) of age_flame_spec (float, Time[Gyr])

Lower confidence level (16%) of the age of the star from FLAME, see description for age_flame_spec. It is defined as the 16^{th} percentile value of the 1D projected distribution from sampling in mass, age, and metallicity. Upper and lower levels contain the 68% confidence interval.

AGE_FLAME_SPEC_UPPER : Upper confidence level (84%) of age_flame_spec (float, Time[Gyr])

Upper confidence level (84%) of the age of the star from FLAME, see description for age_flame_spec.

It is defined as the 84^{th} percentile value of the 1D projected distribution from sampling in mass and age. Upper and lower levels contain the 68% confidence interval.

FLAGS_FLAME_SPEC : Flag indicating quality of parameters from FLAME using GSP-Spec parameters (string)

This field contains the quality flag for the data products from FLAME derived using GSP-Spec parameters and consists of one digit 'A'. It refers to the quality of the mass and age determination (A = 0, 1, 2), and the following is adopted:

A=0 nothing to report

A=1 the star is a giant and the mass and age should be considered with an uncertainty on the order of 20% - 30%

A=2 the mass and age are not available

We note that while the `evolstage_flame_spec` parameter is related to mass and age, this flag is not applicable to this parameter. See Section **??** of the online documentation for details.

EVOLSTAGE_FLAME_SPEC : Evolutionary stage of the star from FLAME using stellar models, see `mass_flame_spec` for details (int)

Evolution stage of the star from FLAME. It is an integer value typically between 100 and 1300 and defined using the median value (50^{th} percentile) of the 1D projected distribution from sampling in mass and age, see `mass_flame_spec` for details. The value is adapted from the BASTI model grid (Hidalgo et al. 2018) adopting the following convention:

- 100 = zero age main sequence (ZAMS)
- 300 = first minimum of $T_{\rm eff}$ for massive stars or central hydrogen mass fraction = 0.30 for low-mass stars
- 360 = main sequence turn-off
- 420 = central hydrogen mass fraction = 0.00
- 490 = base of the red giant branch (RGB)
- 860 = maximum $\mathcal{L}$ along the RGB bump
- 890 = minimum $\mathcal{L}$ along the RGB bump

- 1290 = tip of the RGB

GRAVREDSHIFT_FLAME_SPEC : Gravitational redshift from FLAME using GSP-Spec parameters (float, Velocity[km s^{-1}])

Gravitational redshift, in velocity, from FLAME using `radius_flame_spec` and `mass_flame_spec`.

GRAVREDSHIFT_FLAME_SPEC_LOWER : Lower confidence interval of `gravredshift_flame_spec` (float, Velocity[km s^{-1}])

The lower confidence interval (16%) on the gravitational redshift of the star from FLAME, see description for `gravredshift_flame_spec`. It is defined as the 16th percentile value of the distribution from sampling.

GRAVREDSHIFT_FLAME_SPEC_UPPER : Upper confidence interval of `gravredshift_flame_spec` (float, Velocity[km s^{-1}])

The upper confidence interval (84%) on the gravitational redshift of the star from FLAME, see description for `gravredshift_flame_spec`. It is defined as the 84th percentile value of the distribution from sampling.

BC_FLAME_SPEC : Bolometric correction applied to derive `lum_flame_spec` using GSP-Spec parameters (float, Magnitude[mag])

Bolometric correction for the G-band magnitude (BC$_G$) used to derive `lum_flame_spec`. It is defined as the median value (50th percentile) of the distribution from sampling. It is a function of effective temperature, surface gravity, and metallicity, and has been derived from MARCS models, see Section **??** of the online documentation, using GSP-Spec-based parameters in the AstrophysicalParameter table. The bolometric correction for the Sun is defined as +0.08 mag, see Section **??**, where $M_{bol,\odot}$ = 4.74 mag, see Section **??**, i.e. $M_{G\odot}$ = 4.66 mag.

2.3 TOTAL_GALACTIC_EXTINCTION_MAP

This table provides the Total Galactic Extinction (TGE) map for extinction parameters A_0 describing the effective total Galactic extinction and related uncertainties at four separate HEALPix levels, namely levels 6 to 9. For further details see Section **??** of the online documentation.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`.

HEALPIX_ID : HEALPix identification (long)

The unique HEALPix index number for which the total Galactic extinction parameters are estimated. For further details on the HEALPix scheme used by Gaia, see Bastian & Portell (2020).

HEALPIX_LEVEL : HEALPix level used (byte)

The HEALPix level of the HEALPix. The Total Galactic Extinction map is provided at HEALPix levels 6 through 9. For further details on the HEALPix scheme used by Gaia, see Bastian & Portell (2020).

A0 : Mean A_0 extinction parameter (float, Magnitude[mag])

The median A_0 of the selected extinction tracers (giants) as estimated by GSP-Phot from BP/RP spectra, apparent G magnitude and parallax (i.e. `azero_gspphot` in table `gaia_source`). A_0 is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999), taken as the monochromatic extinction at 547.7 nm.

A0_UNCERTAINTY : Uncertainty for the mean A_0 (float, Magnitude[mag])

The uncertainty of the mean A_0 for selected extinction tracers in the HEALPix.

A0_MIN : Minimum A_0 value used for the HEALPix of interest (float, Magnitude[mag])

Minimum A_0 value of the selected extinction tracers (giants) used for the HEALPix of interest.

A0_MAX : Maximum A_0 value used for the HEALPix of interest (float, Magnitude[mag])

Maximum A_0 value of the selected extinction tracers (giants) used for the HEALPix of interest.

NUM_TRACERS_USED : Number of tracers used (int)

The number of extinction tracers (selected giants) used for calculating the extinction parameters for the HEALPix.

OPTIMUM_HPX_FLAG : Flag to indicate whether a given HEALPix level is the optimum (True) or not (False) (boolean)

The Total Galactic Extinction maps are provided at four different HEALPix levels (i.e. 4 different resolutions, levels 6 through 9). This flag indicates whether a given HEALPix level is the optimum level (True), or not (False).

STATUS : Exit status for TGE (short)

Indicates the exit status of TGE.

0: Nominal processing.

1: Insufficient number of tracers, after validation of input for each source (Step 0).

2: Insufficient number of tracers, after ($T_{\rm eff}$, M_G) selection (Step 1).

3: Insufficient number of tracers, after check on the distance (Step 2).

4: Insufficient number of tracers, after outlier rejection (Step 3).

5: Insufficient number of tracers, after rejection of tracers with large A_0 errors (Step 4).

99: Unknown error flag.

2.4 TOTAL_GALACTIC_EXTINCTION_MAP_OPT

This table provides an optimum version of the Total Galactic Extinction map, derived from the table total_galactic_extinction_map at a single HEALPix level 9. For this, the mean effective total Galactic extinction and related uncertainties have been selected from the optimal HEALPix level of the four offered in total_galactic_extinction_map. For further details see Section **??** of the online documentation.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`.

HEALPIX_ID : HEALPix identification (long)

The unique HEALPix index number for which the total Galactic extinction parameters are estimated. For further details on the HEALPix scheme used by Gaia, see Bastian & Portell (2020).

A0 : Median A_0 extinction parameter (float, Magnitude[mag])

The median A_0 of the selected extinction tracers (giants) as estimated by GSP-Phot from BP/RP spectra, apparent G magnitude and parallax (i.e. `azero_gspphot` in table `gaia_source`). A_0 is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999), taken as the monochromatic extinction at 547.7 nm. Here the A_0 value is taken from the optimum HEALPix in table `total_galactic_extinction_map`.

A0_UNCERTAINTY : Uncertainty for the mean A_0 (float, Magnitude[mag])

The uncertainty of the mean A_0 for selected extinction tracers in the HEALPix. Here the value is taken from the optimum HEALPix in table `total_galactic_extinction_map`.

NUM_TRACERS_USED : Number of tracers used (int)

The number of extinction tracers (selected giants) used for calculating the extinction parameters for this HEALPix. Here the value is taken from the optimum HEALPix in table `total_galactic_extinctio`

STATUS : Exit status for TGE (short)

Indicates the exit status of TGE.

0: Nominal processing.

1: Insufficient number of tracers, after validation of input for each source (Step 0).

2: Insufficient number of tracers, after ($T_{\rm eff}$, M_G) selection (Step 1).

3: Insufficient number of tracers, after check on the distance (Step 2).

4: Insufficient number of tracers, after outlier rejection (Step 3).

5: Insufficient number of tracers, after rejection of tracers with large A_0 errors (Step 4).

99: Unknown error flag.

OPTIMUM_HPX_LEVEL : Number indicating which HEALPix level was chosen to populate this HEALPix (byte)

The HEALPix level (6-9) of the optimum HEALPix: The `TotalGalalcticExtinctionMap` HEALPix at highest resolution (highest HEALPix level) with at least 10 tracers in the direction of this HEALPix, as indicated by the `optimum_hpx_flag`, and used to populate the values in this HEALPix. As the optimum HEALPix may be at a lower HEALPix level than this map (level 9), the values in this level 9 HEALPix will be the same as neighboring HEALPix pixels if `optimum_hpx_level` is less than 9.

2.5 OA_NEURON_INFORMATION

This is the table hosting the content of a Self-Organized Map calculated from a dataset composed by outliers by the Apsis module OA. Each entry corresponds to parameters estimated for one particular neuron of the map. The prototype BP/RP spectrum for a particular neuron is available in another table: `oa_neuron_xp_spectra`. See Section **??** for further details.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOM_ID : Self-Organized Map identifier (long)

A unique single numerical identifier of the Self-Organized Map.

NEURON_ID : Neuron identifier (long)

A unique single numerical identifier of the neuron.

NEURON_ROW_INDEX : Row index of the neuron in the Self-Organised Map lattice (short)

A row index which determines the position of the neuron within the Self-Organized Map lattice, together with `neuron_column_index`.

NEURON_COLUMN_INDEX : Column index of the neuron in the Self-Organised Map lattice (short)

A column index which determines the position of the neuron within the Self-Organized Map lattice, together with `neuron_row_index`.

HITS : Number of sources populating the neuron (int)

Number of sources that have been assigned to the neuron according to the squared Euclidean distance between the sources XP spectra and the neuron XP prototype (`neuron_oa_dist` in table `astrophysical_parameters`), see Section **??** for further details.

CLASS_LABEL : Astronomical class estimated for the neuron (string)

Astronomical class estimated for the neuron by means of a template matching procedure among a set of reference templates. This field can be null if no template is assigned. See Section **??** for further details.

CENTROID_ID : Identifier of the Gaia source that minimizes the classification distance to the neuron (long)

Identifier of the Gaia source (`gaia_source.source_id`) that minimizes the squared Euclidean distance between the source XP spectrum and the neuron XP prototype. See `centroid_distance`.

CENTROID_DISTANCE : Squared Euclidean distance between the centroid XP spectrum and the neuron XP prototype (float)

Squared Euclidean distance between the XP spectrum of the centroid source and the neuron XP prototype (`xp_spectrum_prototype_flux` in table `oa_neuron_xp_spectra`).

TEMPLATE_DISTANCE : Squared Euclidean distance between the reference XP template and the neuron XP prototype (float)

Squared Euclidean distance between the XP spectrum of the reference template (`xp_spectrum_template_fl` in table `oa_neuron_xp_spectra`) and the neuron XP prototype (`xp_spectrum_prototype_flux` in table `oa_neuron_xp_spectra`). Thie field can be null if no template is assigned. See Section **??** for further details.

G_MAG_MEAN : Mean G value for the sources that belong to the neuron (float, Magnitude[mag])

Mean G magnitude value for those sources that belong to the neuron. The mean G magnitude (`phot_g_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

G_MAG_STD_DEV : Standard deviation of G values for the sources that belong to the neuron (float, Magnitude[mag])

Standard deviation of G magnitude values for those sources that belong to the neuron. The mean G magnitude (`phot_g_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

G_MAG_MIN : Minimum G value for the sources that belong to the neuron (float, Magnitude[mag])

Minimum G value for those sources that belong to the neuron. The mean G magnitude (`phot_g_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

G_MAG_MAX : Maximum G value for the sources that belong to the neuron (float, Magnitude[mag])

Maximum G value for those sources that belong to the neuron. The mean G magnitude (`phot_g_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_MAG_MEAN : Mean G_{BP} value for the sources that belong to the neuron (float, Magnitude[mag])

Mean G_{BP} value for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (`phot_bp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_MAG_STD_DEV : Standard deviation of G_{BP} values for the sources that belong to the neuron (float, Magnitude[mag])

Standard deviation of G_{BP} values for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (`phot_bp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_MAG_MIN : Minimum value of G_{BP} for the sources that belong to the neuron (float, Magnitude[mag])

Minimum value of G_{BP} for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (`phot_bp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_MAG_MAX : Maximum value of G_{BP} for the sources that belong to the neuron (float, Magnitude[mag])

Maximum value of G_{BP} for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (`phot_bp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_MAG_MEAN : Mean G_{RP} value for the sources that belong to the neuron neuron (float, Magnitude[mag])

Mean G_{RP} value for those sources that belong to the neuron. The integrated mean G_{RP} magnitude (`phot_rp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_MAG_STD_DEV : Standard deviation of G_{RP} values for the sources that belong to the neuron (float, Magnitude[mag])

Standard deviation of G_{RP} values for those sources that belong to the neuron. The integrated mean G_{RP} magnitude (`phot_rp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_MAG_MIN : Minimum value of G_{RP} for the sources that belong to the neuron (float, Magnitude[mag])

Minimum value of G_{RP} for those sources that belong to the neuron. The integrated mean G_{RP} magnitude (`phot_rp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_MAG_MAX : Maximum value of G_{RP} for the sources that belong to the neuron (float, Magnitude[mag])

Maximum value of G_{RP} for those sources that belong to the neuron. The integrated mean G_{RP} magnitude (`phot_rp_mean_mag` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_RA_MEAN : Mean value of the proper motion in right ascension for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Mean value of the proper motion in right ascension direction for those sources that belong to the neuron. The proper motion in right ascension (`gaia_source.pmra`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_RA_STD_DEV : Standard deviation of the proper motion in right ascension for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Standard deviation of the proper motion in right ascension direction for those sources that belong to the neuron. The proper motion in right ascension (`gaia_source.pmra`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_RA_MIN : Minimum value of the proper motion in right ascension for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Minimum value of the proper motion in right ascension direction for those sources that belong to the neuron. The proper motion in right ascension (`gaia_source.pmra`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_RA_MAX : Maximum value of the proper motion in right ascension for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Maximum value of the proper motion in right ascension direction for those sources that belong to the neuron. The proper motion in right ascension (`gaia_source.pmra`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_DEC_MEAN : Mean value of the proper motion in declination for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Mean value of the proper motion in declination direction for those sources that belong to the neuron. The proper motion in declination (`gaia_source.pmdec`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_DEC_STD_DEV : Standard deviation of the proper motion in declination for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Standard deviation of the proper motion in declination direction for those sources that belong to the neuron. The proper motion in declination (`gaia_source.pmdec`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_DEC_MIN : Minimum value of the proper motion in declination for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Minimum value of the proper motion in declination direction for those sources that belong to the neuron. The proper motion in declination (`gaia_source.pmdec`) for each source is used, and if such a value is not finite, then it is not taken into account.

PM_DEC_MAX : Maximum value of the proper motion in declination for the sources that belong to the neuron (float, Angular Velocity[mas yr^{-1}])

Maximum value of the proper motion in declination direction for those sources that belong to the neuron. The proper motion in declination (`gaia_source.pmdec`) for each source is used, and if such a value is not finite, then it is not taken into account.

PARALLAX_MEAN : Mean parallax value for the sources that belong to the neuron (float, Angle[mas])

Mean parallax value for those sources that belong to the neuron. The parallax (`gaia_source.parallax`) for each source is used, and if such a value is not finite, then it is not taken into account.

PARALLAX_STD_DEV : Standard deviation of the parallax values for the sources that belong to the neuron (float, Angle[mas])

Standard deviation of the parallax values for those sources that belong to the neuron. The parallax (`gaia_source.parallax`) for each source is used, and if such a value is not finite, then it is not taken into account.

PARALLAX_MIN : Minimum parallax value for the sources that belong to the neuron (float, Angle[mas])

Minimum parallax value for those sources that belong to the neuron. The parallax (gaia_source.parallax) for each source is used, and if such a value is not finite, then it is not taken into account.

PARALLAX_MAX : Maximum parallax value for the sources that belong to the neuron (float, Angle[mas])

Maximum parallax value for those sources that belong to the neuron. The parallax (gaia_source.parallax) for each source is used, and if such a value is not finite, then it is not taken into account.

GAL_LATITUDE_MEAN : Mean galactic latitude for the sources that belong to the neuron (float, Angle[deg])

Mean value of the galactic latitude for those sources that belong to the neuron. The galactic latitude (gaia_source.b) for each source is used, and if such a value is not finite, then it is not taken into account.

GAL_LATITUDE_STD_DEV : Standard deviation of the galactic latitude values for the sources that belong to the neuron (float, Angle[deg])

Standard deviation of the galactic latitude values for those sources that belong to the neuron. The galactic latitude (gaia_source.b) for each source is used, and if such a value is not finite, then it is not taken into account.

GAL_LATITUDE_MIN : Minimum galactic latitude for the sources that belong to the neuron (float, Angle[deg])

Minimum value of the galactic latitude for those sources that belong to the neuron. The galactic latitude (gaia_source.b) for each source is used, and if such a value is not finite, then it is not taken into account.

GAL_LATITUDE_MAX : Maximum galactic latitude for the sources that belong to the neuron (float, Angle[deg])

Maximum value of the galactic latitude for those sources that belong to the neuron. The galactic latitude (gaia_source.b) for each source is used, and if such a value is not finite, then it is not taken into account.

INTRA_NEURON_DISTANCE_MEAN : Mean value of the squared Euclidean distance between each of the XP sources in the neuron and the neuron prototype (float)

Mean value of the squared Euclidean distance between each of the XP spectra of the sources that belong to the neuron and the XP prototype of the neuron (`oa_neuron_xp_spectra.xp_spectrum_prototyp`
See Section ?? for further details.

INTRA_NEURON_DISTANCE_STD_DEV : Standard deviation of the squared Euclidean distance between each of the XP sources in the neuron and the neuron prototype (float)

Standard deviation of the squared Euclidean distance between each of the XP spectra of the sources that belong to the neuron and the XP prototype of the neuron (`oa_neuron_xp_spectra.xp_spectru`
See Section ?? for further details.

INTRA_NEURON_DISTANCE_MIN : Minimum squared Euclidean distance between each of the XP sources in the neuron and the neuron prototype (float)

Minimum value of the Squared Euclidean distance between each of the XP spectra of the sources that belong to the neuron and the XP prototype of the neuron (`oa_neuron_xp_spectra.xp_spectrum_prot`
See Section ?? for further details.

INTRA_NEURON_DISTANCE_MAX : Maximum squared Euclidean distance between each of the XP sources in the neuron and the neuron prototype (float)

Maximum value of the Squared Euclidean distance between each of the XP spectra of the sources that belong to the neuron and the XP prototype of the neuron (`oa_neuron_xp_spectra.xp_spectrum_prot`
See Section ?? for further details.

INTER_NEURON_DISTANCE_MEAN : Mean value of the squared Euclidean distance between the neuron XP prototype and the XP prototypes of its immediate neighbours (float)

Mean value of the squared Euclidean distance between the neuron XP prototype (`xp_spectrum_prototype_f`
in table `oa_neuron_xp_spectra`) and the XP prototypes of its immediate neighbours. See Section ?? for further details.

INTER_NEURON_DISTANCE_STD_DEV : Standard deviation of the squared Euclidean distance between the neuron XP prototype and the XP prototypes of its immediate neighbours (float)

Standard deviation of the squared Euclidean distance between the neuron XP prototype (xp_spectrum_proto
in table oa_neuron_xp_spectra) and the XP prototypes of its immediate neighbours. See Section ?? for further details.

INTER_NEURON_DISTANCE_MIN : Minimum value of the squared Euclidean distance between the neuron XP prototype and the XP prototypes of its immediate neighbours (float)

Minimum value of the squared Euclidean distance between the neuron XP prototype (xp_spectrum_prototy
in table oa_neuron_xp_spectra) and the XP prototypes of its immediate neighbours. See Section ?? for further details.

INTER_NEURON_DISTANCE_MAX : Maximum value of the squared Euclidean distance between the neuron XP prototype and the XP prototypes of its immediate neighbours (float)

Maximum value of the squared Euclidean distance between the neuron XP prototype (xp_spectrum_prototy
in table oa_neuron_xp_spectra) and the XP prototypes of its immediate neighbours. See Section ?? for further details.

TEMPLATE_NAME : Name of the template used to describe the neuron (string)

Name of the template that has been assigned to the neuron. Templates were built from observed XP spectra of representative astronomical classes and allow to assign an astronomical type or class label to the objects populating a neuron. This field can be null if no template is assigned. See Section ?? for further details.

DISTANCE_PERCENTILE25 : 25th percentile value for the intra-neuron distance distribution (float)

25^{th} percentile value for the intra-neuron distance distribution, which includes the 25% of the worst classified objects. That is, the 25% of objects with the highest squared Euclidean distances to their neuron XP prototype (oa_neuron_xp_spectra.xp_spectrum_prototype_flux). See Section ?? for further details.

DISTANCE_PERCENTILE50 : 50th percentile value for the intra-neuron distance distribution (float)

50^{th} percentile value for the intra-neuron distance distribution, which includes the 50% of the worst classified objects. That is, the 50% of objects with the highest squared Euclidean distances to their neuron XP prototype (`oa_neuron_xp_spectra.xp_spectrum_prototype_flux`). See Section **??** for further details.

DISTANCE_PERCENTILE68 : 68th percentile value for the intra-neuron distance distribution (float)

68^{th} percentile value for the intra-neuron distance distribution, which includes the 68% of the worst classified objects. That is, the 68% of objects with the highest squared Euclidean distances to their neuron XP prototype (`oa_neuron_xp_spectra.xp_spectrum_prototype_flux`). See Section **??** for further details.

DISTANCE_PERCENTILE75 : 75th percentile value for the intra-neuron distance distribution (float)

75^{th} percentile value for the intra-neuron distance distribution, which includes the 75% of the worst classified objects. That is, the 75% of objects with the highest squared Euclidean distances to their neuron XP prototype (`oa_neuron_xp_spectra.xp_spectrum_prototype_flux`). See Section **??** for further details.

DISTANCE_PERCENTILE95 : 95th percentile value for the intra-neuron distance distribution (float)

95^{th} percentile value for the intra-neuron distance distribution, which includes the 95% of the worst classified objects. That is, the 95% of objects with the highest squared Euclidean distances to their neuron XP prototype (`oa_neuron_xp_spectra.xp_spectrum_prototype_flux`). See Section **??** for further details.

DISTANCE_FWHM : Full Width at Half Maximum value for the intra-neuron distance distribution (float)

FWHM is given by the distance between two points on a neuron squared Euclidean distance distribution at which the function reaches half its maximum value. Those neurons showing low values for this quantity contain objects displaying similar spectra, and can be considered as neurons with a good clustering quality. See Section **??** for further details.

DISTANCE_SKEW : Skewness value for the intra-neuron distance distribution (float)

Skewness is the third standardized moment of a distribution. It measures the distortion or asymmetry on a neuron squared Euclidean distance distribution. If the skewness value is positive, then the function is shifted to the left, and if its value is negative to the right, in both cases the function is said to be skewed. See Section **??** for further details.

DISTANCE_KURTOSIS : Kurtosis value for the intra-neuron distance distribution (float)

Kurtosis is the ratio of the fourth moment μ^4 to the square of the variance. It is a measure of the heaviness of the tails of the neuron squared Euclidean distance distribution. Those better quality neurons will take a value clearly greater than zero and, therefore, the distribution of distances will tend to be a focused distribution. See Section **??** for further details.

DISTANCE_I_Q_R : Inter-Quartile Range value for the intra-neuron distance distribution (float)

Difference between the 75^{th} (`distance_percentile75`) and 25^{th} (`distance_percentile25`) percentile values for the intra-neuron distance distribution. Low values indicate a focused distance distribution. See Section **??** for further details.

DISTANCE_FWHM_NORM : Normalized FWHM value for the intra-neuron distance distribution (float)

FWHM (`distance_fwhm`) is given by the distance between two points on a neuron squared Euclidean distance distribution at which the function reaches half its maximum value. We calculate it as a normalized value, by dividing the FWHM mean value obtained for the 10% of neurons with the lowest values in the SOM map by the FWHM in the neuron (`distance_fwhm`). Those neurons showing values near or above one for this quantity contain objects displaying similar spectra, and can be considered as neurons with a good clustering quality. See Section **??** for further details.

QUALITY_CATEGORY : Quality category assigned to the neuron, where 0 corresponds to the most homogeneous neurons and 6 to the most heterogeneous ones (short)

In order to provide a unified interpretation of the goodness of the clustering in a neuron, a general index has been calculated that takes into account the results obtained for the three intra-neuron distance distribution measurements: FWHM (`distance_fwhm`), skewness (`distance_skew`) and kurtosis (`distance_kurtosis`). To do so, the following percentile values of the three indices have been set: 10^{th}, 32^{th}, 50^{th}, 75^{th}, 90^{th} and 95^{th}. For each of the indices it is possible to obtain seven quality categories depending on the interquartile area where the measures are grouped, and then assign the neuron a global index named quality category (QC). Quality category can take any of the following values: 0 in case all three indices are in percentile level 95^{th}, value 1 if they are in level 90^{th}, and so on to finish with level 6 when all quality indices are outside percentile 10^{th}. Quality category 0 corresponds to the most homogeneous neurons and 6 to the most heterogeneous ones. If no category could be assigned then it takes value -1. See Section **??** for further details.

BP_TRANSITS_MEAN : Mean value of the number of BP transits for the sources that belong to the neuron (float)

Mean value of the number of BP transits for those sources that belong to the neuron. The number of BP transits (`gaia_source.phot_bp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_TRANSITS_STD_DEV : Standard deviation of the number of BP transits for the sources that belong to the neuron (float)

Standard deviation of the number of BP transits for those sources that belong to the neuron. The number of BP transits (`gaia_source.phot_bp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_TRANSITS_MIN : Minimum value of the number of BP transits for the sources that belong to the neuron (float)

Minimum value of the number of BP transits for those sources that belong to the neuron. The number of BP transits (`gaia_source.phot_bp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

BP_TRANSITS_MAX : Maximum value of the number of BP transits for the sources that belong to the neuron (float)

Maximum value of the number of BP transits for those sources that belong to the neuron. The number of BP transits (`gaia_source.phot_bp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_TRANSITS_MEAN : Mean value of the number of RP transits for the sources that belong to the neuron (float)

Mean value of the number of RP transits for those sources that belong to the neuron. The number of RP transits (`gaia_source.phot_rp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_TRANSITS_STD_DEV : Standard deviation of the number of RP transits for the sources that belong to the neuron (float)

Standard deviation of the number of RP transits for those sources that belong to the neuron. The number of RP transits (`gaia_source.phot_rp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_TRANSITS_MIN : Minimum value of the number of RP transits for the sources that belong to the neuron (float)

Minimum value of the number of RP transits for those sources that belong to the neuron. The number of RP transits (`gaia_source.phot_rp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

RP_TRANSITS_MAX : Maximum value of the number of RP transits for the sources that belong to the neuron (float)

Maximum value of the number of RP transits for those sources that belong to the neuron. The number of RP transits (`gaia_source.phot_rp_n_obs`) for each source is used, and if such a value is not finite, then it is not taken into account.

RUWE_MEAN : Mean value of the renormalised unit weight error for the sources that belong to the neuron (float)

Mean value of the renormalised unit weight error for those sources that belong to the neuron. The renormalised unit weight error (`gaia_source.ruwe`) for each source is used, and if such a value is not finite, then it is not taken into account.

RUWE_STD_DEV : Standard deviation of the renormalised unit weight error for the sources that belong to the neuron (float)

Standard deviation of the renormalised unit weight error for those sources that belong to the neuron. The renormalised unit weight error (`gaia_source.ruwe`) for each source is used, and if such a value is not finite, then it is not taken into account.

RUWE_MIN : Minimum value of the renormalised unit weight error for the sources that belong to the neuron (float)

Minimum value of the renormalised unit weight error for those sources that belong to the neuron. The renormalised unit weight error (`gaia_source.ruwe`) for each source is used, and if such a value is not finite, then it is not taken into account.

RUWE_MAX : Maximum value of the renormalised unit weight error for the sources that belong to the neuron (float)

Maximum value of the renormalised unit weight error for those sources that belong to the neuron. The renormalised unit weight error (`gaia_source.ruwe`) for each source is used, and if such a value is not finite, then it is not taken into account.

BPRP_MEAN_FLUX_EXCESS_MEAN : Mean value of the BP/RP flux excess for the sources that belong to the neuron (float)

Mean value of the flux excess for those sources that belong to the neuron. The BP/RP excess factor (`phot_bp_rp_excess_factor` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BPRP_MEAN_FLUX_EXCESS_STD_DEV : Standard deviation of the BP/RP flux excess for the sources that belong to the neuron (float)

Standard deviation of the flux excess values for those sources that belong to the neuron. The BP/RP excess factor (`phot_bp_rp_excess_factor` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BPRP_MEAN_FLUX_EXCESS_MIN : Minimum value of the BP/RP flux excess for the sources that belong to the neuron (float)

Minimum value of the flux excess for those sources that belong to the neuron. The BP/RP excess factor (`phot_bp_rp_excess_factor` in table `gaia_source`) for each source is used, and if such a value is not finite, then it is not taken into account.

BPRP_MEAN_FLUX_EXCESS_MAX : Maximum value of the BP/RP flux excess for the sources that belong to the neuron (float)

Maximum value of the flux excess for those sources that belong to the neuron. The BP/RP excess factor (phot_bp_rp_excess_factor in table gaia_source) for each source is used, and if such a value is not finite, then it is not taken into account.

BPRP_COLOUR_MEAN : Mean value of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for the sources that belong to the neuron (float, Magnitude[mag])

Mean value of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (gaia_source.phot_bp_mean_mag) and mean G_{RP} magnitude (gaia_source.phot_rp_mean_mag) for each source are used, and if such values are not finite, then it is not taken into account.

BPRP_COLOUR_STD_DEV : Standard deviation of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for the sources that belong to the neuron (float, Magnitude[mag])

Standard deviation of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (gaia_source.phot_bp_mean_mag) and mean G_{RP} magnitude (gaia_source.phot_rp_mean_mag) for each source are used, and if such values are not finite, then it is not taken into account.

BPRP_COLOUR_MIN : Minimum value of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for the sources that belong to the neuron (float, Magnitude[mag])

Minimum value of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (gaia_source.phot_bp_mean_mag) and mean G_{RP} magnitude (gaia_source.phot_rp_mean_mag) for each source are used, and if such values are not finite, then it is not taken into account.

BPRP_COLOUR_MAX : Maximum value of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for the sources that belong to the neuron (float, Magnitude[mag])

Maximum value of the $G_{\mathrm{BP}} - G_{\mathrm{RP}}$ colour for those sources that belong to the neuron. The integrated mean G_{BP} magnitude (gaia_source.phot_bp_mean_mag) and mean G_{RP} magnitude (gaia_source.phot_rp_mean_mag) for each source are used, and if such values are not finite, then it is not taken into account.

2.6 OA_NEURON_XP_SPECTRA

This is the table hosting the prototype BP/RP spectrum corresponding to each of the neurons of the Self-Organised-Map produced by the Apsis module OA. Other neuron attributes, such as statistics on various parameters, are available in another table: `oa_neuron_information`. See Section **??** for further details.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`.

NEURON_ID : Neuron identifier (long)

A unique single numerical identifier of the neuron.

NEURON_ROW_INDEX : Row index of the neuron in the Self-Organised Map lattice (short)

A row index which determines the position of the neuron within the Self-Organized Map lattice, together with `neuron_column_index`.

NEURON_COLUMN_INDEX : Column index of the neuron in the Self-Organised Map lattice (short)

A column index which determines the position of the neuron within the Self-Organized Map lattice, together with `neuron_row_index`.

XP_SPECTRUM_PROTOTYPE_FLUX : Normalised flux at wavelength `xp_spectrum_prototype_wavelength` for the preprocessed XP spectrum that best represents the neuron (prototype) (float)

Flux at wavelength value specified by `xp_spectrum_prototype_wavelength` for the preprocessed XP spectrum (including normalisation) that best represents the sources that belong to the neuron (prototype). See Section **??** for further details.

XP_SPECTRUM_PROTOTYPE_WAVELENGTH : Wavelength associated with the XP spectrum flux values (float, Length & Distance[nm])

Wavelength value associated with the `xp_spectrum_prototype_flux` and `xp_spectrum_template_flux` fluxes.

XP_SPECTRUM_TEMPLATE_FLUX : Normalised flux at wavelength `xp_spectrum_prototype_wavelength` for the preprocessed XP spectrum corresponding to the neuron template (float)

Flux at wavelength value specified by `xp_spectrum_prototype_wavelength` for the preprocessed XP spectrum (including normalisation) of the reference template assigned to the neuron. This field can be null if no template is assigned. See Section **??** for further details.

2.7 MCMC_SAMPLES_GSP_PHOT

This is the DataLink table hosting Monte-Carlo Markov Chain (MCMC) samples for the posterior probability distribution of all parameters derived from the General Stellar Parametrizer from Photometry (GSP-Phot, see Section **??** in the online documentation). 2000 MCMC samples are provided for 1) all sources brighter than G=12, 2) a random subset of 0.1% of the sources fainter than G=12. For all other sources fainter than G=12, the sample size is 100 (the last 100 samples in the MCMC).

The table considers the following parameters:

- effective temperature $T_{\rm eff}$ in K
- monochromatic extinction at 547.7 nm A_0 in mag
- surface gravity $\log g$
- metallicity [M/H]
- G-band extinction in mag
- absolute magnitude $M_{\rm G}$ in mag
- distance in pc
- $G_{\rm BP}$ band extinction $A_{\rm BP}$ in mag
- $G_{\rm RP}$ band extinction $A_{\rm RP}$ in mag
- reddening $E(G_{\rm BP} - G_{\rm RP}) = A_{\rm BP} - A_{\rm RP}$ in mag
- logarithmic posterior probability
- logarithmic likelihood
- stellar radius in $R_{\odot}$

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NSAMPLES : Number of samples in the chain from GSP-Phot (short)

The sample size is 100 for most sources, and is set to 2000 for 1) all sources brighter than G=12, 2) a random sample of 0.1% of the sources fainter than G=12.

TEFF : MCMC samples for $T_{\rm eff}$ from GSP-Phot (float[`nsamples`] array, Temperature[K])

MCMC samples for posterior probability distribution of the stellar effective temperature from GSP-Phot.

AZERO : MCMC samples for extinction A_0 from GSP-Phot (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of the monochromatic extinction at 547.7 nm A_0 from GSP-Phot.

LOGG : MCMC samples for $\log g$ from GSP-Phot (float[`nsamples`] array, GravitySurface[log cgs])

MCMC samples for posterior probability distribution of the stellar surface gravity $\log g$ from GSP-Phot.

MH : MCMC samples for the metallicity from GSP-Phot (float[`nsamples`] array, Abundances[dex])

MCMC samples for posterior probability distribution of metallicity [M/H] from GSP-Phot.

AG : MCMC samples for extinction in G band from GSP-Phot (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of the extinction in the G band from GSP-Phot.

MG : MCMC samples for $M_{\rm G}$ from GSP-Phot (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of the absolute magnitude in the G band M_G from GSP-Phot. The M_G value is obtained from isochrones (for details see Section **??** in the online documentation).

DISTANCEPC : MCMC samples for distance from GSP-Phot (float[`nsamples`] array, Length & Distance[pc])

MCMC samples for posterior probability distribution of the distance from GSP-Phot.

ABP : MCMC samples for extinction in G_{BP} band from GSP-Phot (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of the extinction in the G_{BP} band from GSP-Phot.

ARP : MCMC samples for extinction in G_{RP} band from GSP-Phot (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of the extinction in the G_{RP} band from GSP-Phot.

EBPMINRP : MCMC samples for reddening $E(G_{BP} - G_{RP})$ from GSP-Phot (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of the reddening $E(G_{BP} - G_{RP}) = A_{BP} - A_{RP}$ from GSP-Phot.

LOG_POS : MCMC samples for the log-posterior from GSP-Phot (float[`nsamples`] array)

Logarithmic posterior probability of MCMC samples from GSP-Phot. This can be used in order to replace the GSP-Phot priors by a user-chosen prior using importance sampling (for details see Section **??** in the online documentation).

LOG_LIK : MCMC samples for the log-likelihood from GSP-Phot (float[`nsamples`] array)

Logarithmic likelihood of MCMC samples from GSP-Phot. This can be used in order to replace the GSP-Phot priors by a user-chosen prior using importance sampling (for details see Section **??**

in the online documentation).

RADIUS : MCMC samples for stellar radius from GSP-Phot (float[`nsamples`] array, Length & Distance[Solar Radius])

MCMC samples for posterior probability distribution of the stellar radius from GSP-Phot.

2.8 MCMC_SAMPLES_MSC

This is the DataLink table hosting Monte-Carlo Markov Chain (MCMC) samples for the posterior probability distribution of all parameters derived from the Multiple Source Classifier (MSC, see Section **??** in the online documentation). 100 random MCMC samples are provided for each source.

The table considers the following parameters:

- effective temperature $T_{\mathrm{eff},1}$ of the primary star
- effective temperature $T_{\mathrm{eff},2}$ of the secondary star
- surface gravity $\log g_1$ of the primary star
- surface gravity $\log g_2$ of the secondary star
- monochromatic extinction at 547.7 nm A_0
- metallicity [M/H]
- distance
- logarithmic posterior probability
- logarithmic likelihood

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

NSAMPLES : Number of samples in the chain from MSC (short)

The sample size is 100 for all sources.

TEFF1 : MCMC samples for $T_{\mathrm{eff},1}$ of primary from MSC (float[`nsamples`] array, Temperature[K])

MCMC samples for posterior probability distribution of the primary star effective temperature from MSC.

TEFF2 : MCMC samples for $T_{\mathrm{eff},2}$ of secondary from MSC (float[`nsamples`] array, Temperature[K])

MCMC samples for posterior probability distribution of the secondary star effective temperature from MSC.

LOGG1 : MCMC samples for $\log g_1$ of primary from MSC (float[`nsamples`] array, Gravity-Surface[log cgs])

MCMC samples for posterior probability distribution of the stellar surface gravity of the primary star from MSC.

LOGG2 : MCMC samples for $\log g_2$ of secondary from MSC (float[`nsamples`] array, Gravity-Surface[log cgs])

MCMC samples for posterior probability distribution of the stellar surface gravity of the secondary star from MSC.

AZERO : MCMC samples for extinction A_0 from MSC (float[`nsamples`] array, Magnitude[mag])

MCMC samples for posterior probability distribution of monochromatic extinction A_0 at 547.7 nm from MSC. NB: This is the extinction parameter in the adopted Fitzpatrick extinction law (Fitzpatrick 1999, see Section **??** of the online documentation).

MH : MCMC samples for the metallicity from MSC (float[`nsamples`] array, Abundances[dex])

MCMC samples for posterior probability distribution of metallicity [M/H] from MSC.

DISTANCEPC : MCMC samples for distance from MSC (float[`nsamples`] array, Length & Distance[pc])

MCMC samples for posterior probability distribution of the distance from MSC.

LOG_POS : MCMC samples for the log-posterior from MSC (float[`nsamples`] array)

Logarithmic posterior probability of MCMC samples from MSC. This can be used in order to replace the MSC priors by a user-chosen prior using importance sampling (for details see Section **??** in the online documentation).

LOG_LIK : MCMC samples for the log-likelihood from MSC (float[`nsamples`] array)

Logarithmic likelihood of MCMC samples from MSC. This can be used in order to replace the MSC priors by a user-chosen prior using importance sampling (for details see Section **??** in the online documentation).

3 Auxiliary tables

3.1 COMMANDED_SCAN_LAW

This table provides a representation of the Gaia scanning law over the 34 month time period covered by the Gaia Data Release 3 (from 2014-07-25 10:31:26 to 2017-05-28 08:46:29), including the Ecliptic Pole Scanning at the beginning of the mission. Note that this is the commanded attitude of the spacecraft, the actual attitude could deviate from it by up to about 30 arcsec. Also there is no data during the interruptions that occurred in the course of the real mission, of which the main ones are listed in Chapter **??**, Section **??**.

The scanning law has been sampled at a 10 second interval, in which the satellite rotates about 10 arcminutes (the target spin rate is actually 59.9641857803 arcsec/sec). Note that this is several times shorter than a typical field-of-view transit and the scan position angle will be practically constant during this interval.

Notes:

- The times in columns 1, 2 and 3 are in Julian days in TCB with time origin 2010-01-01T00:00 (JD 2455197.5), following the time coordinate convention used in the Gaia archive. TCB stands for Barycentric Coordinate Time and is the time standard used in Gaia processing, equivalent to the proper time experienced by a clock at rest in a coordinate frame co-moving with the barycentre of the Solar system but outside its gravity well, therefore not influenced by the gravitational time dilation caused by the Sun and the rest of the Solar system.
- Column 1 is the reference time for the spacecraft attitude, while columns 2 and 3 give the times with the (relativistic) corrections applied for the light-travel time to the Solar system barycentre, corresponding to an infinitely distant source at the RA, DEC at the centres of FOV 1 and 2, respectively.
- FOV1 and FOV2 correspond to the preceding (PFOV) and following (FFOV) fields-of-view, respectively.
- The centres of the field of views are separated by the basic angle of 106.5 deg, see Fig. 2 of Lindegren et al. (2012). Their origin in the focal plane is illustrated in Fig. 3 of the same paper: both originate in the astrometric field (AF) 7, with FOV1 in row 3 and FOV2 in row 5.

- The scan angle, theta, is the position angle of the direction in which the FOV is moving (also called 'along-scan' direction), and is defined in the usual astronomical sense: theta = 0 when the FoV is moving towards local North, and theta = 90 degrees towards local East.
- All values have been formatted to the default double numerical precision and so this precision should not be interpreted as the accuracy of the data.

Columns description:

JD_TIME : Time [Julian Date in TCB at Gaia – 2 455 197.5] (double, Time[Julian Date (day)])

Time at Gaia in units of JD (in TCB) in days −2 455 197.5. The time at which the scan angles and FoV angles are evaluated in TCB (Temps Coordonnée Barycentrique) with an offset of 2 455 197.5 days applied (corresponding to a reference time T_0 at 2010-01-01T00:00:00) to have a conveniently small numerical value.

BJD_FOV1 : Time [Julian Date in TCB at barycentre for FOV1 – 2 455 197.5] (double, Time[Barycentric JD in TCB – 2 455 197.5 (day)])

Observation time in units of Barycentric JD (in TCB) in days −2 455 197.5, computed as follows. First the observation time is converted from On-board Mission Time (OBMT) into Julian date in TCB (Temps Coordonnée Barycentrique). Next a correction is applied for the light-travel time to the Solar system barycentre corresponding to an infinitely distant source at (`ra_fov1`, `dec_fov1`), resulting in Barycentric Julian Date (BJD). Finally, an offset of 2 455 197.5 days is applied (corresponding to a reference time T_0 at 2010-01-01T00:00:00) to have a conveniently small numerical value.

BJD_FOV2 : Time [Julian Date in TCB at barycentre for FOV2 – 2 455 197.5] (double, Time[Barycentric JD in TCB – 2 455 197.5 (day)])

Observation time in units of Barycentric JD (in TCB) in days −2 455 197.5, computed as follows. First the observation time is converted from On-board Mission Time (OBMT) into Julian date in TCB (Temps Coordonnée Barycentrique). Next a correction is applied for the light-travel time to the Solar system barycentre corresponding to an infinitely distant source at (`ra_fov2`, `dec_fov2`), resulting in Barycentric Julian Date (BJD). Finally, an offset of 2 455 197.5 days is applied (corresponding to a reference time T_0 at 2010-01-01T00:00:00) to have a conveniently small numerical value.

OBMT_TIME : Time at Gaia (OBMT) (long, Time[OBMT])

Observation time at Gaia converted to OBMT using the HATT (High Accuracy Time Transformation; see Sect. **??**).

RA_FOV1 : Right Ascension of FOV1 centre (float, Angle[deg])

Barycentric Right Ascension α of Field of View 1 (preceding) in ICRS at given time.

DEC_FOV1 : Declination of FOV1 centre (float, Angle[deg])

Barycentric Declination δ of Field of View 1 (preceding) in ICRS at given time.

HEAL_PIX_FOV1 : FOV1 HEALPix level 12 (int)

Level 12 nested scheme HEALPix containing the Field of View 1 (preceding) right ascension and declination.

This field can be used in conjunction with `source_id`, whose most significant bits contain HEALPix information.

SCAN_ANGLE_FOV1 : Scan position angle of FOV1 (float, Angle[deg])

Field of View 1 (preceding) scan angle.

RA_FOV2 : Right ascension of FOV2 centre (float, Angle[deg])

Barycentric Right Ascension α of Field of View 2 (following) in ICRS at given time.

DEC_FOV2 : Declination of FOV2 centre (float, Angle[deg])

Barycentric Declination δ of Field of View 2 (preceding) in ICRS at given time.

HEAL_PIX_FOV2 : FOV2 HEALPix level 12 (int)

Level 12 nested scheme HEALPix containing the Field of View 2 (following) right ascension and declination.

This field can be used in conjunction with `source_id`, whose most significant bits contain HEALPix information.

SCAN_ANGLE_FOV2 : Scan position angle of FOV2 (float, Angle[deg])

Field of View 2 (following) scan angle.

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

4 Cross-matches

4.1 DR2_NEIGHBOURHOOD

Users wishing to look up the E/DR3 record for an astrophysical source identified in DR2 must **NOT** simply extract the record from E/DR3 having the same source identifier.

As described in the detailed description of attribute `designation` in gaia_source it is not guaranteed that the same astronomical source will always have the same source identifier in different Data Releases. Hence the only safe way to compare source records between different Data Releases in general is to check the records of proximal source(s) in the same small part of the sky. This table provides the means to do this via a precomputed crossmatch of such sources, taking into account the proper motions available at E/DR3.

Within the neighbourhood of a given E/DR3 source there may be none, one or (rarely) several possible counterparts in DR2 indicated by rows in this table. This occasional source confusion is an inevitable consequence of the merging, splitting and deletion of identifiers introduced in previous releases during the E/DR3 processing and results in no guaranteed one–to–one correspondence in source identifiers between the releases.

For more details of the procedure used to create this crossmatch, see Chapter **??** in the online documentation.

Columns description:

DR2_SOURCE_ID : Source identifier in Gaia DR2 (long)

Source identifier assigned during DR2 processing for an astrophysical object in close proximity to (possibly) the same object in E/DR3.

DR3_SOURCE_ID : Source identifier in Gaia E/DR3 (long)

Source identifier assigned during E/DR3 processing for an astrophysical object in close proximity to one or more (including possibly the same) objects in DR2.

ANGULAR_DISTANCE : Angular distance between the two sources (float, Angle[mas])

Angular (great–circle) distance on sky between the source pairing between DR2 and E/DR3.

MAGNITUDE_DIFFERENCE : G band magnitude difference between the sources (float, Magnitude[mag])

G band magnitude difference between the sources based on the individual magnitudes materialised in `gaia_source` at the time of the respective data releases. The sense of the difference is E/DR3 minus DR2.

PROPER_MOTION_PROPAGATION : Flag indicating whether E/DR3 coordinates were proper motion corrected (boolean)

This flag indicates whether the E/DR3 source has proper motion estimates. If yes, they have been used to propagate E/DR3 coordinates to the DR2 epoch (J2015.5). A simple linear correction has been applied, due to the epoch proximity between both catalogues (0.5 yr).

4.2 ALLWISE_BEST_NEIGHBOUR

Table `allwise_best_neighbour` lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches for Gaia source counterparts in AllWISE. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

ALLWISE_OID : External Catalogue source identifier (int)

The additional numeric unique source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the external catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

4.3 ALLWISE_NEIGHBOURHOOD

Table allwise_neighbourhood includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches for Gaia source counterparts in AllWISE. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

ALLWISE_OID : External Catalogue source identifier (int)

The additional numeric unique source identifier of the external catalogue, increasing with Declination.

4.4 APASSDR9_BEST_NEIGHBOUR

Table apassdr9_best_neighbour lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in APASS DR9. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

CLEAN_APASSDR9_OID : External Catalogue source identifier (long)

The additional numeric source identifier of the external catalogue, increasing with Declination.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue. The identifier is the VizieR record number recno.

ANGULAR_DISTANCE : Angular Distance between the two sources (double, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (int)

Number of sources in the external catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (short)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

XM_FLAG : Cross-match algorithm flag (int)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter ??.

4.5 APASSDR9_JOIN

Convenience table to be used to join the APASS DR9 catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`clean_apassdr9_oid`).

Both `original_ext_source_id` and `clean_apassdr9_oid` are present in the cross-match output tables (`apassdr9_best_neighbour` and `apassdr9_neighbourhood`). However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `clean_apassdr9_oid`.

In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed. In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested in all matching suspected duplicates should instead use the `clean_apassdr9_oid` in the join with the cross-match result tables.

See Chapter **??** for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

CLEAN_APASSDR9_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.6 APASSDR9_NEIGHBOURHOOD

Table `apassdr9_neighbourhood` includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in APASS DR9. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

CLEAN_APASSDR9_OID : External Catalogue source identifier (long)

The additional numeric source identifier of the external catalogue, increasing with Declination.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue. The identifier is the VizieR record number `recno`.

ANGULAR_DISTANCE : Angular Distance between the two sources (double, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (int)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.7 GAIA_ESO_SURVEY_BEST_NEIGHBOUR

Table `gaia_eso_survey_best_neighbour` lists each matched external catalogue object with its best neighbour in Gaia. The cross-match algorithm is not symmetric and searches Gaia-ESO Survey sources counterparts in Gaia. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in Gaia whose position is compatible within position errors with the external catalogue target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

GAIA_ESO_SURVEY_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in Gaia Catalogue (byte)

Number of sources in the Gaia catalogue which match the external catalogue source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

4.8 GAIA_ESO_SURVEY_JOIN

Convenience table to be used to join Gaia-ESO Survey catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`gaia_eso_survey_oid`).

Both `original_ext_source_id` and `gaia_eso_survey_oid` are present in the cross-match output tables (`gaia_eso_survey_best_neighbour` and `gaia_eso_survey_neighbourhood`).

However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `gaia_eso_survey_oid`. In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed.

In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `gaia_eso_survey_oid` in the join with the cross-match result tables.

See Chapter **??**, for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

GAIA_ESO_SURVEY_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.9 GAIA_ESO_SURVEY_NEIGHBOURHOOD

Table `gaia_eso_survey_neighbourhood` includes all good neighbours for each matched Gaia-ESO Survey object. A good neighbour for a given Gaia-ESO Survey source is a nearby Gaia object whose position is compatible (within position errors) with the Gaia-ESO Survey target. The cross-match algorithm is not symmetric and searches Gaia-ESO Survey sources counterparts in Gaia. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

GAIA_ESO_SURVEY_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.10 GSC23_BEST_NEIGHBOUR

Table `gsc23_best_neighbour` lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in GSC2.3. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

CLEAN_GSC23_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the External Catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best-neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

4.11 GSC23_JOIN

Convenience table to be used to join the GSC 2.3 catalogue with cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`clean_gsc23_oid`). Both `original_ext_source_id` and `clean_gsc23_oid` are present in the cross-match output tables (`gsc23_best_neighbour` and `gsc23_neighbourhood`).

However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `clean_gsc23_oid`. In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed.

In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `clean_gsc23_oid` in the join with the cross-match result tables.

See Chapter **??** for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

CLEAN_GSC23_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.12 GSC23_NEIGHBOURHOOD

Table gsc23_neighbourhood includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in GSC2.3. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

CLEAN_GSC23_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.13 HIPPARCOS2_BEST_NEIGHBOUR

Table `hipparcos2_best_neighbour` lists each matched external catalogue object with its best neighbour in Gaia. The cross-match algorithm is not symmetric and searches Hipparcos2 sources counterparts in Gaia. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in Gaia whose position is compatible within position errors with the external catalogue target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

Unique identifier of the Gaia source, the attribute corresponds to gaia_source.source_id

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (int)

The unique source identifier in the original External catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the External Catalogue

NUMBER_OF_NEIGHBOURS : Number of neighbours in Gaia Catalogue (byte)

Number of sources in the Gaia Catalogue which match the External Catalogue source within

position errors.
The identifiers of all the neighbours can be found in the Neighbourhood table.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

xm_flag values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.14 HIPPARCOS2_NEIGHBOURHOOD

Table `hipparcos2_neighbourhood` includes all good neighbours for each matched Hipparcos2 object. A good neighbour for a given Hipparcos2 source is a nearby Gaia object whose position is compatible (within position errors) with the Hipparcos2 target. The cross-match algorithm is not symmetric and searches Hipparcos2 sources counterparts in Gaia. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

Unique identifier of the Gaia source, the attribute corresponds to `gaia_source.source_id`.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (int)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.15 PANSTARRS1_BEST_NEIGHBOUR

Table `panstarrs1_best_neighbour` lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in Pan-STARRS1 DR1. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

Unique identifier of the Gaia source, the attribute corresponds to `gaia_source.source_id`.

CLEAN_PANSTARRS1_OID : External Catalogue source identifier (long)

The additional numeric source identifier of the external catalogue, increasing with Declination.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the external catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.16 PANSTARRS1_JOIN

Convenience table to be used to join Pan-STARRS1 DR1.1 catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`clean_panstarrs1_oid`).

Both `original_ext_source_id` and `clean_panstarrs1_oid` are present in the cross-match output tables (`panstarrs1_best_neighbour` and `panstarrs1_neighbourhood`).

However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `clean_panstarrs1_oid`. In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed.

In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `clean_panstarrs1_oid` in the join with the cross-match result tables.

See Chapter **??**, for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

CLEAN_PANSTARRS1_OID : External Catalogue source identifier (long)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.17 PANSTARRS1_NEIGHBOURHOOD

Table `panstarrs1_neighbourhood` includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in Pan-STARRS1 DR1. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

Unique identifier of the Gaia source, the attribute corresponds to `gaia_source.source_id`.

CLEAN_PANSTARRS1_OID : External Catalogue source identifier (long)

The additional numeric source identifier of the external catalogue, increasing with Declination.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.18 RAVEDR5_BEST_NEIGHBOUR

Table ravedr5_best_neighbour lists each matched external catalogue object with its best neighbour in Gaia. The cross-match algorithm is not symmetric and searches RAVE DR5 sources counterparts in Gaia. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in Gaia whose position is compatible within position errors with the external catalogue target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

CLEAN_RAVEDR5_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in Gaia Catalogue (byte)

Number of sources in the Gaia catalogue which match the external catalogue source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

4.19 RAVEDR5_JOIN

Convenience table to be used to join RAVE DR5 catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`clean_ravedr5_oid`).

Both `original_ext_source_id` and `clean_ravedr5_oid` are present in the cross-match output tables (`ravedr5_best_neighbour` and `ravedr5_neighbourhood`).

However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `clean_ravedr5_oid`. In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed.

In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `clean_ravedr5_oid` in the join with the cross-match result tables.

See Chapter **??**, for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

CLEAN_RAVEDR5_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.20 RAVEDR5_NEIGHBOURHOOD

Table ravedr5_neighbourhood includes all good neighbours for each matched RAVE DR5 object. A good neighbour for a given RAVE DR5 source is a nearby Gaia object whose position is compatible (within position errors) with the RAVE DR5 target. The cross-match algorithm is not symmetric and searches RAVE DR5 sources counterparts in Gaia. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

CLEAN_RAVEDR5_OID : External Catalogue source identifier (int)

The additional numeric unique source identifier of the external catalogue, increasing with Declination.

4.21 RAVEDR6_BEST_NEIGHBOUR

Table `ravedr6_best_neighbour` lists each matched external catalogue object with its best neighbour in Gaia. The cross-match algorithm is not symmetric and searches RAVE DR6 sources counterparts in Gaia. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in Gaia whose position is compatible within position errors with the external catalogue target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

RAVEDR6_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in Gaia Catalogue (byte)

Number of sources in the Gaia catalogue which match the external catalogue source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

4.22 RAVEDR6_JOIN

Convenience table to be used to join RAVE DR6 catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`ravedr6_oid`).

Both `original_ext_source_id` and `ravedr6_oid` are present in the cross-match output tables (`ravedr6_best_neighbour` and `ravedr6_neighbourhood`).

However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `ravedr6_oid`. In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed.

In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `ravedr6_oid` in the join with the cross-match result tables.

See Chapter **??**, for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

RAVEDR6_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.23 RAVEDR6_NEIGHBOURHOOD

Table ravedr6_neighbourhood includes all good neighbours for each matched RAVE DR6 object. A good neighbour for a given RAVE DR6 source is a nearby Gaia object whose position is compatible (within position errors) with the RAVE DR6 target. The cross-match algorithm is not symmetric and searches RAVE DR6 sources counterparts in Gaia. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

RAVEDR6_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.24 SDSSDR13_BEST_NEIGHBOUR

Table sdssdr13_best_neighbour lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in SDSS DR13. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

CLEAN_SDSSDR13_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the External catalogue which match the Gaia source within position errorse The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.25 SDSSDR13_JOIN

Convenience table to be used to join SDSS DR13 catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`clean_sdssdr13_oid`).

Both `original_ext_source_id` and `clean_sdssdr13_oid` are present in the cross-match output tables (`sdssdr13_best_neighbour` and `sdssdr13_neighbourhood`).

However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `clean_sdssdr13_oid`. In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed.

In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `clean_sdssdr13_oid` in the join with the cross-match result tables.

See Chapter **??** for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

CLEAN_SDSSDR13_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.26 SDSSDR13_NEIGHBOURHOOD

Table `sdssdr13_neighbourhood` includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in SDSS DR13. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

CLEAN_SDSSDR13_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.27 SKYMAPPERDR2_BEST_NEIGHBOUR

Table skymapperdr2_best_neighbour lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in SkyMapper DR2. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

Unique identifier of the Gaia source, the attribute corresponds to gaia_source.source_id.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the external catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.28 SKYMAPPERDR2_JOIN

Convenience table to be used to join the SkyMapper DR2 catalogue with the cross-match results. It lists all the SkyMapper DR2 sources which were used in the cross-match. See Chapter **??** for more details on the catalogue.

Columns description:

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original External catalogue.

4.29 SKYMAPPERDR2_NEIGHBOURHOOD

Table `skymapperdr2_neighbourhood` includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in SkyMapper DR2. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

Unique identifier of the Gaia source, the attribute corresponds to `gaia_source.source_id`.

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (long)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

4.30 TMASS_PSC_XSC_BEST_NEIGHBOUR

Table `tmass_psc_xsc_best_neighbour` lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in 2MASS. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

CLEAN_TMASS_PSC_XSC_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the external catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue will be resolved by Gaia and as such will be the best match of more than one Gaia object.

4.31 TMASS_PSC_XSC_JOIN

Convenience table to be used to join 2MASS PSC+XSC catalogue with the cross-match results. The table links the external catalogue original source_id (`original_ext_source_id`) to the corresponding additional numerical identifier (`clean_tmass_psc_xsc_oid`).

Both `original_ext_source_id` and `clean_tmass_psc_xsc_oid` are present in the cross-match output tables (`tmass_psc_xsc_best_neighbour` and `tmass_psc_xsc_neighbourhood`). However, in case there are suspected duplicates in the external catalogue, different `original_ext_source_id` will correspond to the same `clean_tmass_psc_xsc_oid`.

In the cross-match output table only the `original_ext_source_id` of the source with the best astrometry among the suspected duplicates will be listed. In practice, users may use the `original_ext_source_id` in the original catalogue to find the matching source with the best astrometry. Users interested to find all matching suspected duplicates should instead use the `clean_tmass_psc_xsc_oid` in the join with the cross-match result tables.

See Chapter **??** for more details on the duplicates in the external catalogues and their treatment in the cross-match computations.

Columns description:

ORIGINAL_PSC_SOURCE_ID : Original 2MASS PSC source identifier (string)

The unique source identifier in 2MASS PSC.

ORIGINAL_XSC_SOURCE_ID : Original 2MASS XSC source identifier (string)

The unique source identifier in 2MASS XSC.

CLEAN_TMASS_PSC_XSC_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.32 TMASS_PSC_XSC_NEIGHBOURHOOD

Table `tmass_psc_xsc_neighbourhood` includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in 2MASS. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

CLEAN_TMASS_PSC_XSC_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.33 TYCHO2TDSC_MERGE_BEST_NEIGHBOUR

Table tycho2tdsc_merge_best_neighbour lists each matched external catalogue object with its best neighbour in Gaia. The cross-match algorithm is not symmetric and searches Tycho2tdscMerge source counterparts in Gaia. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in Gaia whose position is compatible within position errors with the external catalogue target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

xm_flag values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of ipd_gof_harmonic_amplitude or ruwe.

For detailed documentation about xm_flag and the cross-match algorithm, see Chapter **??**.

TYCHO2TDSC_MERGE_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in Gaia Catalogue (byte)

Number of sources in the Gaia catalogue which match the external catalogue source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

4.34 TYCHO2TDSC_MERGE_NEIGHBOURHOOD

Table tycho2tdsc_merge_neighbourhood includes all good neighbours for each matched Tycho2tdscMerge object. A good neighbour for a given Tycho2tdscMerge source is a nearby Gaia object whose position is compatible (within position errors) with the Tycho2tdscMerge target. The cross-match algorithm is not symmetric and searches Tycho2tdscMerge source counterparts in Gaia. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the Gaia environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

TYCHO2TDSC_MERGE_OID : External Catalogue source identifier (int)

The additional numeric source identifier of the external catalogue, increasing with Declination.

4.35 URAT1_BEST_NEIGHBOUR

Table `urat1_best_neighbour` lists each matched Gaia object with its best neighbour in the external catalogue. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in URAT-1. The best neighbour is chosen among good neighbours as the one with the highest value of the figure of merit, which evaluates the ratio between two opposite models/hypotheses: the counterpart candidate is a match or it is found by chance. Good neighbours are nearby objects in the external catalogue whose position is compatible within position errors with the Gaia target. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see `gaia_source.source_id`).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its best neighbour in the external catalogue.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

URAT1_OID : External Catalogue source identifier (int)

The additional numeric unique source identifier of the external catalogue, increasing with Declination.

NUMBER_OF_NEIGHBOURS : Number of neighbours in External Catalogue (byte)

Number of sources in the external catalogue which match the Gaia source within position errors. The identifiers of all the neighbours can be found in the corresponding neighbourhood table.

NUMBER_OF_MATES : Number of mates in Gaia Catalogue (byte)

Number of other Gaia sources that have as best neighbour the same external catalogue source. In case there are no other Gaia sources with the same best neighbour in the external catalogue, the number of mates is equal to zero. Given the Gaia high angular resolution, it will be the case that what appears as a single object in an external catalogue may be resolved by Gaia and as such will be the best match of more than one Gaia object.

4.36 URAT1_NEIGHBOURHOOD

Table urat1_neighbourhood includes all good neighbours for each matched Gaia object. A good neighbour for a given Gaia source is a nearby object in the external catalogue whose position is compatible (within position errors) with the Gaia target. The cross-match algorithm is not symmetric and searches Gaia sources counterparts in URAT-1. The cross-match algorithm is positional and exploits the full 5 parameter covariance matrix of the Gaia astrometric solution when available and the external catalogue positions and position errors. In addition it takes into account the external catalogue environment using the local density.

Please note that the cross-match algorithm is a trade-off between multiple requirements, in particular between completeness and correctness. It is thus not limited to a simple cone search.

Reference papers:
Marrese et al. (2017)
Marrese et al. (2019)

Columns description:

SOURCE_ID : Unique Gaia source identifier (long)

A unique single numerical identifier of the source (for a detailed description see gaia_source.source_id).

ORIGINAL_EXT_SOURCE_ID : Original External Catalogue source identifier (string)

The unique source identifier in the original external catalogue.

ANGULAR_DISTANCE : Angular Distance between the two sources (float, Angle[arcsec])

Angular distance between a Gaia source and its good neighbours in the external catalogue.

SCORE : Score of neighbours (double)

Score of a given neighbour. The score is a figure of merit based on geometric distance and local density of the external catalogue: the higher the score, the more probable the match is.

XM_FLAG : Cross-match algorithm flag (short)

This flag is a bitmask indicating the details of the cross-match algorithm used for the source.

`xm_flag` values and descriptions:

- 0 = Initial value; resets all bits.
- 1 = The external catalogue object has one or more multiples. This means that there is at least another object with exactly the same astrometry.
- 2 = The external catalogue object has one or more suspected duplicates. This means that there is at least another object much closer than the catalogue angular resolution.
- 4 = The external catalogue object is resolved in Gaia.
- 8 = The Gaia object has a five parameters astrometric solution.
- 16 = The Gaia object has a two parameters astrometric solution.
- 32 = The external catalogue object is matched only after the special treatment for sources with under-estimated position errors.
- 64 = The external catalogue object is matched only after the special treatment for Gaia sources with large values of `ipd_gof_harmonic_amplitude` or `ruwe`.

For detailed documentation about `xm_flag` and the cross-match algorithm, see Chapter **??**.

URAT1_OID : External Catalogue source identifier (int)

The additional numeric unique source identifier of the external catalogue, increasing with Declination.

5 Extra–galactic tables

5.1 GALAXY_CANDIDATES

This table contains parameters derived from various modules dedicated to the classification and characterisation of sources considered as galaxy candidates. This table has been constructed with the intention to be complete rather than pure and, as such, it will contain a large fraction of non-genuine extragalactic sources. Purer samples can be drawn using dedicated flags or queries. Please refer to Chapter **??** of the on-line documentation for details about how this table was built, its content, and for recommendations regarding its exploitation.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

VARI_BEST_CLASS_NAME : Name of best class, see table vari_classifier_class_definition for details of the class (string)

Best class name with corresponding classification score in `best_class_score` of table `vari_classifier_r` For the 'n_transits:5+' classifier in DR3, the following classes are published: 'ACV|CP|MCP|ROAM|ROAP|SX 'ACYG', 'AGN', 'BCEP', 'BE|GCAS|SDOR|WR', 'CEP', 'CV', 'DSCT|GDOR|SXPHE', 'ECL', 'ELL', 'EP', 'LPV', 'MICROLENSING', 'RCB', 'RR', 'RS', 'S', 'SDB', 'SN', 'SOLAR_LIKE', 'SPB', 'SYST', 'WD', and 'YSO'. The 'GALAXY' classifications are largely due to artificial variability (see Section **??** of the release documentation for details) and their probabilities are published exclusively in column `vari_best_class_score` of table `galaxy_candidates`.

See `vari_classifier_class_definition` for a detailed description of this classifier and its published classes.

VARI_BEST_CLASS_SCORE : Score of the best class (float)

It describes a quantity between 0 and 1 which is related to the (median) normalised rank of the confidence of the classifier(s) in the identification of the best class (`vari_best_class_name`). In the special case of class 'EP', all scores are set to 1. See Section **??** of the release documentation for details.

CLASSPROB_DSC_COMBMOD_GALAXY : Probability from DSC-Combmod of being a galaxy (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_QUASAR : Probability from DSC-Combmod of being a quasar (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSLABEL_DSC : Class assigned by DSC based on the probability from its Combmod classifier (string)

Class assigned by DSC based on the probability from its Combmod classifier. DSC-Combmod provides a normalized posterior probability vector across several classes. Note that this incorporates the global class prior, as explained in the documentation. This class label is set to that class with the largest probability above 0.5. If no probability is above 0.5, this class label is 'unclassified'. If users want to perform classification using a different threshold, or by adopting a different prior, they should use the DSC probability vectors.

CLASSLABEL_DSC_JOINT : Class assigned by DSC based on the probability from its Specmod and Allosmod classifiers (string)

DSC-Specmod and DSC-Allosmod each provide a normalized posterior probability vector across several classes. Both incorporate the global class prior, as explained in the documentation. If the 'quasar' class probability from both Specmod and Allosmod are above 0.5, this class label is set to 'quasar'. If the 'galaxy' class probability from both Specmod and Allosmod are above 0.5, this class label is set to 'galaxy'. (Note that these two cases are mutually exclusive.) Otherwise the class label is set to 'unclassified'.

CLASSLABEL_OA : Class assigned by OA the neuron that represents the source (string)

Class label of the neuron that represents the source, as assigned by the OA module in Apsis. See Section **??** for further details.

REDSHIFT_UGC : Redshift from UGC (float)

The redshift of the source treated as a galaxy by the Apsis module UGC. The redshift is estimated from the sampled mean BP/RP spectrum applying a regression model based on Support Vector Machines (SVM), a supervised machine learning algorithm. Details are provided in Section **??** of the on-line documentation.

As an estimate of the uncertainty on `redshift_ugc` the value (`redshift_ugc_upper` − `redshift_ugc_low` may be used. We note that in the ranges `redshift_ugc`< 0.02, 0.28 <`redshift_ugc`< 0.30 and `redshift_ugc`> 0.58 the SVM-model performance is particularly low and the derived redshifts lie outside of the achievable prediction range. A very narrow interval at 0.070 <`redshift_ugc`< 0.071 includes several thousand bright sources which probably have redshifts lower than 0.04, as explained in the on-line documentation (Section **??**).

REDSHIFT_UGC_LOWER : Redshift prediction lower limit from UGC (float)

The performance limits are based on the mean error $predictDiffMean[r_i]$ and its standard deviation $predictDiffStDev[r_i]$ (1σ-level) obtained during the SVM training with a test data set, where r_i=int(`redshift_ugc`/0.02). The lower limit is defined as `redshift_ugc`$-predictDiffMean[r_i]$ $-predictDiffStDev[r_i]$. For more details see the on-line documentation, Section **??**.

REDSHIFT_UGC_UPPER : Redshift prediction upper limit from UGC (float)

The performance limits are based on the mean error $predictDiffMean[r_i]$ and its standard deviation $predictDiffStDev[r_i]$ (1σ-level) obtained during the SVM training with a test data set, where r_i=int(`redshift_ugc`/0.02). The upper limit is defined as `redshift_ugc`$-predictDiffMean[r_i]$ $+predictDiffStDev[r_i]$. For more details see the on-line documentation, Section **??**.

N_TRANSITS : Number of transits used for the morphological analysis (int)

The number of transits used to reconstruct the image and to analyse the object morphology.

POSANGLE_SERSIC : Fitted position angle of the source for the Sersic Profile (double, Angle[deg])

Position angle of the source for fitted Sersic profile with respect to Celestial North Pole.

POSANGLE_SERSIC_ERROR : Error on the fitted position angle of the source for the Sersic Profile (double, Angle[deg])

Uncertainty in the position angle of source with respect to Celestial North Pole for the Sersic profile.

INTENSITY_SERSIC : Fitted intensity of the source for the Sersic Profile (double, Flux[e^{-} s^{-1}])

Intensity of the source at the fitted effective radius (`radius_sersic`) for the Sersic profile.

INTENSITY_SERSIC_ERROR : Error on the fitted intensity of the source at effective radius radius_sersic (double, Flux[e^{-} s^{-1}])

Uncertainty of the light intensity at the fitted effective radius (`radius_sersic`) of the source for the Sersic profile.

RADIUS_SERSIC : Fitted effective radius of the source for the Sersic Profile (double, Angle[mas])

Effective radius containing half of the total luminosity of the source bulge as obtained by morphological fitting for the Sersic profile.

RADIUS_SERSIC_ERROR : Error on the fitted effective radius of the source for the Sersic Profile (double, Angle[mas])

Uncertainty in the effective radius containing half of the total luminosity of the source for the Sersic profile.

ELLIPTICITY_SERSIC : Fitted ellipticity of source for the Sersic Profile (double)

Ellipticity (defined as 1-(b/a) where b/a is the axis ratio) of the source for the Sersic profile.

ELLIPTICITY_SERSIC_ERROR : Error on the fitted ellipticity of the source for the Sersic Profile (double)

Uncertainty in the ellipticity (defined as 1-(b/a) where b/a is the axis ratio) of the source for the Sersic profile.

N_SERSIC : Fitted Sersic Index for Sersic Profile (float)

Sersic index for the Sersic profile. The Sersic profile is a mathematical function that describes how the intensity of a galaxy varies with the distance from its center. The Sersic index describes how steep this variation is.

N_SERSIC_ERROR : Error on the fitted Sersic Index for Sersic Profile (float)

Uncertainty in the Sersic index for the Sersic profile.

L2_SERSIC : L2 norm for the Sersic Profile (double)

This value represents the mean squared error between the integrated flux of all observed samples (from the Sky Mapper and Astrometric Field) and the integrated flux of synthetic samples produced with the fitted profile.

MORPH_PARAMS_CORR_VEC_SERSIC : Vector form of the upper triangle of the correlation matrix for the fitted parameters for the Sersic Profile (double[10] array)

Vector form of the correlation matrix of the fitted profile parameters, as obtained by morphological fitting for the Sersic profile, in the following order: [0]: position angle [1]: intensity [2]:

radius [3]: ellipticity [4]: Sersic index

Only non-zero, non-unity, correlation coefficients from the correlation matrix **M** are provided here. They are served as a linear array of size $S = n(n-1)/2$, where n is the number of fitted parameters covered in the correlation matrix. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

FLAGS_SERSIC : Flag indicative of processing or scientific quality for the morphological parameters fitting for the Sersic Profile (byte)

This flag provides information about the processing or scientific quality of the results of the Galaxy morphology analysis chain for the source of interest for the Sersic Profile.

The flag coding is the following. Note that not all flag cases apply to a given profile.

1: Elliptical profile fitted, other source exists at less that 2.5″, doubtful solution

2: Circular profile fitted, other source exists at less that 2.5″, doubtful solution

3: Elliptical profile fitted, the position angle did not converge and one parameter or more is at the bound, Poor solution.

4: Elliptical profile fitted, the position angle did not converge

5: Elliptical profile fitted, one parameter or more is at the bound, Poor solution

6: Elliptical profile fitted

7: Circular profile fitted, one parameter or more is at the bound, Poor solution

8: Circular profile fitted

POSANGLE_DE_VAUCOULEURS : Fitted position angle of the source for the de Vaucouleurs Profile (double, Angle[deg])

Position angle of the source for fitted de Vaucouleurs profile with respect to Celestial North Pole.

POSANGLE_DE_VAUCOULEURS_ERROR : Error on the fitted position angle of the source for the de Vaucouleurs Profile (double, Angle[deg])

Uncertainty in the position angle of source with respect to Celestial North Pole for the de Vaucouleurs profile.

INTENSITY_DE_VAUCOULEURS : Fitted intensity of the source for the de Vaucouleurs Profile (double, Flux[e^{-} s^{-1}])

Intensity of the source at the fitted effective radius (`radius_de_vaucouleurs`) for the de Vaucouleurs profile.

INTENSITY_DE_VAUCOULEURS_ERROR : Error on the fitted intensity of the bulge for the de Vaucouleurs Profile (double, Flux[e^{-} s^{-1}])

Uncertainty of the light intensity at the fitted effective radius (`radius_de_vaucouleurs`) of the source for the de Vaucouleurs profile.

RADIUS_DE_VAUCOULEURS : Fitted effective radius of the source for de Vaucouleurs Profile (double, Angle[mas])

Effective radius containing half of the total luminosity of the source bulge as obtained by morphological fitting for the de Vaucouleurs profile.

RADIUS_DE_VAUCOULEURS_ERROR : Error on the fitted effective radius of the source for the de Vaucouleurs Profile (double, Angle[mas])

Uncertainty in the effective radius containing half of the total luminosity of the source for the de Vaucouleurs profile.

ELLIPTICITY_DE_VAUCOULEURS : Fitted ellipticity of source for the de Vaucouleurs Profile (double)

Ellipticity (defined as 1-(b/a) where b/a is the axis ratio) of the source for the de Vaucouleurs profile.

ELLIPTICITY_DE_VAUCOULEURS_ERROR : Error on the fitted ellipticity of the source for the de Vaucouleurs Profile (double)

Uncertainty in the ellipticity (defined as 1-(b/a) where b/a is the axis ratio) of the source for the de Vaucouleurs profile.

L2_DE_VAUCOULEURS : L2 norm for the de Vaucouleurs Profile (double)

This value represents the mean squared error between the integrated flux of all observed samples (from the Sky Mapper and Astrometric Field) and the integrated flux of synthetic samples produced with the fitted profile.

MORPH_PARAMS_CORR_VEC_DE_VAUCOULEURS : Vector form of the upper triangle of the correlation matrix for the fitted parameters for the de Vaucouleurs Profile (double[21] array)

Vector form of the correlation matrix of the fitted profile parameters, as obtained by morphological fitting for the de Vaucouleurs profile, in the following order: [0]: position angle [1]: intensity [2]: radius [3]: ellipticity

Only non-zero, non-unity, correlation coefficients from the correlation matrix **M** are provided here. They are served as a linear array of size $S = n(n-1)/2$, where n is the number of fitted parameters covered in the correlation matrix. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

FLAGS_DE_VAUCOULEURS : Flag indicative of processing or scientific quality for the morphological parameters fitting for the de Vaucouleurs Profile (byte)

This flag provides information about the processing or scientific quality of the results of the Galaxy morphology analysis chain for the source of interest for the de Vaucouleurs Profile.

The flag coding is the following. Note that not all flag cases apply to a given profile.

1: Elliptical profile fitted, other source exists at less that 2.5″, doubtful solution

2: Circular profile fitted, other source exists at less that 2.5″, doubtful solution

3: Elliptical profile fitted, the position angle did not converge and one parameter or more is at the bound, Poor solution.

4: Elliptical profile fitted, the position angle did not converge

5: Elliptical profile fitted, one parameter or more is at the bound, Poor solution

6: Elliptical profile fitted

7: Circular profile fitted, one parameter or more is at the bound, Poor solution

8: Circular profile fitted

SOURCE_SELECTION_FLAGS : Bit indicative of whether the input data from a given module met the source list eligibility criteria for the source of interest (int)

Bit indicative of whether the input data from a given module met the source list eligibility criteria for the source of interest.

The bit is coded as follows:

- bit 0: The source meets the eligibility criteria for the output of the Surface brightness analysis module (see Chapter **??**).
- bit 1: The source belongs to the `galaxy_catalogue_name` table.
- bit 2: The source meets the eligibility criteria for the output of the classification module based on photometric lightcurves (see Chapter **??**).
- bit 3: The source meets the eligibility criteria for the output of the DSC module (see Chapter **??**).
- bit 4: The source meets the eligibility criteria for the redshift determined by the UGC module (see Chapter **??**).
- bit 5: The source meets the eligibility criteria for the classification output of the UGC module (not yet applicable to DR3).

5.2 GALAXY_CATALOGUE_NAME

This table provides the list of input catalogues that have been used to select any given source for which morphological analysis parameters are provided in table `galaxy_candidates`.

Each source may have been cross-matched to more than one catalogue and therefore can have several entries in the table.

For DR3, the catalogues considered for this selection are mostly external, although sources identified by DPAC based on the classification performed by other processing have also been included here.

Each catalogue is assigned a `catalogue_id`. For DR3 the only input list corresponds to that published in Krone-Martins et al. (2022). Further details on these catalogues are given in the chapter on extended object processing (Section **??**).

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

CATALOGUE_ID : The unique identifier for the catalogue(s) used to select the sources in the morphological analysis (byte)

Each catalogue used to select the sources under morphological analysis is assigned a unique ID. The corresponding catalogues are listed in the description of the `galaxy_catalogue_name` table, and further details are given in the chapter on extended object processing in the on-line documentation (Section **??**).

5.3 QSO_CANDIDATES

This table contains parameters derived from various modules dedicated to the classification and characterisation of sources considered as QSO candidates. Together with those, the QSOs used to define the Gaia-CRF3 are also listed in this table. This table has been constructed with the intention to be complete rather than pure and, as such, it will contain a large fraction of non-genuine extragalactic sources. Purer samples can be drawn using dedicated flags or queries. Please refer to Chapter **??** of the on-line documentation for details about how this table was built, its content, and for recommendations regarding its exploitation.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

ASTROMETRIC_SELECTION_FLAG : Flag indicating if the source is part of the astrometric selection (boolean)

This flag indicates whether the source is part of the astrometric selection of the `qso_candidates` table that was constructed based on the principles originally that were used to select the sources defining the Gaia-CRF3 and published in `agn_cross_id`. See also Klioner et al. (2021).

GAIA_CRF_SOURCE : Flag indicative of whether the source was used define the Gaia-CRF3 (boolean)

This boolean flag indicates whether the source is part of the Gaia-CRF3, which is published through agn_cross_id.

See also Klioner et al. (2021).

VARI_BEST_CLASS_NAME : Name of best class, see table vari_classifier_class_definition for details of the class (string)

Best class name with corresponding classification score in best_class_score of table vari_classifier_r
For the 'n_transits:5+' classifier in DR3, the following classes are published: 'ACV|CP|MCP|ROAM|ROAP|SX
'ACYG', 'AGN', 'BCEP', 'BE|GCAS|SDOR|WR', 'CEP', 'CV', 'DSCT|GDOR|SXPHE', 'ECL', 'ELL', 'EP', 'LPV', 'MICROLENSING', 'RCB', 'RR', 'RS', 'S', 'SDB', 'SN', 'SOLAR_LIKE', 'SPB', 'SYST', 'WD', and 'YSO'. The 'GALAXY' classifications are largely due to artificial variability (see Section **??** of the release documentation for details) and their probabilities are published exclusively in column vari_best_class_score of table galaxy_candidates.

See vari_classifier_class_definition for a detailed description of this classifier and its published classes.

VARI_BEST_CLASS_SCORE : Score of the best class (float)

It describes a quantity between 0 and 1 which is related to the (median) normalised rank of the confidence of the classifier(s) in the identification of the best class (vari_best_class_name). In the special case of class 'EP', all scores are set to 1. See Section **??** of the release documentation for details.

FRACTIONAL_VARIABILITY_G : Fractional variability in the G band (float)

The fractional variability is calculated as $\sqrt{\mathrm{MAD}^2(F) - \mathrm{RMS}^2(\sigma_F)}/\mathrm{median}(F)$, where MAD($F$) is the Median Absolute Deviation (MAD) of the field-of-view transit fluxes F in the G band, $\mathrm{RMS}^2(\sigma_F)$ the mean square of flux uncertainties σ_F, and median(F) is the median flux of the field-of-view transits in the G band.

STRUCTURE_FUNCTION_INDEX : Index of the first-order structure function in the G band (float)

Index of the first-order structure function (SF; Simonetti et al. 1985), i.e., slope in the logSF vs logTau space, where Tau is the time lag. The SF is expressed in magnitude squared and computed from field-of-view transit magnitudes in the G band. The index is linked to that of the Fourier power spectrum and indicates the type of noise process at work.

STRUCTURE_FUNCTION_INDEX_SCATTER : Standard deviation of the index of the structure function (double)

Standard deviation of the index α of the structure function (i.e., slope in the logSF vs logTau space). The structure function is expressed in magnitude square. The index is linked to the power of the Fourier power spectrum and indicates the type of noise process at work. AGN should show $\alpha = 0.5$, in between flicker noise ($\alpha = 0$) and shot (random walk) noise ($\alpha = 1$).

QSO_VARIABILITY : Quasar variability metric in the G band (float)

Quasar variability metric from field-of-view transit magnitudes in the G band in log format, $\log(\chi^2_{\rm QSO}/\nu)$, from Butler & Bloom (2011), after adaptation to Gaia data.

NON_QSO_VARIABILITY : Non-quasar variability metric in the G band (float)

Non-quasar variability metric from field-of-view transit magnitudes in the G band in log format, $\log(\chi^2_{\rm false}/\nu)$, from Butler & Bloom (2011), after adaptation to Gaia data.

VARI_AGN_MEMBERSHIP_SCORE : Membership score (0=lowest,1=highest) of source to be of AGN type (double)

Membership score (0=lowest,1=highest) of source to be of AGN type.

Each specific object module has its own method of computing this score so this value cannot be perceived as a probability, nor can it readily be compared between different specific object modules without recalibration (apart from the extremes 0 and 1).

For SOS-AGN (Chapter **??**), it is defined as the Mahalanobis distance from the AGIS3.1 reference set of QSOs, inverted and rescaled by a Gaussian from 0 to 1, which takes into account five variability features (and their covariances) from the Gaia time series: the Butler & Bloom parameters (QSOvar and non-QSOvar), the structure function slope, the fractional variability, and the Abbe (or von Neumann) parameter.

CLASSPROB_DSC_COMBMOD_QUASAR : Probability from DSC-Combmod of being a quasar (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSPROB_DSC_COMBMOD_GALAXY : Probability from DSC-Combmod of being a galaxy (data used: BP/RP spectrum, photometry, astrometry) (float)

Probability that the object is of the named class. This is the overall probability for this class, computed by combining the class probabilities from DSC-Specmod (which classifies objects using BP/RP spectra) and DSC-Allosmod (which classifies objects using several astrometric and photometric features). It is important to realise that the DSC classes are defined by the training data used, and that this may produce a narrower definition of the class than may be expected given the class name. This is a posterior probability that includes the global class prior, given in the documentation.

CLASSLABEL_DSC : Class assigned by DSC based on the probability from its Combmod classifier (string)

Class assigned by DSC based on the probability from its Combmod classifier. DSC-Combmod provides a normalized posterior probability vector across several classes. Note that this incorporates the global class prior, as explained in the documentation. This class label is set to that class with the largest probability above 0.5. If no probability is above 0.5, this class label is 'unclassified'. If users want to perform classification using a different threshold, or by adopting a different prior, they should use the DSC probability vectors.

CLASSLABEL_DSC_JOINT : Class assigned by DSC based on the probability from its Specmod and Allosmod classifiers (string)

DSC-Specmod and DSC-Allosmod each provide a normalized posterior probability vector across several classes. Both incorporate the global class prior, as explained in the documentation. If the 'quasar' class probability from both Specmod and Allosmod are above 0.5, this class label is set to 'quasar'. If the 'galaxy' class probability from both Specmod and Allosmod are above 0.5, this class label is set to 'galaxy'. (Note that these two cases are mutually exclusive.) Otherwise the class label is set to 'unclassified'.

CLASSLABEL_OA : Class assigned by OA the neuron that represents the source (string)

Class label of the neuron that represents the source, as assigned by the OA module in Apsis. See

Section **??** for further details.

REDSHIFT_QSOC : Redshift from QSOC (float)

The redshift of the source estimated from the analysis of the BP/RP spectra by the QSOC Apsis module.

The redshift of the source is inferred from the cross-match of a quasar template to the observed BP/RP spectra in order to produce the cross correlation function that corresponds to the negative of the χ^2 values evaluated in each trial redshift, plus a constant. The construction of the cross correlation function and subsequent selection of the redshift is described in Section **??** of the on-line documentation.

REDSHIFT_QSOC_LOWER : Redshift lower confidence level from QSOC (float)

Lower confidence level of the redshift estimate based on the BP/RP spectra analysis. This is the 16th percentile of the PDF over redshift as computed by QSOC.

REDSHIFT_QSOC_UPPER : Redshift upper confidence level from QSOC (float)

Upper confidence level of the redshift estimate based on the BP/RP spectra analysis. This is the 84th percentile of the PDF over redshift as computed by QSOC.

CCFRATIO_QSOC : Value of the cross-correlation function used to derive the redshift from QSOC, relative to the maximum value (float)

Ratio of the value of the cross correlation function evaluated at the selected redshift estimate to the maximum of the cross correlation function over all redshifts. Values are in the range [0,1]. When different from one, low values of this parameter indicate an inappropriate fit of the quasar template to the observed spectrum (i.e. a high χ^2) while large values indicate potential degeneracy in the redshift determination.

See Section **??** of the on-line documentation for further details.

ZSCORE_QSOC : Redshift zscore from QSOC (float)

The parameter zscore is defined in Section **??** of the on-line documentation and takes values between 0 and 1. Low values of zscore indicate that at least one emission line commonly found in the spectra of QSOs is not present.

FLAGS_QSOC : Processing flags for the analysis based on BP/RP Spectra from QSOC (long)

The processing flags report the potential errors that can occur during the prediction process from QSOC.

The flag value is a binary combination (binary OR) of:

- 0: Z_NOWARNING. The processing of this source raised no warning flag.
- 1: Z_AMBIGUOUS. The cross correlation function has more than one maximum with `ccfratio_qsoc` > 0.85, meaning that at least two redshifts lead to a similar χ^2 and the solution is ambiguous.
- 2: Z_LOWCCFRATIO. The selected redshift leads to a small value of the cross correlation function when compared to the maximum value of the cross correlation function. Equivalently, `ccfratio_qsoc` < 0.9.
- 4: Z_LOWZSCORE. The selected redshift leads to a low `zscore_qsoc`, meaning that at least one emission line is either missing or is strongly damped. Equivalently, `zscore_qsoc` < 0.9.
- 8: Z_NOTOPTIMAL. We did not choose the redshift having the lowest χ^2 (i.e. `ccfratio_qsoc` < 1).
- 16: Z_BADSPEC. Raised if one of the following conditions is met:
  - the number of BP or RP spectral transits ($N_{\rm BP}$ and $N_{\rm RP}$ hereafter), is lower than 10 transits, or
  - $G > 20.5$ mag, or
  - $G > 19 + 0.03 \times (N_{\rm BP} - 10)$ mag, or
  - $G > 19 + 0.03 \times (N_{\rm RP} - 10)$ mag.
    This allows the user to filter out uncertain predictions in a simple way without having to explicitly deal with the aforementioned formula, nor with $N_{\rm BP}$ and $N_{\rm RP}$.

For a definition of `ccfratio_qsoc` and `zscore_qsoc`, see Section **??** of the on-line documentation.

N_TRANSITS : Number of transits used for the morphological analysis (int)

The number of transits used to reconstruct the image and to analyse the object morphology.

INTENSITY_QUASAR : Fitted intensity of the quasar at its center (double, Flux[e^- s^{-1}])

Light intensity at the center of the quasar as obtained by fitting an exponential profile for the central quasar and a Sersic profile for the host galaxy.

INTENSITY_QUASAR_ERROR : Error on the fitted intensity of the quasar at its center (double, Flux[e^- s^{-1}])

Uncertainty on the light intensity at the center of the quasar as obtained by fitting an exponential profile for the central quasar and a Sersic profile for the host galaxy.

INTENSITY_HOSTGALAXY : Fitted intensity of the host galaxy at the effective radius (double, Flux[e^- s^{-1}])

Light intensity at the center of the host galaxy as obtained by fitting an exponential profile for the central quasar and a Sersic profile for the host galaxy.

INTENSITY_HOSTGALAXY_ERROR : Error on the fitted intensity of the host galaxy at effective radius (double, Flux[e^- s^{-1}])

Formal uncertainty on the light intensity of the host galaxy at the effective radius as obtained by fitting an exponential profile for the central quasar and a Sersic profile for the host galaxy.

RADIUS_HOSTGALAXY : Fitted effective radius of the host galaxy (double, Angle[mas])

Effective radius containing half of the total luminosity of the Sersic profile used to fit the host galaxy.

RADIUS_HOSTGALAXY_ERROR : Error on the fitted effective radius of the host galaxy (double, Angle[mas])

Uncertainty on the effective radius containing half of the total luminosity of the Sersic profile used to fit the host galaxy.

SERSIC_INDEX : Fitted sersic Index (float)

Sersic index as obtained by fitting a Sersic profile for the host galaxy. The Sersic profile is a mathematical function that describes how the intensity of a galaxy varies with the distance from its center. The Sersic index describes how steep is this variation.

SERSIC_INDEX_ERROR : Error on the fitted sersic Index (float)

Formal uncertainty on `sersic_index`.

ELLIPTICITY_HOSTGALAXY : Fitted ellipticity of the host galaxy (double)

Ellipticity (defined as 1-(b/a) where (b/a) is the axis ratio) of the host galaxy obtained by the morphological fitting of a Sersic profile for the host galaxy.

ELLIPTICITY_HOSTGALAXY_ERROR : Error on the fitted ellipticity of the host galaxy (double)

Formal uncertainty on the ellipticity of the host galaxy as obtained by the morphological fitting of a Sersic profile.

POSANGLE_HOSTGALAXY : Fitted position angle of the host galaxy (double, Angle[deg])

Position angle of the host galaxy obtained by the morphological fitting of the Sersic profile with respect to Celestial North Pole.

POSANGLE_HOSTGALAXY_ERROR : Error on the fitted position angle of the host galaxy (double, Angle[deg])

Formal uncertainty on the position angle of the host galaxy obtained by the morphological fitting of the Sersic profile with respect to Celestial North Pole.

HOST_GALAXY_DETECTED : Flag indicating whether a host galaxy has been detected (boolean)

Flag indicating the presence of a detectable host galaxy. False means that no host galaxy could be detected, while True means that a measurable host galaxy was detected around the quasar.

L2_NORM : L2 norm for the fitted Sersic profile (double)

This value represents the mean squared error between the integrated flux of all observed samples (from the Sky Mapper and Astrometric Field) and the integrated flux of synthetic samples produced with the fitted profile.

MORPH_PARAMS_CORR_VEC : Vector form of the upper triangle of the correlation matrix for the fitted morphological parameters (double[15] array)

Correlation matrix of the fitted profile parameters in the following order:

0: intensity of the quasar

1: intensity of the host galaxy

2: radius of the host galaxy

3: Sersic index of the host galaxy

4: ellipticity of the host galaxy

5: position angle of the host galaxy

Only non-zero, non-unity, correlation coefficients from the correlation matrix **M** are provided here. They are served as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

HOST_GALAXY_FLAG : Flag indicative of processing or scientific quality for the morphological parameters fitting (byte)

This flag provides information about the processing or scientific quality of the results of the Quasar morphology analysis chain for the source of interest.

The flag coding is the following:

1: Host Galaxy measured with circular Sersic profile

2: Host Galaxy measured with elliptical Sersic profile

3: No host galaxy detected

4: Poor solution measured with elliptical Sersic profile

5: No convergence of fitting but host galaxy detected

6: No convergence of fitting or doubtful solution due to presence of a secondary source at d < 5 arcsec

SOURCE_SELECTION_FLAGS : Bit indicative of whether the input data from a given module met the source list eligibility criteria for the source of interest (int)

Bit indicative of whether the input data from a given module met the source list eligibility criteria for the source of interest.

The bit is coded as follows:

- bit 0: The source belongs to the Gaia-CRF3 (`agn_cross_id` table)
- bit 1: The source belongs to the `frame_rotator_source` table with either `used_for_reference_frame_orientation` or `used_for_reference_frame_spin` set to True.
- bit 2: The source meets the eligibility criteria for the output of the Surface brightness analysis module (see Chapter **??**).
- bit 3: The source belongs to the `qso_catalogue_name` table.
- bit 4: The source meets the eligibility criteria for the output of the classification module based on photometric lightcurves (see Chapter **??**).
- bit 5: The source meets the eligibility criteria for the output of the SOS AGN module (see Chapter **??**)
- bit 6: The source meets the eligibility criteria for the output of the DSC module (see Chapter **??**).
- bit 7: The source meets the eligibility criteria for the redshift determined by the QSOC module (see Chapter **??**).

- bit 8: The source meets the eligibility criteria for the classification output of the QSOC module (not yet applicable to DR3).

5.4 QSO_CATALOGUE_NAME

This table provides the list of input catalogues that have been used to select any given source for which morphological analysis parameters are provided in table `qso_candidates`.

Each source may have been cross-matched to more than one catalogue and therefore can have several entries in the table.

For DR3, the catalogues considered for this selection are mostly external, although sources identified by DPAC based on the classification performed by other processing have also been included here.

Each catalogue is assigned a `catalogue_id`. For DR3 the following applies:

- 1: GaiaVariQso2018 (internal DPAC classification based on photometry variability)
- 2: ICRF2
- 3: SDSS-DR12Q
- 4: LQAC3
- 5: Half Million Quasars
- 6: Secrest+2015
- 7: Assef+2018_C75

Further details on these catalogues are given in the chapter on extended object processing (Section **??**).

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

CATALOGUE_ID : The unique identifier for the catalogue(s) used to select the sources in the morphological analysis (byte)

Each catalogue used to select the sources under morphological analysis is assigned a unique ID. The corresponding catalogues are listed in the description of the `qso_catalogue_name` table, and further details are given in the chapter on extended object processing in the on-line documentation (Section **??**).

6 Non–single stars tables

6.1 NSS_TWO_BODY_ORBIT

This table contains non-single-star orbital models for sources compatible with an orbital two-body solution. This covers astrometric binaries, spectroscopic binaries, eclipsing binaries and certain combinations thereof. Several possible models are hosted within the same table and they are indicated by the field `nss_solution_type`. The description of this latter lists all possible solution types considered for this release. Only a selection of parameters hosted in this table are provided here, depending on the solution. The details of those is given in the description of field `bit_index`, which can also be used to extract the relevant elements of the correlation vector `corr_vec`.

Details about the formalism used to derive the parameters in this table are given in the on-line documentation, see Chapter **??**. Warning: as a source may receive independent astrometric, spectroscopic or photometric orbits, a query using a given source_id may return several solutions. This has to be accounted for when doing a crossmatch by source_id.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Source Identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NSS_SOLUTION_TYPE : NSS model adopted (string)

This is the non-single star model which has been adopted for the published solution, see online documentation, Chapter **??**, for details.

The solution types covered in table `nss_two_body_orbit` are:

- Orbital: Orbital model for an astrometric binary
- OrbitalAlternative[Validated]: Alternative orbital model mainly for low S/N systems, with a subset containing suffix 'Validated'
- OrbitalTargetedSearch[Validated]: Orbital model for a priori known systems, with a subset containing suffix 'Validated'
- EclipsingBinary: Eclipsing binary model
- EclipsingSpectro: Combined eclipsing binary + spectroscopic orbital model
- SB1: Single Lined Spectroscopic binary model
- SB2: Double Lined Spectroscopic binary model
- SB1C: Single Lined Spectroscopic binary model with circular orbit
- SB2C: Double Lined Spectroscopic binary model with circular orbit
- AstroSpectroSB1: Combined astrometric + single lined spectroscopic orbital model

RA : Right ascension (double, Angle[deg])

Barycentric right ascension α of the source in ICRS at the reference epoch `gaia_source.ref_epoch`

RA_ERROR : Standard error of right ascension (float, Angle[mas])

Standard error $\sigma_{\alpha*} \equiv \sigma_\alpha \cos\delta$ of the right ascension of the source in ICRS at the reference epoch `gaia_source.ref_epoch`.

DEC : Declination (double, Angle[deg])

Barycentric declination δ of the source in ICRS at the reference epoch `gaia_source.ref_epoch`

DEC_ERROR : Standard error of declination (float, Angle[mas])

Standard error σ_δ of the declination of the source in ICRS at the reference epoch `gaia_source.ref_epoch`

PARALLAX : Parallax (double, Angle[mas])

Absolute stellar parallax ϖ of the source at the reference epoch `gaia_source.ref_epoch`

PARALLAX_ERROR : Standard error of parallax (float, Angle[mas])

Standard error σ_ϖ of the stellar parallax at the reference epoch `gaia_source.ref_epoch`

PMRA : Proper motion in right ascension direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in right ascension $\mu_{\alpha*} \equiv \mu_\alpha \cos\delta$ of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension.

PMRA_ERROR : Standard error of proper motion in right ascension direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\alpha*}$ of the local tangent plane projection of the proper motion vector in the direction of increasing right ascension at the reference epoch `gaia_source.ref_epoch`

PMDEC : Proper motion in declination direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in declination μ_δ of the source at the reference epoch `gaia_source.ref_epoch`. This is the projection of the proper motion vector in the direction of increasing declination.

PMDEC_ERROR : Standard error of proper motion in declination direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\delta}$ of the proper motion component in declination at the reference epoch `gaia_source.ref_e`

A_THIELE_INNES : Thiele-Innes element A (double, Angle[mas])

The Thiele-Innes element A of the orbit of the photocenter (for the orbital model). This parameter is fitted for orbital models based on astrometry (`nss_solution_type` = Orbital, OrbitalAlternative[Validated], or OrbitalTargetedSearch[Validated])) or a combination of astrometry and radial velocities (`nss_solution_type` = AstroSpectroSB1). For other orbital models based on photometry or radial velocities, or their combination, the Campbell parameters are fitted instead. See more details, including the transformation from the A, B, F, G Thiele-Innes elements to the a_0, i, ω and Ω Campbell elements, in the on-line documentation (Chapter **??**).

A_THIELE_INNES_ERROR : Standard error of Thiele-Innes element A (float, Angle[mas])

Standard error of the Thiele-Innes element A of the orbit of the photocenter (for the orbital model). The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

B_THIELE_INNES : Thiele-Innes element B (double, Angle[mas])

The Thiele-Innes element B of the orbit of the photocenter (for the orbital model). This parameter is fitted for orbital models based on astrometry (`nss_solution_type` = Orbital, OrbitalAlternative[Validated], or OrbitalTargetedSearch[Validated])) or a combination of astrometry and radial velocities (`nss_solution_type` = AstroSpectroSB1). For other orbital models based on photometry or radial velocities, or their combination, the Campbell parameters are fitted instead. See more details, including the transformation from the A, B, F, G Thiele-Innes elements to the a_0, i, ω and Ω Campbell elements, in the on-line documentation (Chapter **??**).

B_THIELE_INNES_ERROR : Standard error of Thiele-Innes element B (float, Angle[mas])

Standard error of the Thiele-Innes element B of the orbit of the photocenter (for the orbital model). The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

F_THIELE_INNES : Thiele-Innes element F (double, Angle[mas])

The Thiele-Innes element F of the orbit of the photocenter (for the orbital model). This parameter is fitted for orbital models based on astrometry (`nss_solution_type` = Orbital, OrbitalAlternative[Validated], or OrbitalTargetedSearch[Validated])) or a combination of astrometry and radial velocities (`nss_solution_type` = AstroSpectroSB1). For other orbital models based on photometry or radial velocities, or their combination, the Campbell parameters are fitted instead. See more details, including the transformation from the A, B, F, G Thiele-Innes elements to the a_0, i, ω and Ω Campbell elements, in the on-line documentation (Chapter **??**).

F_THIELE_INNES_ERROR : Standard error of Thiele-Innes element F (float, Angle[mas])

Standard error of the Thiele-Innes element F of the orbit of the photocenter (for the orbital model). The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

G_THIELE_INNES : Thiele-Innes element G (double, Angle[mas])

The Thiele-Innes element G of the orbit of the photocenter is fitted for orbital models based on astrometry (`nss_solution_type` = Orbital, OrbitalAlternative[Validated], or OrbitalTargetedSearch[Validated]) or a combination of astrometry and radial velocities (`nss_solution_type` = AstroSpectroSB1). For other orbital models based on photometry or radial velocities, or their combination, the Campbell parameters are fitted instead.

For orbits with small eccentricities (`eccentricity` $<$ 0.0005 and `eccentricity_error` is absent, see Sect. **??**), `g_thiele_innes` is not an unknown in the model but is deduced from the A, B, F Thiele-Innes elements, the whole set of which must yield $\omega = 0$.

For more details, including the transformation from the A, B, F, G Thiele-Innes elements to the a_0, i, ω and Ω Campbell elements see Chapter **??** in the on-line documentation.

G_THIELE_INNES_ERROR : Standard error of Thiele-Innes element G (float, Angle[mas])

Standard error of the Thiele-Innes element G of the orbit of the photocenter (for the orbital model). The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

For orbits with small eccentricities (`eccentricity` $<$ 0.0005 and `eccentricity_error` is absent, see Sect. **??**), `g_thiele_innes` is not an unknown in the model, being computed from A, B, F. `g_thiele_innes_error` is then set as unknown but it may be estimated applying the relations given in the documentation.

C_THIELE_INNES : C element of Thiele-Innes (double, Length & Distance[AU])

The Thiele-Innes element C representing the radial coordinate of the orbit of the primary around the barycenter, $C = a_1 \sin\omega \sin i$, see Heintz (1978). This parameter is fitted for orbital models based on the combination of astrometry and radial velocities (`nss_solution_type` = AstroSpectroSB1). See more details in the on-line documentation (Chapter **??**).

C_THIELE_INNES_ERROR : Standard error of C element of Thiele-Innes (float, Length & Distance[AU])

Standard error of the Thiele-Innes element C.

H_THIELE_INNES : H element of Thiele-Innes (double, Length & Distance[AU])

The Thiele-Innes element H representing the radial coordinate of the orbit of the primary around the barycenter, $H = a_1 \cos\omega \sin i$, see Heintz (1978). This parameter is fitted for orbital models based on the combination of astrometry and radial velocities (`nss_solution_type` = AstroSpectroSB1). See more details in the on-line documentation (Chapter **??**).

H_THIELE_INNES_ERROR : Standard error of H element of Thiele-Innes (float, Length & Distance[AU])

Standard error of the Thiele-Innes element H.

PERIOD : Orbital Period (double, Time[day])

Period of the orbital motion around the barycenter. For Eclipsing Binary solutions, it is the period obtained from the photometric variability analysis reported in field `vari_eclipsing_binary.frequency`. For EclipsingSpectro combined solution, it is either the aforementioned period, or the one stemming from the Spectroscopic binary model, in which case the bit 57 for `nss_two_body_orbit.flags` will be set to 1.

PERIOD_ERROR : Standard error of Orbital Period (float, Time[day])

Standard error of the period of the orbit of the photocenter around the barycenter. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

For Eclipsing Binary solutions, this error is provided in `nss_two_body_orbit.input_period_error`. For EclipsingSpectro combined solution, it is either the aforementioned period, or the one stemming from the Spectroscopic binary model, in which case the bit 57 for `nss_two_body_orbit.flags` will be set to 1.

T_PERIASTRON : Periastron epoch (double, Time[day])

The epoch at periastron is given relative to `gaia_source.ref_epoch`, in the range [−`period`/2, +`period`/2].

In case the eccentricity is not null, `t_periastron` is the time of periastron passage, whatever the input solution: astrometric, spectroscopic or eclipsing binary.

If the eccentricity is null, then the periastron has no meaning and the following convention is adopted:

- for astrometric binaries the periastron is positioned on the ascending node and in the absence of radial velocity measurements, the ascending node is the node whose position angle is between 0 and 180 degrees;
- for spectroscopic binaries the periastron is positioned on the ascending node, the definition of which is specified by the knowledge of the radial velocity curve and is the maximum of the radial velocity curve;
- for eclipsing binaries it is the time of primary eclipse;
- for combined eclipsing/spectroscopic binaries, it is the time of primary eclipse.

T_PERIASTRON_ERROR : Standard error of Periastron epoch (float, Time[day])

Standard error of the periastron epoch, `t_periastron`, defined above. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

ECCENTRICITY : eccentricity (double)

Eccentricity of the orbit.

ECCENTRICITY_ERROR : Standard error of eccentricity (float)

Standard error of the eccentricity of the orbit. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

If the eccentricity is null, a special circular or a pseudo-circular solution is implemented (see Sect. **??**) and the standard error will be null.

For orbits with small eccentricities (`eccentricity` $<$ 0.0005 and `eccentricity_error` is absent, see Sect. **??**), the standard error will be null to indicate that the orbit has been made pseudo-circular.

CENTER_OF_MASS_VELOCITY : The velocity of the center of mass (double, Velocity[km s^{-1}])

The radial velocity of the centre of mass for SB1, SB1C, SB2 and SB2C solutions.

CENTER_OF_MASS_VELOCITY_ERROR : Standard error of The velocity of the center of mass (float, Velocity[km s^{-1}])

Standard error of the center_of_mass_velocity as defined above. The standard errors are derived from the variance-covariance matrix of the final solution in the standard way.

SEMI_AMPLITUDE_PRIMARY : Semi-amplitude of the center of mass (double, Velocity[km s^{-1}])

The semi-amplitude of the radial velocity curve related to the first component: K1. The first component is either the only visible one (concerns SB1, SB1C solutions) or is expected to be any of the two stars (concerns SB2, SB2C solutions).

SEMI_AMPLITUDE_PRIMARY_ERROR : Standard error of Semi-amplitude of the center of mass (float, Velocity[km s^{-1}])

Standard error of the `semi_amplitude_primary` as defined above. The standard errors are derived from the variance-covariance matrix of the final solution in the standard way.

SEMI_AMPLITUDE_SECONDARY : The semiamplitude of the radial velocity curve for second component (double, Velocity[km s^{-1}])

The semi-amplitude of the radial velocity curve related to the second component: K2 (concerns SB2, SB2C solutions).

SEMI_AMPLITUDE_SECONDARY_ERROR : Standard error of The semiamplitude of the radial velocity curve for second component (float, Velocity[km s^{-1}])

Standard error of the `semi_amplitude_secondary` as defined above. The standard errors are derived from the variance-covariance matrix of the final solution in the standard way.

MASS_RATIO : Mass ratio (double)

The mass ratio $q = M_S/M_P$ is given only for EclipsingSpectro solutions.

MASS_RATIO_ERROR : Standard error of Mass ratio (float)

Standard error of the mass_ratio as defined above. In the pure spectroscopic (concerns SB2 and SB2C), the pure eclipsing, and the combined spectroscopic-eclipsing cases, the standard errors are derived from the variance-covariance matrix of the final solution in the standard way. In all the other cases, the standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

FILL_FACTOR_PRIMARY : Fill factor of primary (double)

The fill factor of the primary component, as determined from the eclipsing case. When $s_1 \in [0, 1)$ the component does not fill its Roche lobe. When $s_1 = 1$ the component fills its Roche lobe exactly (semi-detached system). When $s_1 > 1$ then $s_2 > 1$ as well, and the binary system is over-contact (common envelope system).

FILL_FACTOR_PRIMARY_ERROR : Standard error of Fill factor of primary (float)

Standard error of the fill factor of the primary as defined above, derived from the variance-covariance matrix of the final solution in the standard way.

FILL_FACTOR_SECONDARY : Fill factor of secondary (double)

The fill factor of the secondary component as determined from the eclipsing case. When $s_2 \in [0, 1)$ the component does not fill its Roche lobe. When $s_2 = 1$ the component fills its Roche lobe exactly (semi-detached system). When $s_2 > 1$ then $s_1 > 1$ as well, and the binary system is over-contact (common envelope system).

FILL_FACTOR_SECONDARY_ERROR : Standard error of Fill factor of secondary (float)

Standard error of the fill factor of the secondary as defined above, derived from the variance-covariance matrix of the final solution in the standard way.

INCLINATION : Orbital inclination (double, Angle[deg])

Inclination of the orbital plane with respect to the sky. The angle is estimated for eclipsing binary solutions only, and given between 0 and 90° within uncertainties. For astrometric binaries, the inclination is not an estimated parameter, as it is already represented by the A, B, F, G Thiele Innes elements, and should be derived from them.

INCLINATION_ERROR : Standard error of Orbital inclination (float, Angle[deg])

Standard error on the orbital inclination as derived from the eclipsing binary solution.

ARG_PERIASTRON : Argument of periastron (double, Angle[deg])

The argument of periastron is the angular position of the periastron as measured in the plane of the orbit in the sense of the object motion. When the spectroscopic orbit is established, the zero point of the angle is the ascending node (node on the line of nodes where the objects are moving away from the observer). In the absence of spectroscopic constraints, the zero point is the node whose position angle is between 0 and 180 degrees, the position angle being measured in the trigonometric direction. The argument of periastron is considered as fixed (no precession of the apsides). In the case of circular orbits, ω is undefined and set up arbitrarily to zero.

ARG_PERIASTRON_ERROR : Standard error of Argument of periastron (float, Angle[deg])

Standard error of the `arg_periastron` as defined above. In the pure spectroscopic case, the standard errors are derived from the variance-covariance matrix of the final solution in the standard way (concerns SB1, SB1C, SB2 and SB2C solutions). In all the other cases, the standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

TEMPERATURE_RATIO : Ratio of the effective temperatures (double)

Ratio of the fitted effective temperature over that of the unfitted effective temperature.

See `temperature_ratio_definition` for a description of the fitting scenario.

TEMPERATURE_RATIO_ERROR : Standard error of the ratio of the effective temperatures (double)

Standard error of the ratio of the effective temperatures, `temperature_ratio`.

TEMPERATURE_RATIO_DEFINITION : Code defining which fitting scenario did apply to the effective temperature (byte)

Code defining `temperature_ratio`:

1: temperature of the primary (fitted parameter) over temperature of the secondary (fixed parameter)

2: temperature of the secondary (fitted parameter) over temperature of the primary (fixed parameter)

with the convention that the primary component is always the one which is the more luminous in the G band.

ASTROMETRIC_N_OBS_AL : Total astrometric CCD observations in AL considered (int)

Total astrometric CCD observations considered in the along-scan direction.

ASTROMETRIC_N_GOOD_OBS_AL : Total astrometric CCD observations in AL actually used (int)

Total astrometric CCD observations actually used in the along-scan direction.

RV_N_OBS_PRIMARY : Total number of radial velocities considered for the primary (int)

Total number of epoch radial velocities considered for the primary.

RV_N_GOOD_OBS_PRIMARY : Total number of radial velocities actually used for the primary (int)

Total number of epoch radial velocities actually used for the primary.

RV_N_OBS_SECONDARY : Total number of radial velocities considered for the secondary in the case of SB2 (int)

Total number of epoch radial velocities considered for the secondary in the case of SB2.

RV_N_GOOD_OBS_SECONDARY : Total number of radial velocities actually used for the secondary in the case of SB2 (int)

Total number of epoch radial velocities actually used for the secondary in the case of SB2.

PHOT_G_N_OBS : Total number of G photometry measurements considered (int)

Total number of G epoch photometry measurements considered.

PHOT_G_N_GOOD_OBS : Total number of G photometry measurements actually used (int)

Total number of G epoch photometry measurements actually used.

BIT_INDEX : boolean mask for the fields above in the corr_vec matrix (long)

The `bit_index` field corresponds to a boolean mask indicating which of the parameters have been fitted by the model applicable to the non-single-star solution type labelled in `nss_solution_type`. This bit index can then be used in order to identify the fields corresponding to each element of the correlation matrix served through `corr_vec`. When a given parameter has not been fitted, the corresponding elements are empty in the correlation matrix.

`bit_index` contains N+1 bits, where the leading bit (MSB) is always 1, and the other N bits correspond to the possible parameters of a given model.

For solution types hosted in table `nss_two_body_orbit`, not all parameters of a given non-single star model are always fitted and the parameters covered in each case and the value taken by `bit_index` are given by:

- `nss_solution_type` = Orbital: these solutions have either all 12 parameters filled (bit index at 8191) or only 10 (bit index at 8179). The 12 parameters are the following:
  - `ra`
  - `dec`
  - `parallax`
  - `pmra`
  - `pmdec`
  - `a_thiele_innes`
  - `b_thiele_innes`

  - f_thiele_innes
  - g_thiele_innes (not fitted if bit_index = 8179)
  - eccentricity (not fitted if bit_index = 8179)
  - period
  - t_periastron

- nss_solution_type = OrbitalAlternative[Validated] and OrbitalTargetedSearch[Validated]: the following 13 parameters are fitted though the bit index takes value 8191 (i.e., the same as the 12 parameter fields in nss_solution_type = Orbital) as the astrometric_jitter term is not separately indexed in the bit representation.:
  - ra
  - dec
  - parallax
  - pmra
  - pmdec
  - a_thiele_innes
  - b_thiele_innes
  - f_thiele_innes
  - g_thiele_innes
  - period
  - eccentricity
  - t_periastron

- nss_solution_type = SB1: the following 6 parameters are fitted and the bit index consequently takes value 127:
  - period
  - center_of_mass_velocity
  - semi_amplitude_primary
  - eccentricity
  - arg_periastron
  - t_periastron

- nss_solution_type = SB1C: the following 4 parameters are fitted and the bit index consequently takes value 31:
  - period

- center_of_mass_velocity
- semi_amplitude_primary
- t_periastron

- nss_solution_type = SB2: the following 7 parameters are fitted and the bit index consequently takes value 255:
  - period
  - center_of_mass_velocity
  - semi_amplitude_primary
  - semi_amplitude_secondary
  - eccentricity
  - arg_periastron
  - t_periastron
- nss_solution_type = SB2C: the following 5 parameters are fitted and the bit index consequently takes value 63:
  - period
  - center_of_mass_velocity
  - semi_amplitude_primary
  - semi_amplitude_secondary
  - t_periastron
- nss_solution_type = AstroSpectroSB1: these solutions have either all 15 parameters filled (bit index at 65535) or only 12 (bit index at 65435). The 15 parameters are the following:
  - ra
  - dec
  - parallax
  - pmra
  - pmdec
  - a_thiele_innes
  - b_thiele_innes
  - f_thiele_innes
  - g_thiele_innes (not fitted if bit_index = 65435)
  - c_thiele_innes (not fitted if bit_index = 65435)

  - h_thiele_innes
  - center_of_mass_velocity
  - eccentricity (not fitted if bit_index = 65435)
  - period
  - t_periastron

- nss_solution_type = EclipsingBinary: the bit index can take different values and the following table indicates which of the possible 20 parameters are being fitted in each of the cases contemplated thereafter. In the case of temperature_ratio, the applicable index depends on the fitting scenario (see temperature_ratio_definition):

BitIndex	period	t_periastron	center_of_mass_velocity	semi_amplitude_primary	mass_ratio	fill_factor_primary	fill_factor_secondary	eccentricity	inclination	arg_periastron	temperature_ratio	temperature_ratio
1329216		X				X			X			X
1321088		X					X		X		X	
1342528		X				X	X	X	X	X		X
1337472		X				X	X		X		X	
1337408		X				X	X		X			X
1342592		X				X	X	X	X	X	X	
1329280		X				X			X		X	
1321024		X					X		X			X

- nss_solution_type = EclipsingSpectro: the bit index can take different values and the following table indicates which of the possible 20 parameters are being fitted in each of the cases contemplated thereafter. In the case of temperature_ratio, the applicable index depends on the fitting scenario (see temperature_ratio_definition):

BitIndex	period	tperiastron	center_of_mass_velocity	semi_amplitude_primary	mass_ratio	fill_factor_primary	fill_factor_secondary	eccentricity	inclination	arg_periastron	temperature_ratio	temperature_ratio
1566784		X	X	X	X	X	X		X			X
1517632		X	X	X			X		X			X
1566848		X	X	X	X	X	X		X		X	
1517696		X	X	X			X		X		X	
1539200		X	X	X		X	X	X	X	X	X	
1534080		X	X	X		X	X		X		X	
1534016		X	X	X		X	X		X			X

CORR_VEC : Vector form of the upper triangle of the correlation matrix (column-major ordered) (float[231] array)

Correlation matrix of the fitted profile parameters for the applicable non-single star solution. The parameters stored in this matrix and their order is given in the description of field `bit_index`. Since not all parameters of a given solution model are systematically fitted, the matrix can contain empty elements at the corresponding indices.

For astrometric binaries, contrary to the fields `obj_func` and `goodness_of_fit`, the matrix corresponds to a solution calculated by correcting the uncertainties of the astrometric transits so that the goodness-of-fit F_2 is zero.

Only non-zero, non-unity, correlation coefficients from the correlation matrix $\mathbf{M}$ are provided here. They are served as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

OBJ_FUNC : value of the objective function at the solution (float)

The χ^2, defined as $\sum_{i=1}^{n}(x_i - y_i)^2/\sigma_i^2$, where x_i is the observation of the ith transit, y_i is the value calculated from the model, and σ_i is the uncertainty associated to the observation.

GOODNESS_OF_FIT : goodness of fit in the Hipparcos sense (float)

Goodness-of-fit statistic of the solution. This is the 'gaussianized chi-square' (Wilson & Hilferty (1931)'s cube root transformation), which for good fits should approximately follow a normal distribution with zero mean value and unit standard deviation.

This statistic is computed according to the formula:

$$F2 = \sqrt{\frac{9\nu}{2}}\left(\sqrt[3]{\frac{obj\_func}{\nu}} + \frac{2}{9\nu} - 1\right)$$

where obj_func is hopefully a χ^2 and ν is the number of degrees of freedom.

EFFICIENCY : Efficiency of the solution (float)

The efficiency expresses the level of correlation between the parameters of a model. A value of 1 means a total absence of correlation whereas it falls to 0 as the correlation increases. It is defined as the n-th root of the ratio of the product of the diagonal elements of the covariance matrix and the product of the eigen value of that matrix. When all the covariances are 0, the matrix is diagonal and the ratio is exactly 1. See also Eichhorn (1989).

SIGNIFICANCE : The significance of the solution (i.e. how worth keeping a model is) (float)

It turns out that F2 is not always enough to decide whether a model is worth keeping or not. The significance, equivalent to a signal-to-noise ratio, addresses some of these limitations.

For astrometric binaries, it is defined as a function of the parameters that characterise the model, divided by its uncertainty. This uncertainty is derived from the solution covariance matrix, where the uncertainties are corrected in order to obtain the corrected goodness-of-fit $F2_{\text{corrected}} = 0$. The function characterising the orbital model is the semi-major axis, derived from the Thiele-Innes elements.

For spectroscopic binaries, this is the ratio of the semi-amplitude of the primary over its uncertainty.

FLAGS : Quality flag for the achieved NSS solution (long)

Processing flag applicable to specific non-single-star solutions. The meaning of each of those is given in the table below.

Flags bit number	Flag Meaning	Comment
Astrometric binary solutions		
0	No solution searched	The number of astrometric transits is less than or equal 5
1	No stochastic solution searched	The number of transits in ObsVarStar is less than or equal 5
2	Failure to compute a stochastic solution	This should never happen..
3-5	NA	Yet unassigned
6	RV available	
7	RV used for perspective acceleration correction	
Spectroscopic binary solutions		
8	BAD_UNCHECKED_NUMBER_OF_TRANSITS	The length of Transit is not sufficient to process the star (before removing bad transits)
9	NO_MORE_VARIABLE_AFTER_FILTERING	The curve is no more variable after the velocity filtering (at threshold 0.9)
10	BAD_CHECKED_NUMBER_OF_TRANSITS	The length of Transit is not sufficient to process the star (after removing bad transits)
11	SB2_REDIRECTED_TO_SB1_CHAIN_NOT_ENOUGH_COUPLE_MEASURES	SB2 is redirected to SB1 chain because there are not enough couple of measures
12	SB2_REDIRECTED_TO_SB1_CHAIN_PERIODS_NOT_COHERENT	SB2 is redirected to SB1 chain because the periods found by the SB1 and SB2 chains are not coherent.
13	NO_SIGNIFICANT_PERIODS_CAN_BE_FOUND	No significant period can be derived (no period from photometric variability analysis + peridogram peaks below the significance threshold)
14	REFINED_SOLUTION_DOES_NOT_CONVERGE	The refined orbital solution does not converge (with 50 iterations)
15	REFINED_SOLUTION_SINGULAR_VARIANCE_COVARIANCE_MATRIX	The variance covariance matrix can not be obtained (singular) for the refined solution
16	CIRCULAR_SOLUTION_SINGULAR_VARIANCE_COVARIANCE_MATRIX	The variance covariance matrix can not be obtained (singular) for the circular solution
17	TREND_SOLUTION_SINGULAR_VARIANCE_COVARIANCE_MATRIX	The variance covariance matrix can not be obtained (singular) for the trend solution
18	REFINED_SOLUTION_NEGATIVE_DIAGONAL_OF_VARIANCE_COVARIANCE_MATRIX	The diagonal of the variance covariance matrix is negative for the refined solution
19	CIRCULAR_SOLUTION_NEGATIVE_DIAGONAL_OF_VARIANCE_COVARIANCE_MATRIX	The diagonal of the variance covariance matrix is negative for the circular solution
20	TREND_SOLUTION_NEGATIVE_DIAGONAL_OF_VARIANCE_COVARIANCE_MATRIX	The diagonal of the variance covariance matrix is negative for the trend solution
21	CIRCULAR_SOLUTION_DOES_NOT_CONVERGE	The Lucy refined orbital solution diverges (with 50 iterations)
22	LUCY_TEST_APPLIED	The Lucy test has been applied
23	TREND_SOLUTION_NOT_APPLIED	The trend analysis has not been applied (case of unsorted SB2)
24	SOLUTION_OUTSIDE_E_LOGP_ENVELOP	The orbital solution (SB1 or SB2) is outside the e-log(P) envelop.
25	PERIOD_FOUND_IN_CU7_PERIODICITY	The period is equal to a period from CU7Periodicity.Period[] (within the quadratic sum of their errors)
26	FORTUITOUS_SB2	V1 and V2 seem to be un-correlated
27-31	NA	Yet unassigned
Eclipsing binary solutions		
32	No variance-covariance matrix	Covariance matrix computation failed
33-47	NA	Yet unassigned
Combined solutions		
48	NOCOMBINATION_FOUND	No combination found
49	BAD_GOF_COMBINATION	Reject a combination because of large GoF
50	WRONG_COMPONENT_COMBINATION	Reject a combination because the output produces different components (when combining stochastic and spectro)
51	SB2_TREATED_AS_SB1	When combining an astro+SB2 but it fails and then we treat it as SB1
52	STOCHA_TO_ORBITAL	When combining a stochasticAstro and SBxx , output: AstroSpectroSBx
53	STOCHA_TO_MULTIPLE	When combining a stochasticAstro and SBxx (but fitting 2 orbits), output: MultipleAstroSpectroSBx
54	ORBITALALTERNATIVE_TO_ORBITAL	Combination between an OrbitalAlternative and SBxx, output: AstroSpectroSBxx
55	TRIPLE_COMBINATION	When there is a successful triple combination, output: AstroSpectroSBx + EclipsingSpectro
56	TREND_COMBINATION	When we combine a spectroscopic trend solution or stochastic spectro
57	DU434_INPUT_USED	When trying an EclipsingSpectro combination with spectroscopic binaries input parameters and gives lower F2 than photometric binaries inputs parameters

CONF_SPECTRO_PERIOD : The probability of the period for not being due to (gaussian white) noise. Relevant for SB1, SB1C, SB2 and SB2C models. To be ignored otherwise. (float)

One of the first important step in the analysis of the RV time series suspected to present variations is the computation of a Fourier periodogram and the search for a period. A probability can be associated to the selected period. This probability is 1 - SL (significance level) where the SL is the probability to observe at least such a peak under the null-hypothesis of white noise. A probability of 1 indicates a very significant periodicity.

This field is only relevant for SB1, SB1C, SB2 and SB2C models and can be ignored otherwise.

R_POLE_SUM : Sum of the polar radii of primary and secondary (in units of the semi-major axis) (double)

The sum of the polar radii of the primary and secondary in the Roche model corresponding to the eclipsing solution. Provided as a convenience.

R_L1_POINT_SUM : L1-pointing radii of primary and secondary (in units of the semi-major axis) (double)

The sum of the radii of the primary and secondary that points towards the first Lagrange point (L_1) in the Roche model corresponding to the eclipsing solution. Provided as a convenience.

R_SPHER_SUM : Sum of the radii of sphere having the same volume as the primary and secondary (in units of the semi-major axis (double)

The sum of the radii of a sphere having the same volume as that of the Roche model for the primary and secondary. Provided as a convenience.

ECL_TIME_PRIMARY : Time of mid-eclipse of the primary by the secondary (double, Time[Julian Date (day)])

Time of mid-eclipse of the primary by the secondary, expressed relative to the same reference epoch as the periastron epoch, i.e., `gaia_source.ref_epoch`.

ECL_TIME_SECONDARY : Time of mid-eclipse of the secondary by the primary (double, Time[Julian Date (day)])

Time of mid-eclipse of the secondary by the primary, expressed relative to the same reference epoch as the periastron epoch, i.e., `gaia_source.ref_epoch`.

ECL_DUR_PRIMARY : Duration of primary eclipse assuming spherical components (double, Time[day])

An estimation of primary eclipse duration assuming spherical components with radii equal to the polar radii of the Roche model. This is generally accurate for detached systems but an underestimate for overcontact ones.

ECL_DUR_SECONDARY : Duration of secondary eclipse assuming spherical components (double, Time[day])

An estimation of secondary eclipse duration assuming spherical components with radii equal to the polar radii of the Roche model. This is generally accurate for detached systems but an underestimate for overcontact ones.

G_LUMINOSITY_RATIO : Ratio of the G-band luminosity of the secondary over the primary (double)

Ratio of the G-band luminosity of the secondary over the primary.

INPUT_PERIOD_ERROR : Standard error of the period taken from vari_eclipsing_binary.frequency_error (float, Time[day])

For Eclipsing Binary models, the period is not fitted but taken instead from the variability analysis published in table `vari_eclipsing_binary`. This input period is tabulated in `nss_two_body_orbit.perio` but its standard error is not indicated in `nss_two_body_orbit.period_error`. It is registered in `nss_two_body_orbit.input_period_error` instead.

G_RANK : Rank of the G-band solution (double)

An estimate of the quality of the fit based on the 'fraction of variance unexplained' (FVU) of the Eclipsing Binary model.

ASTROMETRIC_JITTER : Uncorrelated astrometric jitter term (double, Angle[mas])

In order to account for some poorly calibrated effects, this is an excess astrometric noise quadratically added to the uncertainty on the observations such that the resulting gaussianised Goodness of Fit is null. This applies to OrbitalAlternative[Validated] and OrbitalTargetedSearch[Validated] solutions only.

6.2 NSS_ACCELERATION_ASTRO

This table contains non-single-star astrometric models for sources having a non-linear proper motion which is compatible with an acceleration solution. Several possible models are hosted within the same table and they are indicated by the field `nss_solution_type`. The description of this latter lists all possible solution types considered for this release. Only a selection of parameters hosted in this table are provided here, depending on the solution. The details of those is given in the description of field `bit_index`, which can also be used to extract the relevant elements of the correlation vector `corr_vec`.

Details about the formalism used to derive the parameters in this table are given in the on-line documentation, see Chapter **??**.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Source Identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NSS_SOLUTION_TYPE : NSS model adopted (string)

This is the non-single star model which has been adopted for the published solution, see online documentation, Chapter **??**, for details.

The solution types covered in table `nss_acceleration_astro` are:

- Acceleration7: Acceleration model with 7 parameters
- Acceleration9: Acceleration model with 9 parameters

RA : Right ascension (double, Angle[deg])

Barycentric right ascension α of the source in ICRS at the reference epoch `gaia_source.ref_epoch`, compensated for the trajectory assumed by the model in order to be an average estimate.

RA_ERROR : Standard error of right ascension (float, Angle[mas])

Standard error $\sigma_{\alpha*} \equiv \sigma_{\alpha} \cos\delta$ of the right ascension of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

DEC : Declination (double, Angle[deg])

Barycentric declination δ of the source in ICRS at the reference epoch `gaia_source.ref_epoch`, compensated for the trajectory assumed by the model in order to be an average estimate.

DEC_ERROR : Standard error of declination (float, Angle[mas])

Standard error σ_{δ} of the declination of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

PARALLAX : Parallax (double, Angle[mas])

Absolute stellar parallax ϖ of the source at the reference epoch `gaia_source.ref_epoch`

PARALLAX_ERROR : Standard error of parallax (float, Angle[mas])

Standard error σ_{ϖ} of the stellar parallax at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

PMRA : Proper motion in right ascension direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in right ascension $\mu_{\alpha*} \equiv \mu_{\alpha} \cos\delta$ of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension. As for the position, the effect of the motion assumed in the model is compensated in order to be an average estimate.

PMRA_ERROR : Standard error of proper motion in right ascension direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\alpha*}$ of the local tangent plane projection of the proper motion vector in the direction of increasing right ascension at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

PMDEC : Proper motion in declination direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in declination μ_δ of the source at the reference epoch `gaia_source.ref_epoch`. This is the projection of the proper motion vector in the direction of increasing declination. As for the position, the effect of the motion assumed in the model is compensated in order to be an average estimate.

PMDEC_ERROR : Standard error of proper motion in declination direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\delta}$ of the proper motion component in declination at the reference epoch `gaia_source.ref_e`
The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

ACCEL_RA : Acceleration in RA (double, Misc[mas yr^{-2}])

Acceleration along the RA axis. This is the time derivative of `pmra`.

ACCEL_RA_ERROR : Standard error of Acceleration in RA (float, Misc[mas yr^{-2}])

Standard error of the acceleration along the RA axis. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

ACCEL_DEC : Acceleration in DEC (double, Misc[mas yr^{-2}])

Acceleration along the declination axis. This is the time derivative of `pmdec`.

ACCEL_DEC_ERROR : Standard error of Acceleration in DEC (float, Misc[mas yr^{-2}])

Standard error of the acceleration along the declination axis. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

DERIV_ACCEL_RA : Time derivative of the accel. in RA (double, Misc[mas yr^{-3}])

Time derivative of the acceleration along the RA axis, `accel_ra`.

DERIV_ACCEL_RA_ERROR : Standard error of Time derivative of the acceleration in RA (float, Misc[mas yr^{-3}])

Standard error of the time derivative of the acceleration along the RA axis. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

DERIV_ACCEL_DEC : Time derivative of the accel. in DEC (double, Misc[mas yr^{-3}])

Time derivative of the acceleration along the declination axis, `accel_dec`.

DERIV_ACCEL_DEC_ERROR : Standard error of Time derivative of the acceleration in DEC (float, Misc[mas yr^{-3}])

Standard error of the time derivative of the acceleration along the declination axis. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

ASTROMETRIC_N_OBS_AL : Total astrometric CCD observations in AL considered (int)

Total astrometric CCD observations considered in the along-scan direction. Dimension : Number of sources

ASTROMETRIC_N_GOOD_OBS_AL : Total astrometric CCD observations in AL actually used (int)

Total astrometric along–scan CCD observations that may have been used in the calculation of the solution. For the acceleration solutions, up to 5% of these transits may have been discarded as being outliers.

BIT_INDEX : Boolean mask for the fields above in the corr_vec matrix (long)

The bit_index field corresponds to a boolean mask indicating which of the parameters have been fitted by the model applicable to the non-single-star solution type labelled in nss_solution_type. This bit index can then be used in order to identify the fields corresponding to each element of the correlation matrix served through corr_vec. When a given parameter has not been fitted, the corresponding elements are empty in the correlation matrix.

bit_index contains N+1 bits, where the leading bit (MSB) is always 1, and the other N bits correspond to the possible parameters of a given model.

For solution types hosted in table nss_acceleration_astro, all parameters of a given non-single star model are always fitted and all bits are set to 1. The parameters covered in each case and the value taken by bit_index are:

- nss_solution_type = Acceleration7: the following 7 parameters are fitted and the bit index consequently takes value 255:
  - ra
  - dec
  - parallax
  - pmra
  - pmdec
  - accel_ra
  - accel_dec
- nss_solution_type = Acceleration9: the following 9 parameters are fitted and the bit index consequently takes value 1023:
  - ra
  - dec
  - parallax
  - pmra
  - pmdec
  - accel_ra
  - accel_dec
  - deriv_accel_ra

– deriv_accel_dec

CORR_VEC : Vector form of the upper triangle of the correlation matrix (float[98] array)

Correlation matrix of the fitted profile parameters for the applicable non-single star solution. The parameters stored in this matrix and their order is given in the description of field `bit_index`. Since not all parameters of a given solution model are systematically fitted, the matrix can contain empty elements at the corresponding indices.

Contrary to the fields `obj_func` and `goodness_of_fit`, the matrix corresponds to a solution calculated by correcting the uncertainties of the astrometric transits so that the goodness-of-fit F_2 is zero.

Only non-zero, non-unity, correlation coefficients from the correlation matrix **M** are provided here. They are served as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

OBJ_FUNC : Value of the objective function at the solution (float)

The χ^2, defined as $\sum_{i=1}^{n}(x_i - y_i)^2/\sigma_i^2$, where x_i is the abscissa of the ith transit, y_i is the value calculated from the model, and σ_i is the uncertainty obtained from the astrometric reduction, without any correction.

GOODNESS_OF_FIT : Goodness of fit in the Hipparcos sense (float)

Goodness-of-fit statistic of the solution. This is the 'gaussianized chi-square' (Wilson & Hilferty (1931)'s cube root transformation), which for good fits should approximately follow a normal distribution with zero mean value and unit standard deviation.

This statistic is computed according to the formula:

$$F2 = \sqrt{\frac{9\nu}{2}}\left(\sqrt[3]{\frac{obj\_func}{\nu}} + \frac{2}{9\nu} - 1\right)$$

where obj_func is hopefully a χ^2 and ν is the number of degrees of freedom.

SIGNIFICANCE : The significance of the solution (i.e. how worth keeping a model is) (float)

It turns out that `goodness_of_fit` is not always enough to decide whether a model is worth keeping or not. The significance addresses some these limitations.

For astrometric binaries, it is defined as a function of the parameters that characterise the model, divided by its uncertainty. This uncertainty is derived from the solution covariance matrix, where the uncertainties are corrected in order to obtain the corrected goodness-of-fit $F_{2\ corrected} = 0$. The function characterising the model is as follows: (a) for the acceleration 7 model, it is the norm of the acceleration vector; (b) for the acceleration 9 model, it is the norm of the time derivative of the acceleration vector.

FLAGS : Quality flag for the achieved NSS solution (long)

Processing flag applicable to specific non-single-star solutions. The meaning of each of those is given in the table below.

Flags bit number	Flag Meaning
6	RV available
7	RV used for perspective acceleration correction

6.3 NSS_NON_LINEAR_SPECTRO

This table contains non-single-star orbital models for spectroscopic binaries compatible with a trend. Several possible models are hosted within the same table and they are indicated by the field `nss_solution_type`. The description of this latter lists all possible solution types considered for this release. Only a selection of parameters hosted in this table are provided here, depending on the solution. The details of those is given in the description of field `bit_index`, which can also be used to extract the relevant elements of the correlation vector `corr_vec`.

Details about the formalism used to derive the parameters in this table are given in the on-line documentation, see Chapter **??**.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Source Identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NSS_SOLUTION_TYPE : NSS model adopted (string)

This is the non-single star model which has been adopted for the published solution, see online documentation, Chapter **??**, for details.

The solution types covered in table `nss_non_linear_spectro` are:

- FirstDegreeTrendSB1: Single Lined first degree trend
- FirstDegreeTrendSB2: Double Lined first degree trend

MEAN_VELOCITY : Mean velocity (double, Velocity[km s^{-1}])

The mean_velocity as calculated over the current mission.

MEAN_VELOCITY_ERROR : Standard error of Mean velocity (float, Velocity[km s^{-1}])

Standard error of `mean_velocity`. The standard errors are derived from the variance-covariance matrix of the final solution in the standard way.

FIRST_DERIV_VELOCITY : First order derivative of the velocity (double, Acceleration[km s^{-1} day^{-1}])

The coefficient of the first degree term in the fitting polynomial (for solutions FirstDegreeTrendSB1, FirstDegreeTrendSB2, SecondDegreeTrendSB1, SecondDegreeTrendSB2, ThirdDegreeTrendSB1, ThirdDegreeTrendSB2, FourthDegreeTrendSB1, FourthDegreeTrendSB2).

FIRST_DERIV_VELOCITY_ERROR : Standard error of First order derivative of the velocity (float, Acceleration[km s^{-1} day^{-1}])

Standard error of the first acceleration. The standard errors are derived from the variance-covariance matrix of the final solution in the standard way.

SECOND_DERIV_VELOCITY : Second order derivative of the velocity (double, Acceleration[km s^{-1} day^{-2}])

The coefficient of the second degree term in the fitting polynomial (SecondDegreeTrendSB1, SecondDegreeTrendSB2, ThirdDegreeTrendSB1, ThirdDegreeTrendSB2, FourthDegreeTrendSB1, FourthDegreeTrendSB2).

SECOND_DERIV_VELOCITY_ERROR : Standard error of Second order derivative of the velocity (float, Acceleration[km s^{-1} day^{-2}])

Standard error of the second acceleration. The standard errors are derived from the variance-covariance matrix of the final solution in the standard way.

RV_N_OBS_PRIMARY : Total number of radial velocities considered for the primary (int)

Total number of radial velocities considered for the primary.

RV_N_GOOD_OBS_PRIMARY : Total number of radial velocities actually used for the primary (int)

Total number of radial velocities actually used for the primary.

BIT_INDEX : Boolean mask for the fields above in the corr_vec matrix (long)

The `bit_index` field corresponds to a boolean mask indicating which of the parameters have been fitted by the model applicable to the non-single-star solution type labelled in `nss_solution_type`. This bit index can then be used in order to identify the fields corresponding to each element of the correlation matrix served through `corr_vec`. When a given parameter has not been fitted, the corresponding elements are empty in the correlation matrix.

`bit_index` contains N+1 bits, where the leading bit (MSB) is always 1, and the other N bits correspond to the possible parameters of a given model.

For solution types hosted in table `nss_non_linear_spectro`, not all parameters of a given non-single star model are always fitted and the parameters covered in each case and the value taken by `bit_index` are given by:

- `nss_solution_type` = FirstDegreeTrendSB1: the following 2 parameters are fitted and the bit index consequently takes value 7:
  - `mean_velocity`
  - `first_deriv_velocity`
- `nss_solution_type` = SecondDegreeTrendSB1: the following 3 parameters are fitted and the bit index consequently takes value 15:
  - `mean_velocity`
  - `first_deriv_velocity`
  - `second_deriv_velocity`

CORR_VEC : Vector form of the upper triangle of the correlation matrix (float[36] array)

Correlation matrix of the fitted profile parameters for the applicable non-single star solution. The parameters stored in this matrix and their order is given in the description of field `bit_index`. Since not all parameters of a given solution model are systematically fitted, the matrix can contain empty elements at the corresponding indices.

Only non-zero, non-unity, correlation coefficients from the correlation matrix **M** are provided here. They are served as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$
\mathbf{M} = \begin{bmatrix}
1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\
 & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\
 & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\
 & & & 1 & C[9] & \cdots & C[S-(n-4)] \\
 & & & & \ddots & \ddots & \vdots \\
 & & & & & 1 & C[S-1] \\
 & & & & & & 1
\end{bmatrix}
$$

OBJ_FUNC : Value of the objective function at the solution (float)

Non-normalised chi-square of the trend solution.

GOODNESS_OF_FIT : Goodness of fit in the Hipparcos sense (float)

Goodness-of-fit statistic of the solution. This is the 'gaussianized chi-square' (Wilson & Hilferty (1931)'s cube root transformation), which for good fits should approximately follow a normal distribution with zero mean value and unit standard deviation.

This statistic is computed according to the formula:

$$F2 = \sqrt{\frac{9\nu}{2}}\left(\sqrt[3]{\frac{obj\_func}{\nu}} + \frac{2}{9\nu} - 1\right)$$

where obj_func is hopefully a χ^2 and ν is the number of degrees of freedom.

FLAGS : Quality flag for the achieved NSS solution (long)

Processing flag applicable to specific non-single-star solutions. The meaning of each of those is given in the table below.

Flags bit number	Flag Meaning	Comment
8	BAD_UNCHECKED_NUMBER_OF_TRANSITS	The length of Transit is not sufficient to process the star (before removing bad transits)
9	NO_MORE_VARIABLE_AFTER_FILTERING	The curve is no more variable after the velocity filtering (at threshold 0.9)
10	BAD_CHECKED_NUMBER_OF_TRANSITS	The length of Transit is not sufficient to process the star (after removing bad transits)
11	SB2_REDIRECTED_TO_SB1_CHAIN_NOT_ENOUGH_COUPLE_MEASURES	SB2 is redirected to SB1 chain because there are not enough couple of measures
12	SB2_REDIRECTED_TO_SB1_CHAIN_PERIODS_NOT_COHERENT	SB2 is redirected to SB1 chain because the periods found by the SB1 and SB2 chains are not coherent.
13	NO_SIGNIFICANT_PERIODS_CAN_BE_FOUND	No significant period can be derived (no period from photometric variability analysis + peridogram peaks below the significance threshold)
14	REFINED_SOLUTION_DOES_NOT_CONVERGE	The refined orbital solution does not converge (with 50 iterations)
15	REFINED_SOLUTION_SINGULAR_VARIANCE_COVARIANCE_MATRIX	The variance covariance matrix can not be obtained (singular) for the refined solution
16	CIRCULAR_SOLUTION_SINGULAR_VARIANCE_COVARIANCE_MATRIX	The variance covariance matrix can not be obtained (singular) for the circular solution
17	TREND_SOLUTION_SINGULAR_VARIANCE_COVARIANCE_MATRIX	The variance covariance matrix can not be obtained (singular) for the trend solution
18	REFINED_SOLUTION_NEGATIVE_DIAGONAL_OF_VARIANCE_COVARIANCE_MATRIX	The diagonal of the variance covariance matrix is negative for the refined solution
19	CIRCULAR_SOLUTION_NEGATIVE_DIAGONAL_OF_VARIANCE_COVARIANCE_MATRIX	The diagonal of the variance covariance matrix is negative for the circular solution
20	TREND_SOLUTION_NEGATIVE_DIAGONAL_OF_VARIANCE_COVARIANCE_MATRIX	The diagonal of the variance covariance matrix is negative for the trend solution
21	CIRCULAR_SOLUTION_DOES_NOT_CONVERGE	The Lucy refined orbital solution diverges (with 50 iterations)
22	LUCY_TEST_APPLIED	The Lucy test has been applied
23	TREND_SOLUTION_NOT_APPLIED	The trend analysis has not been applied (case of unsorted SB2)
24	SOLUTION_OUTSIDE_E_LOGP_ENVELOP	The orbital solution (SB1 or SB2) is outside the e-log(P) envelop.
25	PERIOD_FOUND_IN_CU7_PERIODICITY	The period is equal to a period from CU7Periodicity.Period[] (within the quadratic sum of their errors)
26	FORTUITOUS_SB2	V1 and V2 seem to be un-correlated

6.4 NSS_VIM_FL

This table contains non-single-star models for sources compatible with an Variability Induced Mover (VIM) solution. Several possible models are in principle hosted within the same table and they are indicated by the field nss_solution_type. The description of this latter lists all possible solution types considered for this release. Only a selection of parameters hosted in this table are provided here, depending on the solution. The details of those is given in the description of field bit_index, which can also be used to extract the relevant elements of the correlation vector corr_vec.

For DR3, only VIMF solutions are provided here.

Details about the formalism used to derive the parameters in this table are given in the on-line documentation, see Chapter **??**.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit https://gaia.esac.esa.int/decoder/solnDecoder.jsp

SOURCE_ID : Source Identifier (long)

A unique single numerical identifier of the source obtained from gaia_source (for a detailed description see gaia_source.source_id).

NSS_SOLUTION_TYPE : NSS model adopted (string)

This is the non-single star model which has been adopted for the published solution, see online documentation, Chapter **??**, for details.

The solution types covered in table nss_vim_fl are:

- VIMF: Variability-Induced Mover with fixed configuration

RA : Right ascension (double, Angle[deg])

Right ascension α of the source in ICRS at the reference epoch `gaia_source.ref_epoch`, if the total flux is then equal to the reference flux.

RA_ERROR : Standard error of right ascension (float, Angle[mas])

Standard error $\sigma_{\alpha*} \equiv \sigma_\alpha \cos\delta$ of the right ascension of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

DEC : Declination (double, Angle[deg])

Declination δ of the source in ICRS at the reference epoch `gaia_source.ref_epoch`, if the total flux is then equal to the reference flux.

DEC_ERROR : Standard error of declination (float, Angle[mas])

Standard error σ_δ of the declination of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

PARALLAX : Parallax (double, Angle[mas])

Absolute stellar parallax ϖ of the source at the reference epoch `gaia_source.ref_epoch`

PARALLAX_ERROR : Standard error of parallax (float, Angle[mas])

Standard error σ_ϖ of the stellar parallax at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

PMRA : Proper motion in right ascension direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in right ascension $\mu_{\alpha*} \equiv \mu_\alpha \cos\delta$ of the source in ICRS at the reference epoch `gaia_source.ref_epoch`. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension.

PMRA_ERROR : Standard error of proper motion in right ascension direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\alpha*}$ of the local tangent plane projection of the proper motion vector in the direction of increasing right ascension at the reference epoch `gaia_source.ref_epoch`. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

PMDEC : Proper motion in declination direction (double, Angular Velocity[mas yr^{-1}])

Proper motion in declination μ_δ of the source at the reference epoch `gaia_source.ref_epoch`. This is the projection of the proper motion vector in the direction of increasing declination.

PMDEC_ERROR : Standard error of proper motion in declination direction (float, Angular Velocity[mas yr^{-1}])

Standard error $\sigma_{\mu\delta}$ of the proper motion component in declination at the reference epoch `gaia_source.ref_e`
The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

REF_FLUX_G : Reference flux in the G band (float, Flux[e$^-$ s^{-1}])

The photocenter of a VIM object moves in relation to its total flux in the G band. In a VIMF solution, the position (`ra, dec`) is the mean position of the object when its total flux is the reference flux. In practice, the reference flux is close to (or is) the median flux of the object.

VIM_D_RA : VIM coordinate in RA (double, Angle[mas])

The coordinate, on the RA axis and measured from the variable component, of the position of the photocenter when the total flux is equal to the reference flux. The right ascension of the variable component is therefore: `ra` - `vim_d_ra`.

VIM_D_RA_ERROR : Standard error of VIM coordinate in RA (float, Angle[mas])

Standard error of the coordinate of the photocentre on the RA axis. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

VIM_D_DEC : VIM coordinate in DEC (double, Angle[mas])

The coordinate, on the declination axis and measured from the variable component, of the position of the photocenter when the total flux is equal to the reference flux. The declination of the variable component is therefore: `dec` - `vim_d_dec`.

VIM_D_DEC_ERROR : Standard error of VIM coordinate in DEC (float, Angle[mas])

Standard error of the coordinate of the photocentre on the declination axis. The standard errors are derived from the variance-covariance matrix of the solution, correcting the measurement uncertainties to obtain the goodness-of-fit F2=0.

ASTROMETRIC_N_OBS_AL : Total astrometric CCD observations in AL considered (int)

Total astrometric CCD observations considered in the along-scan direction.

ASTROMETRIC_N_GOOD_OBS_AL : Total astrometric CCD observations in AL actually used (int)

Total astrometric CCD observations actually used in the along-scan direction.

BIT_INDEX : Boolean mask for the fields above in the corr_vec matrix (long)

The `bit_index` field corresponds to a boolean mask indicating which of the parameters have been fitted by the model applicable to the non-single-star solution type labelled in `nss_solution_type`. This bit index can then be used in order to identify the fields corresponding to each element of the correlation matrix served through `corr_vec`. When a given parameter has not been fitted, the corresponding elements are empty in the correlation matrix.

`bit_index` contains N+1 bits, where the leading bit (MSB) is always 1, and the other N bits correspond to the possible parameters of a given model.

For solution types hosted in table `nssVimFl`, all parameters of a given non-single star model are always fitted and all bits are set to 1. The parameters covered in each case and the value taken by `bit_index` are given by:

- `nss_solution_type` = VIMF: the following 7 parameters are fitted and the bit index consequently takes value 255:
  - `ra`
  - `dec`
  - `parallax`
  - `pmra`
  - `pmdec`
  - `vim_d_ra`
  - `vim_d_dec`

CORR_VEC : Vector form of the upper triangle of the correlation matrix (float[50] array)

Correlation matrix of the fitted profile parameters for the applicable non-single star solution. The parameters stored in this matrix and their order is given in the description of field `bit_index`. Since not all parameters of a given solution model are systematically fitted, the matrix can contain empty elements at the corresponding indices.

Contrary to the fields `obj_func` and `goodness_of_fit`, the matrix corresponds to a solution calculated by correcting the uncertainties of the astrometric transits so that the goodness-of-fit F_2 is zero.

Only non-zero, non-unity, correlation coefficients from the correlation matrix $\mathbf{M}$ are provided here. They are served as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

OBJ_FUNC : Value of the objective function at the solution (float)

The χ^2, defined as $\sum_{i=1}^{n}(x_i - y_i)^2/\sigma_i^2$, where x_i is the abscissa of the ith transit, y_i is the value calculated from the model, and σ_i is the uncertainty obtained from the astrometric reduction, without any correction.

GOODNESS_OF_FIT : Goodness of fit in the Hipparcos sense (float)

Goodness-of-fit statistic of the solution. This is the 'gaussianized chi-square' (Wilson & Hilferty (1931)'s cube root transformation), which for good fits should approximately follow a normal distribution with zero mean value and unit standard deviation.

This statistic is computed according to the formula:

$$F2 = \sqrt{\frac{9\nu}{2}}\left(\sqrt[3]{\frac{obj\_func}{\nu}} + \frac{2}{9\nu} - 1\right)$$

where obj_func is hopefully a χ^2 and ν is the number of degrees of freedom.

EFFICIENCY : Efficiency of the solution (float)

The efficiency expresses the level of correlation between the parameters of a model. A value of 1 means a total absence of correlation whereas it falls to 0 as the correlation increases. It is defined as the n-th root of the ratio of the product of the diagonal elements of the covariance matrix and the product of the eigen value of that matrix. When all the covariances are 0, the matrix is diagonal and the ratio is exactly 1. See also Eichhorn (1989).

SIGNIFICANCE : The significance of the solution (i.e. how worth keeping a model is) (float)

It turns out that F2 is not always enough to decide whether a model is worth keeping or not. The significance addresses some these limitations.

For astrometric binaries, it is defined as a function of the parameters that characterise the model, divided by its revised uncertainty. This uncertainty is derived from the solution covariance matrix, where the uncertainties are corrected in order to obtain the corrected goodness-of-fit $F2_{\text{corrected}} = 0$. The function characterising the model is as follows: for the VIMF model, it is the norm of the position of the photocenter for the reference flux, measured from the variable component, i.e. the norm of the vector (`vim_d_ra`,`vim_d_dec`).

FLAGS : Quality flag for the achieved NSS solution (long)

Processing flag applicable to specific non-single-star solutions. The meaning of each of those is given in the table below.

Flags bit number	Flag Meaning
6	RV available
7	RV used for perspective acceleration correction

7 Photometry

7.1 EPOCH_PHOTOMETRY

Epoch photometry. Each row in this table contains the light curve for a given object in bands G, BP and RP as stored in the DataLink Massive data base. This table makes extensive use of array types. It can be obtained selecting the RAW data structure option. A flat table (sparse cube), which one photometric point per source per row can be obtained using INDIVIDUAL or COMBINED.

Note this table is not available through the main archive TAP interface, but via the Massive Data service, indexed by the VO Datalink protocol, described in Sect. ??.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`)

N_TRANSITS : Number of Gaia transits (short)

TRANSIT_ID : Transit unique identifier (long[`n_transits`] array)

The `transit_id` is a unique identifier assigned to each detected (and confirmed) source as it transits the Gaia focal plane. Each time a given source is detected as Gaia scans and re-scans the sky a new `transit_id` will be created to badge that apparition. Hence the along–scan time and the across–scan position along with the telescope in which the source was detected are used to form a unique integer with which to label the transit.

The several features of a detection that are encoded in `transit_id` can be easily retrieved using bit masks (&) and shifts (>>) as follows:

- On-Board Mission Time line [ns] = 204800 * ((`transit_id` >> 17) & (0x000003FFFFFFFFFF))
- Field-of-view = 1 + (`transit_id` >> 15) & 0x03 [1 for 'preceding' and 2 for 'following' fields-of-view respectively]
- CCD row = (`transit_id` >> 12) & 0x07 [dimensionless, in the range 1 to 7]
- Across-scan 'reference acquisition pixel' in strip AF1 = (`transit_id`) & 0x0FFF [pixels] (this is the across-scan centre of the AF1 window and is odd if immediately below the mid-point of the window and even if immediately above)

where the bit mask prefix '0x' denotes hexadecimal.

For further details see Portell et al. (2020). For convenience a decoder for `transit_id` is available on-line at

`https://gaia.esac.esa.int/decoder/transitidDecoder.jsp`

G_TRANSIT_TIME : Transit averaged G band observing time (double[`n_transits`] array, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Field-of-view transit averaged observation time in units of Barycentric JD (in TCB), in days minus 2 455 197.5, computed as follows. First the observation time is converted from On-board Mission Time (OBMT) into Julian date in TCB (Temps Coordonnée Barycentrique). Next a correction is applied for the light-travel time to the Solar system barycentre, resulting in Barycentric Julian Date (BJD). Finally an offset of 2 455 197.5 days is applied (corresponding to a reference time T_0 at 2010-01-01T00:00:00) to have a conveniently small numerical value. Although the centroiding time accuracy of the individual CCD observations is (much) below 1 ms, this per-FoV observation time is averaged over typically 9 CCD observations taken in a time range of about 44 sec.

G_TRANSIT_FLUX : Transit averaged G band flux (double[`n_transits`] array, Flux[$e^- s^{-1}$])

The average G flux value, a combination of individual SM-AF CCD fluxes

G_TRANSIT_FLUX_ERROR : Transit averaged G band flux error (double[n_transits] array, Flux[e$^-$ s^{-1}])

The uncertainty flux_error on flux is the uncertainty on the weighted mean G flux of the set of SM/AF individual CCD observations for the transit. This accounts for intrinsic scatter in the data. The exact formula and further details are given in Carrasco et al. (2017).

G_TRANSIT_FLUX_OVER_ERROR : Transit averaged G band flux divided by its error (float[n_transits] array)

Mean flux in the band divided by its error.

G_TRANSIT_MAG : Transit averaged G band Vega magnitude (double[n_transits] array, Magnitude[mag])

G band Vega magnitude. It is computed from the flux applying the E/DR3 zero-point defined in https://www.cosmos.esa.int/web/gaia/edr3-passbands.

G_TRANSIT_N_OBS : Number of CCD observations contributing to transit averaged G band flux (byte[n_transits] array)

Number of CCD transits contributing to the transit averaged G flux (g_flux and g_flux_error).

BP_OBS_TIME : BP CCD transit observing time (double[n_transits] array, Time[Barycentric JD in TCB – 2 455 197.5 (day)])

Observation time of the BP CCD transit in units of Barycentric JD (in TCB), in days minus 2 455 197.5, computed as follows. First the observation time is converted from On-board Mission Time (OBMT) into Julian date in TCB (Temps Coordonnée Barycentrique). Next a correction is applied for the light-travel time to the Solar system barycentre, resulting in Barycentric Julian Date (BJD). Finally an offset of 2 455 197.5 days is applied (corresponding to a reference time T_0 at 2010-01-01T00:00:00) to have a conveniently small numerical value.

BP_FLUX : BP band flux (double[n_transits] array, Flux[e$^-$ s^{-1}])

The integrated BP flux value of the transit. If the BP flux has been rejected or is unavailable, the flux will be set to NaN.

BP_FLUX_ERROR : BP band flux error (double[`n_transits`] array, Flux[e^{-} s^{-1}])

The uncertainty `flux_error` on `flux` is the uncertainty on the BP flux. This is the uncertainty associated with the single BP CCD transit available for a FoV transit. It includes photon noise and all applicable calibration errors. If the BP flux has been rejected or is unavailable, the value will be set to NaN (in VOTable and FITS formats) and an empty string (in plain text CSV format).

BP_FLUX_OVER_ERROR : BP band flux divided by its error (float[`n_transits`] array)

Mean flux in the band divided by its error. If the BP flux has been rejected or is unavailable, this value will be set to NaN.

BP_MAG : BP band Vega magnitude (double[`n_transits`] array, Magnitude[mag])

BP band Vega magnitude. It is computed from the flux applying the E/DR3 zero-point defined in `https://www.cosmos.esa.int/web/gaia/edr3-passbands`.

RP_OBS_TIME : RP CCD transit observing time (double[`n_transits`] array, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Observation time of the RP CCD transit in units of Barycentric JD (in TCB), in days minus 2 455 197.5, computed as follows. First the observation time is converted from On-board Mission Time (OBMT) into Julian date in TCB (Temps Coordonnée Barycentrique). Next a correction is applied for the light-travel time to the Solar system barycentre, resulting in Barycentric Julian Date (BJD). Finally an offset of 2 455 197.5 days is applied (corresponding to a reference time T_0 at 2010-01-01T00:00:00) to have a conveniently small numerical value.

RP_FLUX : RP band flux (double[`n_transits`] array, Flux[e^{-} s^{-1}])

The integrated RP flux value of the transit. If the RP flux has been rejected or is unavailable, the flux will be set to NaN.

RP_FLUX_ERROR : RP band flux error (double[`n_transits`] array, Flux[e^{-} s^{-1}])

The uncertainty `flux_error` on `flux` is the uncertainty on the RP flux. This is the uncertainty associated with the single RP CCD transit available for a FoV transit. It includes photon noise and all applicable calibration errors. If the RP flux has been rejected or is unavailable, the value will be set to NaN (in VOTable and FITS formats) and an empty string (in plain text CSV format).

RP_FLUX_OVER_ERROR : RP band flux divided by its error (float[n_transits] array)

Mean flux in the band divided by its error. If the RP flux has been rejected or is unavailable, this value will be set to NaN.

RP_MAG : RP band Vega magnitude (double[n_transits] array, Magnitude[mag])

RP band Vega magnitude. It is computed from the flux applying the E/DR3 zero-point defined in https://www.cosmos.esa.int/web/gaia/edr3-passbands.

PHOTOMETRY_FLAG_NOISY_DATA : G band flux scatter larger than expected by photometry processing (all CCDs considered) (boolean[n_transits] array)

PHOTOMETRY_FLAG_SM_UNAVAILABLE : SM transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF1_UNAVAILABLE : AF1 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF2_UNAVAILABLE : AF2 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF3_UNAVAILABLE : AF3 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF4_UNAVAILABLE : AF4 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF5_UNAVAILABLE : AF5 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF6_UNAVAILABLE : AF6 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF7_UNAVAILABLE : AF7 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF8_UNAVAILABLE : AF8 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF9_UNAVAILABLE : AF9 transit unavailable by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_BP_UNAVAILABLE : BP transit unavailable by photometry processing (boolean[n_trans array)

PHOTOMETRY_FLAG_RP_UNAVAILABLE : RP transit unavailable by photometry processing (boolean[n_trans array)

PHOTOMETRY_FLAG_SM_REJECT : SM transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF1_REJECT : AF1 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF2_REJECT : AF2 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF3_REJECT : AF3 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF4_REJECT : AF4 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF5_REJECT : AF5 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF6_REJECT : AF6 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF7_REJECT : AF7 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF8_REJECT : AF8 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_AF9_REJECT : AF9 transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_BP_REJECT : BP transit rejected by photometry processing (boolean[n_transits] array)

PHOTOMETRY_FLAG_RP_REJECT : RP transit rejected by photometry processing (boolean[n_transits] array)

VARIABILITY_FLAG_G_REJECT : Average G transit photometry rejected by variability processing (boolean[n_transits] array)

Rejected by DPAC variability processing (or variability analysis), or negative (unphysical) flux.

VARIABILITY_FLAG_BP_REJECT : BP transit photometry rejected by variability processing (boolean[n_trans array)

Rejected by DPAC variability processing (or variability analysis), or negative (unphysical) flux.

VARIABILITY_FLAG_RP_REJECT : RP transit photometry rejected by variability processing (boolean[n_trans array)

Rejected by DPAC variability processing (or variability analysis), or negative (unphysical) flux.

8 Reference frame

8.1 GAIA_CRF3_XM

This table contains the full cross-match information for the Gaia-CRF3 sources. The Gaia-CRF3 sources were selected from the cross-matches with 17 external QSO catalogues as detailed below (three of which are parts of ICRF3 described in the first paper). For each Gaia-CRF3 source the information in which external catalogue this source was found and which name(s) this source has in those external catalogues is provided. The table allows the user to get all sources from an external catalogue that are in Gaia-CRF3.

The external catalogues from which the Gaia-CRF3 sources were compiled are:

- The third realization of the International Celestial Reference Frame by very long baseline interferometry (Charlot et al. 2020)
- A New Version of the OCARS Catalogue of Optical Characteristics of Astrometric Radio Sources (Malkin 2018) (the catalogue downloaded from `http://www.gaoran.ru/english/as/ac_vlbi/#OCARS` on 17 June 2020)
- Identification of 1.4 Million Active Galactic Nuclei in the Mid-Infrared using WISE Data (Secrest et al. 2015)
- The WISE AGN Catalogue (Assef et al. 2018)
- The Million Quasars (Milliquas) Catalogue, v6.4 (Flesch 2019) with the v6.5 (2020) update
- The Sloan Digital Sky Survey Quasar Catalogue: Fourteenth data release (Pâris et al. 2018)
- LQAC-5: The fifth release of the Large Quasar Astrometric Catalogue. A compilation of 592 809 objects with 398 697 Gaia counterparts (Souchay et al. 2019)
- The Large Sky Area Multi-object Fiber Spectroscopic Telescope (LAMOST) Quasar Survey: The Fourth and Fifth Data Releases (Yao et al. 2019) – see also `https://nadc.china-vo.org/data/article/20190107155838`
- The large quasar reference frame (LQRF). An optical representation of the ICRS (Andrei et al. 2009)
- The 2dF QSO Redshift Survey - XII. The spectroscopic catalogue and luminosity function (Croom et al. 2004)

- The 5th edition of the Roma-BZCAT (Massaro et al. 2015)
- 2WHSP: A multi-frequency selected catalogue of high energy and very high energy γ-ray blazars and blazar candidates (Chang et al. 2017)
- ALMA photometry of extragalactic radio sources (Bonato et al. 2019)
- Catalogues of active galactic nuclei from Gaia and unWISE data (Shu et al. 2019)
- Quasar and galaxy classification in Gaia Data Release 2 (Bailer-Jones et al. 2019)

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Gaia source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

ICRF3SX : The flag describing if the Gaia-CRF3 source was found in ICRF3 S/X (boolean)

The flag describing if the Gaia-CRF3 source was found in ICRF3 S/X (Charlot et al. 2020).

ICRF3K : The flag describing if the Gaia-CRF3 source was found in ICRF3 K (boolean)

The flag describing if the Gaia-CRF3 source was found in ICRF3 K (Charlot et al. 2020).

ICRF3XKA : The flag describing if the Gaia-CRF3 source was found in ICRF3 X/Ka (boolean)

The flag describing if the Gaia-CRF3 source was found in ICRF3 X/Ka (Charlot et al. 2020).

ICRF_NAME : The ICRF name of the source (string)

The ICRF name for this source (Charlot et al. 2020).

IERS_NAME : The IERS name of the source (string)

The IERS name for this source (Charlot et al. 2020).

OCARS : The flag describing if the Gaia-CRF3 source was found in OCARS (boolean)

The flag describing if the Gaia-CRF3 source was found in OCARS (Malkin 2018).

OCARS_NAME : The name for this source in OCARS (string)

The name for this source in OCARS (Malkin 2018) – the catalogue downloaded from `http://www.gaoran.ru/english/as/ac_vlbi/#OCARS` on 19 June 2020.

AW15 : The flag describing if the Gaia-CRF3 source was found in allWISE (boolean)

The flag describing if the Gaia-CRF3 source was found in AllWISE (Secrest et al. 2015).

AW15_NAME : The name for this source in allWISE (string)

The name for this source in AllWISE (Secrest et al. 2015).

R90 : The flag describing if the Gaia-CRF3 source was found in the catalogue R90 (boolean)

The flag describing if the Gaia-CRF3 source was found in the catalogue R90 (Assef et al. 2018).

R90_NAME : The name for this source in R90 (string)

The name for this source in R90 (Assef et al. 2018).

m65 : The flag describing if the Gaia-CRF3 source was found in Milliquas v6.5 (boolean)

The flag describing if the Gaia-CRF3 source was found in Milliquas (Flesch 2019) v6.5 (2020) update.

m65_name : The name for this source in Milliquas v6.5 (string)

The name for this source in Milliquas (Flesch 2019) v6.5 (2020) update.

c75 : The flag describing if the Gaia-CRF3 source was found in the catalogue C75 (boolean)

The flag describing if the Gaia-CRF3 source was found in the catalogue C75 (Assef et al. 2018).

c75_name : The name for this source in C75 (string)

The name for this source in C75 (Assef et al. 2018).

dr14q : The flag describing if the Gaia-CRF3 source was found in the catalogue SDSS DR14Q (boolean)

The flag describing if the Gaia-CRF3 source was found in SDSS DR14Q (Pâris et al. 2018).

dr14q_name : The name for this source in SDSS DR14Q (string)

The name for this source in SDSS DR14Q (Pâris et al. 2018).

lqac5 : The flag describing if the Gaia-CRF3 source was found in LQAC-5 (boolean)

The flag describing if the Gaia-CRF3 source was found in LQAC-5 (Souchay et al. 2019).

lqac5_name : The name for this source in LQAC-5 (string)

The name for this source in LQAC-5 (Souchay et al. 2019).

lamost5 : The flag describing if the Gaia-CRF3 source was found in the LAMOST QSO catalogue (boolean)

The flag describing if the Gaia-CRF3 source was found in the LAMOST QSO catalogue (Yao et al. 2019); `https://nadc.china-vo.org/data/article/20190107155838`

LAMOST5_NAME : The name for this source in the LAMOST QSO catalogue (string)

The name for this source in the LAMOST QSO catalogue (Yao et al. 2019); `https://nadc.china-vo.org/data/article/20190107155838`

LQRF : The flag describing if the Gaia-CRF3 source was found in LQRF (boolean)

The flag describing if the Gaia-CRF3 source was found in LQRF (Andrei et al. 2009).

LQRF_NAME : The name for this source in LQRF (string)

The name for this source in LQRF (Andrei et al. 2009).

CAT2QZ : The flag describing if the Gaia-CRF3 source was found in 2QZ (boolean)

The flag describing if the Gaia-CRF3 source was found in 2QZ (Croom et al. 2004).

CAT2QZ_NAME : The name for this source in 2QZ (string)

The name for this source in 2QZ (Croom et al. 2004).

BZCAT5 : The flag describing if the Gaia-CRF3 source was found in Roma-BZCAT, v5 (boolean)

The flag describing if the Gaia-CRF3 source was found in Roma-BZCAT, v5 (Massaro et al. 2015).

BZCAT5_NAME : The name for this source in Roma-BZCAT, v5 (string)

The name for this source in Roma-BZCAT, v5 (Massaro et al. 2015).

CAT2WHSPJ : The flag describing if the Gaia-CRF3 source was found in 2WHSPJ (boolean)

The flag describing if the Gaia-CRF3 source was found in 2WHSPJ (Chang et al. 2017).

CAT2WHSPJ_NAME : The name for this source in 2WHSPJ (string)

The name for this source in 2WHSPJ (Chang et al. 2017).

ALMA19 : The flag describing if the Gaia-CRF3 source was found in the ALMA calibrator catalogue (boolean)

The flag describing if the Gaia-CRF3 source was found in the ALMA calibrator catalogue (Bonato et al. 2019).

ALMA19_NAME : The name for this source in the ALMA calibrator catalogue (string)

The name for this source in the ALMA calibrator catalogue (Bonato et al. 2019).

GUW : The flag describing if the Gaia-CRF3 source was found in Gaia-unWISE (boolean)

The flag describing if the Gaia-CRF3 source was found in Gaia-unWISE (Shu et al. 2019).

GUW_NAME : The name for this source in Gaia-unWISE (string)

The name for this source in Gaia-unWISE (Shu et al. 2019).

B19 : The flag describing if the Gaia-CRF3 source was found in the Gaia DR2 quasar and galaxy classification catalogue (boolean)

The flag describing if the Gaia-CRF3 source was found in the Gaia DR2 quasar and galaxy classification catalogue (Bailer-Jones et al. 2019).

B19_NAME : The name for this source in the Gaia DR2 quasar and galaxy classification catalogue (string)

The name for this source in the Gaia DR2 quasar and galaxy classification catalogue (Bailer-

Jones et al. 2019).

8.2 AGN_CROSS_ID

Table agn_cross_id lists sources whose positions and proper motions define the celestial reference frame of the Gaia catalogue (Gaia–CRF3). The table lists the sources in Gaia (E)DR3 cross-matched to sources in a number of external AGN catalogues. The first column is the source identifier in the external catalogue specified in the third column, the second column is the source identifier in Gaia (E)DR3.

The selection of sources and the quality of the Gaia-CRF3 are discussed in Klioner et al. (2021).

Columns description:

SOURCE_NAME_IN_CATALOGUE : Identifier in the external catalogue (string)

Source name in the external catalogue (see description in agn_cross_id.catalogue_name).

SOURCE_ID : Gaia source identifier (long)

A unique single numerical identifier of the source obtained from gaia_source (for a detailed description see gaia_source.source_id).

CATALOGUE_NAME : Name of the external catalogue (string)

A unique name for each considered external catalogue used to cross match QSOs. Only one identification is given here even if the same source occurs in more than one catalogue. Further details are given in Chapter **??** of the full documentation.

8.3 FRAME_ROTATOR_SOURCE

Sources used to compute the Gaia reference frame.

The AGIS frame rotator algorithm has two different parts: the reference frame orientation; and the reference frame spin. The reference frame orientation is fixed using the International Earth Rotation and Reference System Service (=IERS) position of a subset of IERS sources defining the third realization of the International Coordinate Reference Frame (Charlot et al. 2020), `http://hpiers.obspm.fr/icrs-pc/newwww/icrf/index.php`. The reference frame spin is defined using the Gaia proper motion of a list of QSOs. The reference frame algorithms have an outliers scheme. Hence for each aspect we provide the considered sources and the used sources actually used, and the number of used sources might be lower than the number of considered sources.

Columns description:

SOURCE_ID : Gaia source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

CONSIDERED_FOR_REFERENCE_FRAME_ORIENTATION : Considered for the reference frame orientation (boolean)

True if the source was a considered source for the reference frame orientation, false otherwise.

USED_FOR_REFERENCE_FRAME_ORIENTATION : Used for the reference frame orientation (boolean)

True if the source was effectively used for the reference frame orientation, false otherwise.

CONSIDERED_FOR_REFERENCE_FRAME_SPIN : Considered for the reference frame spin (boolean)

True if the source was a considered source for the reference frame spin determination, false otherwise.

USED_FOR_REFERENCE_FRAME_SPIN : Used for the reference frame spin (boolean)

True if the source was effectively used for the reference frame spin determination, false otherwise.

9 Science alert tables

9.1 SCIENCE_ALERTS

Table containing all Gaia Photometric Science Alerts triggered in the period 25-07-2014 to 28-05-2017, i.e. the time span covered by DR3.

A Gaia Photometric Science Alert is known to the community by its name Gaiannxyz where nn is the year number and xyz is an incrementing, alphabetic sequence starting at aaa. Science alerts have their details published on the WWW. Given the name of an alert, the URL for the published details can be derived, e.g. `https://gsaweb.ast.cam.ac.uk/alerts/alert/Gaia18ahj` for alert Gaia18ahj.

The `source_id` associated to the alert may have other alternative matches in Gaia DR3. These other identifiers are listed in table `alerts_mixedin_sourceids`.

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

TRANSIT_ID : Alerting transit identifier (long)

The `transit_id` is a unique identifier assigned to each detected (and confirmed) source as it transits the Gaia focal plane. Each time a given source is detected as Gaia scans and re-scans the sky a new `transit_id` will be created to badge that apparition. Hence the along–scan time and the across–scan position along with the telescope in which the source was detected are used to form a unique integer with which to label the transit.

The several features of a detection that are encoded in `transit_id` can be easily retrieved using bit masks (&) and shifts (>>) as follows:

- On-Board Mission Time line [ns]
  = 204800 * ((`transit_id` >> 17) & (0x000003FFFFFFFFFF))
- Field-of-view = 1 + (`transit_id` >> 15) & 0x03 [1 for ‘preceding’ and 2 for ‘following’ fields-of-view respectively]
- CCD row = (`transit_id` >> 12) & 0x07 [dimensionless, in the range 1 to 7]

- Across-scan 'reference acquisition pixel' in strip AF1 = (`transit_id`) & 0x0FFF [pixels] (this is the across-scan centre of the AF1 window and is odd if immediately below the mid-point of the window and even if immediately above)

where the bit mask prefix '0x' denotes hexadecimal.

For further details see Portell et al. (2020). For convenience a decoder for `transit_id` is available on-line at

`https://gaia.esac.esa.int/decoder/transitidDecoder.jsp`

NAME : Name of alert (string)

Name of the alert, in the format 'Gaiannabc', where nn is the year-number and abc is an incrementing, alphabetic sequence, starting at aaa in each year.

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

9.2 ALERTS_MIXEDIN_SOURCEIDS

Some photometric science alerts mix transits from their primary source and other sources in the catalogue. This is done when those sources are believed to be associated with a single, astrophysical source.

This table lists the identifier for these mixed-in sources, linking them to the primary source_ids listed in table `science_alerts`.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

ALERT_SOURCE_ID : Primary source_id associated to the alert (long)

The primary `source_id` associated to the alert, as listed in table `science_alerts`.

MIXED_IN_SOURCE_ID : Additional source_id, if any, associated to the alert (long)

Identifier of the additional source_id, if any, associated to the science alert.

10 Simulation tables

10.1 GAIA_SOURCE_SIMULATION

Table of sources realised according to the Gaia Object Generator (GOG) simulation. Observed attributes are given with simulated observational uncertainties.

This table contains the output of GOG. The values are obtained after adding the corresponding uncertainty (based on the error models) to the true values in table `gaia_universe_model`. Both the values and the uncertainties are provided.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Long Identifier (long)

A unique source identifier composed by the type of source, the sky region where the source is located and a sequential number inside this region (see the `source_extended_id` in `gaia_universe_model` table).

In the `source_id` information is coded within the 64 bit long integer. The celestial position is encoded via a level 12 Hierarchical Triangular Mesh, covering roughly one square arc minute size on the average:

- The 4 most significant bits contain the object type: (0: Unknown; 1: Stellar; 2: Galaxy; 3: QSO; 4: Supernova; 5: Exoplanet; 6: Noise or PPE; 7: Cluster; 8: Planetary Nebulae; 9: HII Region; 10: GRB; 11: Asteroid; 12: Comet; 13: Planet; 14: Satellite; 15: User Source; -1: Not identified)
- The 28 following bits contain the HTM index at level 12 (note the use of HTM as opposed to HEALPix in `source_id` in `gaia_source`)

- One bit indicates the variability,
- One bit indicates whether this is a multiple system (i.e. not a component).
- The 4 next groups of 3 bits are the 4 hierarchical levels for a multiple system. It is based on the fact that the maximum multiplicity of a hierarchical multiple system currently known is 7 (i.e. 3 bits are needed) with a 4 levels depth. The components in a level are sequential (i.e. non-hierarchical).
- The 18 least significant bits concern the object number in the region.

RA : Right Ascension (double, Angle[deg])

GOG simulation of the right ascension of the barycentre at J2010 reference epoch in ICRS frame

RA_ERROR : Right Ascension error (float, Angle[mas])

GOG simulation of the standard error of right ascension

DEC : Declination (double, Angle[deg])

GOG simulation of the declination of the barycentre at J2010 reference epoch in ICRS frame

DEC_ERROR : Declination error (float, Angle[mas])

GOG simulation of the standard error of declination

PARALLAX : Parallax (float, Angle[mas])

GOG simulation of the parallax of the source. The inverse of the parallax is the distance from the barycenter of the Solar System to the barycenter of the source at J2010 reference epoch

PARALLAX_ERROR : Parallax error (float, Angle[mas])

GOG simulation of the standard error of parallax

PMRA : Proper motion in RA (float, Angular Velocity[mas yr^{-1}])

GOG simulation of the proper motion along right ascension at J2010 reference epoch: $\mu_{\alpha*} \equiv \mu_{\alpha}\cos\delta$. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension.

PMRA_ERROR : Error in RA proper motion (float, Angular Velocity[mas yr^{-1}])

GOG simulation of the standard error of proper motion in right ascension direction

PMDEC : Proper motion in dec (float, Angular Velocity[mas yr^{-1}])

GOG simulation of the proper motion along declination at J2010 reference epoch. This is the projection of the proper motion vector in the direction of increasing declination.

PMDEC_ERROR : Error in dec. proper motion (float, Angular Velocity[mas yr^{-1}])

GOG simulation of the standard error of proper motion in declination direction

N_OBS_AL : Number of AL observations (int)

AL number of accepted observations

N_OUTLIERS_AL : Number of outliers AL observations (int)

AL number of outliers observations

PHOT_G_MEAN_FLUX : Mean G flux (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean flux in the G band.

PHOT_G_MEAN_FLUX_ERROR : Mean G flux error (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean G-band flux error

PHOT_G_MEAN_MAG : Mean G magnitude (float, Magnitude[mag])

GOG simulation of the apparent mean magnitude in the G band in the Vega scale.

PHOT_BP_MEAN_FLUX : Mean BP flux (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean flux in the BP band

PHOT_BP_MEAN_FLUX_ERROR : Mean BP flux error (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean BP flux error

PHOT_BP_MEAN_MAG : Mean BP magnitude (float, Magnitude[mag])

GOG simulation of the mean apparent magnitude in the integrated BP band in the Vega scale.

PHOT_RP_MEAN_FLUX : Mean RP flux (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean flux in the RP band.

PHOT_RP_MEAN_FLUX_ERROR : Mean RP flux error (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean RP flux error

PHOT_RP_MEAN_MAG : Mean RP magnitude (float, Magnitude[mag])

GOG simulation of the mean apparent magnitude in the integrated RP band in the Vega scale.

PHOT_RVS_MEAN_FLUX : Mean RVS flux (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean flux in the RVS band.

PHOT_RVS_MEAN_FLUX_ERROR : Mean RVS flux error (float, Flux[e^{-} s^{-1}])

GOG simulation of the mean RVS flux error

PHOT_RVS_MEAN_MAG : Mean RVS magnitude (float, Magnitude[mag])

GOG simulation of the mean apparent magnitude in the integrated RVS band in the Vega scale.

RADIAL_VELOCITY : Radial velocity (float, Velocity[km s^{-1}])

GOG simulation of the spectroscopic radial velocity in the solar barycentric reference frame at J2010 reference epoch.

RADIAL_VELOCITY_ERROR : Radial velocity error (float, Velocity[km s^{-1}])

GOG simulation of the radial velocity error

TEFF : Effective temperature (float, Temperature[K])

GOG simulation of the star effective temperature

TEFF_ERROR : Effective temperature error (float, Temperature[K])

GOG simulation of the star effective temperature error

VSINI : v sin i (float, Velocity[km s^{-1}])

GOG simulation of the rotational velocity

VSINI_ERROR : v sin i error (float, Velocity[km s^{-1}])

GOG simulation of the rotational velocity error

A0 : Extinction at 550 nm (float, Magnitude[mag])

GOG simulation of the extinction at 550 nm

A0_ERROR : Extinction at 550 nm error (float, Magnitude[mag])

GOG simulation of the extinction at 550 nm error

FEH : Iron abundance (float, Abundances[dex])

GOG simulation of the iron abundance

FEH_ERROR : Iron abundance error (float, Abundances[dex])

GOG simulation of the iron abundance error

LOGG : Surface gravity (float, GravitySurface[log cgs])

GOG simulation of the log10 of the surface gravity (log cgs)

LOGG_ERROR : Surface gravity Error (float, GravitySurface[log cgs])

GOG simulation of the log10 of the surface gravity error

10.2 GAIA_UNIVERSE_MODEL

Table of simulated galactic stars according to the Gaia Universal Model Simulation (GUMS). True values of the intrinsic simulated quantities (astrometry, photometry and physical parameters) for the sources generated by GOG using the Universe Model are given. No errors are added.

Columns description:

SOURCE_EXTENDED_ID : Extended source identifier (string)

Unique object String identifier describing:

- the object type. Here only stars or stellar systems are present, code ='*'
- the HTM region of the object (0-268435455)
- the object number in this region (0-262143)
- the multiplicity (Washington Double Stars Catalogue -WDS- type, 7 components, 4 hierarchical levels max)
- a variability flag ('V')

Example: *000000455-000035Ab2V is a variable star and component Ab2 in a 3-level system. This system is the 35th of the HTM region 455. Such a system as at least 7 sources present in the GUMS table: *000000455-000035+ (the system), *000000455-000035A+, *000000455-000035B, *000000455-000035Aa, *000000455-000035Ab+, *000000455-000035Ab1, *000000455-000035Ab2V

SOURCE_ID : Long Identifier (long)

A unique source identifier composed by the type of source, the sky region where the source is located and a sequential number inside this region (as the `source_extended_id`).

In the `source_id` information is coded within the 64 bit long integer. The celestial position is encoded via a level 12 Hierarchical Triangular Mesh, covering roughly one square arc minute size on the average:

- The 4 most significant bits contain the object type: (0: Unknown; 1: Stellar; 2: Galaxy; 3: QSO; 4: Supernova; 5: Exoplanet; 6: Noise or PPE; 7: Cluster; 8:

Planetary Nebulae; 9: HII Region; 10: GRB; 11: Asteroid; 12: Comet; 13: Planet; 14: Satellite; 15: User Source; -1: Not identified)

- The 28 following bits contain the HTM index at level 12 (note the use of HTM as opposed to HEALPix in `source_id` in `gaia_source`)
- One bit indicates the variability,
- One bit indicates whether this is a multiple system (i.e. not a component).
- The 4 next groups of 3 bits are the 4 hierarchical levels for a multiple system. It is based on the fact that the maximum multiplicity of a hierarchical multiple system currently known is 7 (i.e. 3 bits are needed) with a 4 levels depth. The components in a level are sequential (i.e. non-hierarchical).
- The 18 least significant bits concern the object number in the region.

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

RA : Right Ascension (double, Angle[deg])

Right ascension of the barycentre at J2010 reference epoch in ICRS frame

DEC : Declination (double, Angle[deg])

Declination of the barycentre at J2010 reference epoch in ICRS frame

BARYCENTRIC_DISTANCE : Barycentric distance to the simulated source (float, Length & Distance[pc])

Distance from the barycenter of the Solar System to the barycenter of the source at J2010 reference epoch

PMRA : Proper motion along right ascension (float, Angular Velocity[mas yr^{-1}])

Proper motion along right ascension at J2010 reference epoch: $\mu_{\alpha*} \equiv \mu_\alpha \cos\delta$. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension.

PMDEC : Proper motion along declination (float, Angular Velocity[mas yr^{-1}])

Proper motion along declination at J2010 reference epoch. This is the projection of the proper motion vector in the direction of increasing declination.

RADIAL_VELOCITY : Radial Velocity (float, Velocity[km s^{-1}])

Spectroscopic radial velocity in the solar barycentric reference frame at J2010 reference epoch.

MAG_G : Mean Apparent G magnitude (float, Magnitude[mag])

Mean apparent magnitude in the G band in the Vega scale.

MAG_BP : Mean Apparent BP magnitude (float, Magnitude[mag])

Mean Apparent magnitude in the integrated BP band in the Vega scale.

MAG_RP : Mean Apparent RP magnitude (float, Magnitude[mag])

Mean Apparent magnitude in the integrated RP band in the Vega scale.

MAG_RVS : Mean Apparent RVS magnitude (float, Magnitude[mag])

Mean Apparent magnitude in the integrated RVS band in the Vega scale.

V_I : (V-I) colour (float, Magnitude[mag])

Intrinsic V-I colour (Johnson-Cousins)

MEAN_ABSOLUTE_V : Mean Absolute V magnitude (float, Magnitude[mag])

Mean Absolute V (Johnson) magnitude

AG : Absorption in G (float, Magnitude[mag])

line-of-sight interstellar absorption in the G band

AV : Absorption in V (float, Magnitude[mag])

line-of-sight interstellar absorption in the V band

TEFF : Effective temperature (float, Temperature[K])

Stellar effective temperature.

SPECTRAL_TYPE : spectral class + luminosity class (string)

Stellar MK classification

LOGG : Surface gravity (float, GravitySurface[log cgs])

Stellar surface gravity log g

FEH : Metallicity (float, Abundances[dex])

Stellar metallicity [Fe/H]

ALPHAFE : Alpha elements (float, Abundances[dex])

Abundance of alpha-elements with respect to iron [α/Fe]

MBOL : Absolute bolometric magnitude (float, Magnitude[mag])

Mean absolute bolometric magnitude

AGE : Age (float, Time[Gyr])

Age of the stellar source (Gyr)

MASS : Mass (float, Mass[Solar Mass])

Stellar mass

RADIUS : Radius (float, Length & Distance[Solar Radius])

Stellar radius (mean value for variable pulsating stars)

VSINI : Rotational velocity (float, Velocity[km s^{-1}])

Projected rotational velocity

POPULATION : Population (int)

Galactic stellar population: 1=thin disc, 2=thick disc, 3=spheroid, 4=bulge

HAS_PHOTOCENTER_MOTION : Boolean describing if the photocenter has or not motion (boolean)

Field to describe if the photocenter has or not stellar hotspot induced motion

NC : Number of components (int)

nb of components (a component can be either one star or a system)

NT : Total number of object (int)

total number of objects (stars, brown dwarfs or exoplanets) in the system

SEMIMAJOR_AXIS : Semi major axis (float, Length & Distance[AU])

semi-major axis of the orbit of the component (for multiple systems)

ECCENTRICITY : Eccentricity (float)

Eccentricity of the orbit of the component (for multiple systems)

INCLINATION : Inclination (float, Angle[deg])

Inclination of the orbit of the component (for multiple systems)

LONGITUDE_ASCENDING_NODE : Longitude of ascending node (float, Angle[deg])

Longitude of the ascending node of the orbit of the component (for multiple systems)

ORBIT_PERIOD : Period of the orbit (float, Time[day])

Period of the orbit of the component (for multiple systems)

PERIASTRON_DATE : Date of periastron (float, Time[day])

Periastron date of the orbit of the component (for multiple systems)

PERIASTRON_ARGUMENT : Periastron argument (float, Angle[deg])

Periastron argument of the orbit of the component (for multiple systems)

VARIABILITY_TYPE : Variability type (string)

Stellar variability type : ACV, be, cepheid, classicalnovae, deltascuti, dwarfnovae, DYPer, emission, Flaring, gammador, microlens, mira, RCrBs, RRab, RRc, roAp, semiregular, ZZceti

VARIABILITY_AMPLITUDE : Amplitude of variability (float, Magnitude[mag])

Photometric variability amplitude in V magnitude

VARIABILITY_PERIOD : Period of variability (float, Time[day])

Photometric variability period.

VARIABILITY_PHASE : Phase of variability (float)

Photometric variability phase at J2010 reference epoch

R_ENV_R_STAR : Envelope characterisic for Be stars (float)

Envelope characteristic parameter for Be stars

11 Solar System object tables

11.1 SSO_SOURCE

This table contains data related to Solar System objects observed by Gaia. The quantities in the table are derived from data reduction and are associated to single objects.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Source identifier (long)

A unique single numerical identifier of the source. Note in particular that these identifiers are by convention negative for SSOs.

NUM_OF_OBS : number of observations (int)

Number of CCD-level observations of the asteroid that appear in the sso_observation table.

NUMBER_MP : Minor Planet number (long)

Minor planet number attributed by the Minor Planet Centre (MPC). It is set to zero for the natural planetary satellites and the candidate new minor planets.

DENOMINATION : standard MPC denomination of the asteroid (string)

Name of the object. It follows the Minor Planet Centre convention for the minor planets. For bundle of observations that are not identified at the time of the data processing, the name is a string like Gaia-DR3SSO-<RN> where RN is a running number unique to the bundle. For the natural satellites of the major planets, its standard name is given followed by a string (XYY) where X is the first letter of the planetary system it belongs to, and YY is the number of the satellite in Roman numeral.

NUM_OF_SPECTRA : Number of epoch spectra used to compute the average (int)

Number of epoch spectra combined to generate the mean reflectance spectrum.

11.2 SSO_OBSERVATION

Solar System object observations. Each table line contains data obtained during the transit of the source on a single CCD, during a single transit. The corresponding epoch is provided. Data not varying within the transit are repeated identically for all single observations of that transit.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Source identifier (long)

A unique single numerical identifier of the source. Note in particular that these identifiers are by convention negative for SSOs.

DENOMINATION : standard MPC denomination of the asteroid (string)

Name of the object. It follows the Minor Planet Centre convention for the minor planets. For bundle of observations that are not identified at the time of the data processing, the name is a string like Gaia-DR3SSO-<RN> where RN is a running number unique to the bundle. For the natural satellites of the major planets, its standard name is given followed by a string (XYY) where X is the first letter of the planetary system it belongs to, and YY is the number of the satellite in Roman numeral.

TRANSIT_ID : Transit Identifier (long)

The `transit_id` is a unique identifier assigned to each detected (and confirmed) source as it transits the Gaia focal plane. Each time a given source is detected as Gaia scans and re-scans the sky a new `transit_id` will be created to badge that apparition. Hence the along–scan time and the across–scan position along with the telescope in which the source was detected are used to form a unique integer with which to label the transit.

The several features of a detection that are encoded in `transit_id` can be easily retrieved using bit masks (&) and shifts (>>) as follows:

- On-Board Mission Time line [ns]
  = 204800 * ((`transit_id` >> 17) & (0x000003FFFFFFFFFF))
- Field-of-view = 1 + (`transit_id` >> 15) & 0x03 [1 for ‘preceding’ and 2 for ‘following’ fields-of-view respectively]
- CCD row = (`transit_id` >> 12) & 0x07 [dimensionless, in the range 1 to 7]
- Across-scan ‘reference acquisition pixel’ in strip AF1 = (`transit_id`) & 0x0FFF [pixels] (this is the across-scan centre of the AF1 window and is odd if immediately below the mid-point of the window and even if immediately above)

where the bit mask prefix ‘0x’ denotes hexadecimal.

For further details see Portell et al. (2020). For convenience a decoder for `transit_id` is available on-line at

`https://gaia.esac.esa.int/decoder/transitidDecoder.jsp`

OBSERVATION_ID : Observation Identifier (long)

Identifier at single CCD level of the observation of a Solar System object. It is unique, and obtained from a combination of `transit_id` and an integer number representing the CCD strip: OBSERVATION_ID = TRANSIT_ID * 10 + AF CCD number

NUMBER_MP : Minor Planet number (long)

Minor planet number attributed by the Minor Planet Centre (MPC). It is set to zero for the natural planetary satellites and the candidate new minor planets.

EPOCH : Gaia-centric epoch TCB(Gaia) (double, Time[Gaia-Centric JD in TCB − 2 455 197.5 (day)])

Gaia-centric epoch TCB(Gaia) in JD corresponding to the time of crossing of the fiducial line of the CCD (mid exposure). This is the epoch to which the target coordinates and the position/velocity of Gaia are referred. To avoid loss of precision the reference time J2010.0 has been subtracted.

EPOCH_ERR : Error in Gaiacentric epoch (double, Time[day])

The error in the Gaiacentric epoch (for both `epoch` and `epoch_utc`).

EPOCH_UTC : Gaia-centric TCB epoch converted to UTC (double, Time[Gaia-Centric JD in UTC − 2 455 197.5 (day)])

Gaiacentric epoch in UTC in JD-J2010.0 corresponding to right ascension and declination obtained from the conversion of TCB(Gaia) to UTC.

RA : Right ascension of the source (double, Angle[deg])

ICRS right ascension of the source as observed by Gaia at `epoch`, corrected for full relativistic aberration but not for relativistic light deflection in the gravitational field of the Solar System.

DEC : Declination of the source (double, Angle[deg])

ICRS declination of the source as observed by Gaia at `epoch`, corrected for full relativistic aberration but not for relativistic light deflection in the gravitational field of the Solar System.

RA_ERROR_SYSTEMATIC : Standard error of right ascension - systematic (double, Angle[mas])

Uncertainty on right ascension, systematic component (assumed to be constant during a transit), multiplied by cos of declination.

DEC_ERROR_SYSTEMATIC : Standard error of declination - systematic (double, Angle[mas])

Standard error for declination, systematic component (assumed to be constant during a transit).

RA_DEC_CORRELATION_SYSTEMATIC : Correlation of ra and dec errors - systematic (double)

Correlation of ra_error_systematic and dec_error_systematic.

RA_ERROR_RANDOM : Standard error of right ascension - random (double, Angle[mas])

Uncertainty on right ascension, random component, multiplied by cos of declination.

DEC_ERROR_RANDOM : Standard error of declination - random (double, Angle[mas])

Standard error for declination, random component.

RA_DEC_CORRELATION_RANDOM : Correlation of ra and dec errors - random (double)

Correlation of ra and dec uncertainty, random component.

G_MAG : Calibrated G mag (double, Magnitude[mag])

G magnitude derived from `g_flux`.

G_FLUX : Average calibrated G flux for the transit (double, Flux[e^{-} s^{-1}])

Average calibrated G flux for the transit.

G_FLUX_ERROR : Error on the G flux (double, Flux[e^{-} s^{-1}])

Error on the average transit-level G flux derived from the individual CCD-level flux measurements of the single transit.

X_GAIA : Barycentric x position of Gaia (double, Length & Distance[AU])

Barycentric equatorial J2000 (ICRS) x position of Gaia at the epoch of the observation.

Y_GAIA : Barycentric y position of Gaia (double, Length & Distance[AU])

Barycentric equatorial J2000 y position (ICRS) of Gaia at the epoch of the observation.

Z_GAIA : Barycentric z position of Gaia (double, Length & Distance[AU])

Barycentric equatorial J2000 z position (ICRS) of Gaia at the epoch of observation.

VX_GAIA : Barycentric x velocity of Gaia (double, Velocity[AU day^{-1}])

Barycentric equatorial J2000 (ICRS) x velocity of Gaia at the epoch of the observation.

VY_GAIA : Barycentric y velocity of Gaia (double, Velocity[AU day^{-1}])

Barycentric equatorial J2000 (ICRS) y velocity of Gaia at the epoch of observation.

VZ_GAIA : Barycentric z velocity of Gaia (double, Velocity[AU day^{-1}])

Barycentric equatorial J2000 (ICRS) z velocity of Gaia at the epoch of observation.

X_GAIA_GEOCENTRIC : Geocentric x position of Gaia (double, Length & Distance[AU])

Geocentric equatorial J2000 x position of Gaia at the epoch of observation, in a reference aligned to ICRS.

Y_GAIA_GEOCENTRIC : Geocentric y position of Gaia (double, Length & Distance[AU])

Geocentric equatorial J2000 y position of Gaia at the epoch of observation in a reference aligned to ICRS.

Z_GAIA_GEOCENTRIC : Geocentric z position of Gaia (double, Length & Distance[AU])

Geocentric equatorial J2000 z position of Gaia at the epoch of observation in a reference aligned to ICRS.

VX_GAIA_GEOCENTRIC : Geocentric x velocity of Gaia (double, Velocity[AU day^{-1}])

Geocentric equatorial J2000 x velocity of Gaia at the epoch of observation in a reference aligned to ICRS.

VY_GAIA_GEOCENTRIC : Geocentric y velocity of Gaia (double, Velocity[AU day^{-1}])

Geocentric equatorial J2000 y velocity of Gaia at the epoch of observation in a reference aligned to ICRS.

VZ_GAIA_GEOCENTRIC : Geocentric z velocity of Gaia (double, Velocity[AU day^{-1}])

Geocentric equatorial J2000 z velocity of Gaia at the epoch of observation in a reference aligned to ICRS.

POSITION_ANGLE_SCAN : Position angle of the scanning direction (double, Angle[deg])

Position angle of the scan direction at the epoch of observation in the equatorial reference frame. 0 = North direction, $\pi/2$ = increasing right ascension, pi = South, $3\pi/2$ = decreasing right ascension. It is defined as the angle between the AL direction and the direction to the North Pole, at the SSO position, after applying the correction for aberration. As a consequence of this correction for aberration, the AC direction is not strictly perpendicular to the AL direction.

ASTROMETRIC_OUTCOME_CCD : Result of processing the CCDs (int[10] array)

Result of the astrometric processing of the individual CCDs in the transit. Values presently defined:

1 Good position derived.

11 No position derived, because no centroid could be determined.

12 Position rejected a priori, because previous studies have shown that it is unreliable.

24 Position rejected, because this CCD has some samples that have been eliminated.

25 Position rejected, because this CCD is affected by an AOCS update.

26 Position rejected, because this CCD is affected by a non-nominal gating.

29 Position rejected, because of more than one reason, combination of codes 21–26.

32 Position rejected as outlier, because this position does not fit on the regression line.

35 Position rejected, because it does not fulfill the magnitude-uncertainty relation, see documentation.

39 Position rejected, because the value of distToLastCi is invalid.

40 Position rejected, because the epoch corresponds to known bad attitude, see documentation.

41 Position rejected, because no attitude or no calibration is available for the epoch of observation.

ASTROMETRIC_OUTCOME_TRANSIT : Result of processing the transit (int)

Result of the astrometric processing of the transit. Values defined at present are:

1 The transit contains at least one good position.

2 Positions derived, but less consistent than expected. This means that the criterion to reject outliers had to be relaxed to find an unambiguous set of consistent positions.

5 Positions derived, but outlier rejection was not possible because of dramatic loss of precision.

6 Positions derived, but no future field angles in RP/BP, because no attitude is available for the future epochs (reference epoch + 45, 50 and 55 seconds).

11.3 SSO_REFLECTANCE_SPECTRUM

This table contains the mean BP/RP reflectance spectra of asteroids computed as the ratio between the asteroid flux and an averaged solar analogue flux. In each row, the reflectance spectrum of a given asteroid is given at a given wavelength. Entries for all asteroids are concatenated into a single table.

Columns description:

SOURCE_ID : Source identifier (long)

A unique single numerical identifier of the source. Note in particular that these identifiers are by convention negative for SSOs.

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`.

NUMBER_MP : Minor Planet number (long)

Minor planet number attributed by the Minor Planet Centre (MPC). It is set to zero for the natural planetary satellites and the candidate new minor planets.

DENOMINATION : standard MPC denomination of the asteroid (string)

Name of the object. It follows the Minor Planet Centre convention for the minor planets. For bundle of observations that are not identified at the time of the data processing, the name is a string like Gaia-DR3SSO-<RN> where RN is a running number unique to the bundle. For the natural satellites of the major planets, its standard name is given followed by a string (XYY) where X is the first letter of the planetary system it belongs to, and YY is the number of the satellite in Roman numeral.

NB_SAMPLES : Nb samples in spectrum (short)

Number of wavelength bins in the reflectance spectrum.

NUM_OF_SPECTRA : number of epoch spectra used to compute the average (int)

Number of epoch spectra combined to generated the mean reflectance spectrum.

REFLECTANCE_SPECTRUM : Reflectance spectrum (float)

Reflectance value at the given wavelength.

REFLECTANCE_SPECTRUM_ERR : Error in reflectance spectrum (float)

Error in the reflectance.

WAVELENGTH : Internally-calibrated wavelength of reflectance spectrum (float, Length & Distance[nm])

Internally-calibrated wavelength.

REFLECTANCE_SPECTRUM_FLAG : Reflectance spectrum value flag (byte)

This flag indicates the quality of the reflectance in the applicable wavelength channel, and can take the following values:

- 0: Good quality
- 1: Potential poor quality
- 2: The quality appears compromised. The use of this reflectance value is not recommended.

12 Spectroscopic tables

12.1 RVS_MEAN_SPECTRUM

This is the RVS mean sampled spectrum table. The spectra are in the rest frame, they are normalised and their wavelength grid ranges from 846 to 870 nm in steps of 0.01 nm (2401 elements).

See Sect. ?? for a description on how the mean spectra are obtained, and Seabroke & et al. (2022) for a description of the spectra validation.

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

RA : Right Ascension (double, Angle[deg])

Barycentric Right Ascension α of the object in ICRS at reference epoch `ref_epoch` from the `gaia_source` table.

DEC : Declination (double, Angle[deg])

Barycentric Declination δ of the object in ICRS at reference epoch `ref_epoch` from the `gaia_source` table.

FLUX : array of fluxes (float[2401] array)

The mean normalized spectrum flux.

The mean flux per wavelength bin is:

$$\texttt{flux[i]} = \frac{\sum_{j=0}^{n} f_j[i]}{n}$$

where n is the number of flux values $f_j[i]$ contributing to the wavelength bin i, and j is the jth CCD spectrum being combined out of a total of n in the wavelength bin i.

In general, n corresponds to `combined_ccds`, but it may be smaller, especially in the bins at the edges of the wavelength range, which are often not sampled by all the CCD spectra shifted to the rest frame.

FLUX_ERROR : array of uncertainties in flux (float[2401] array)

The uncertainty on the mean normalised flux is:

$$\texttt{flux\_error[i]} = \frac{\sigma_{f_n}[i]}{\sqrt{n}}$$

where $\sigma_{f_n}[i]$ is the standard deviation of all the flux values contributing to the wavelength bin i:

$$\sigma_{f_n}[i] = \sqrt{\frac{1}{n}\sum_{j=0}^{n}(f_j[i] - \texttt{flux[i]})^2}$$

where $f_j[i]$ is the flux the jth CCD spectrum being combined out of a total of n in the wavelength bin i.

In general, n corresponds to `combined_ccds`, but it may be smaller, especially in the bins at the edges of the wavelength range, which are often not sampled by all the CCD spectra. This results in typically larger flux_error at the edges of the combined spectrum.

COMBINED_TRANSITS : number of combined transits (short)

This reports the number of transits used to compute the mean RVS spectrum.

COMBINED_CCDS : number of combined CCD spectra (short)

This number reports the total number of spectra that have been combined (over the `combined_transits`), taking into account that for any combined transit 1, 2 or 3 spectra can be valid and therefore combined.

DEBLENDED_CCDS : number of deblended CCD spectra (short)

This field contains the information on how many deblended spectra have been used to produce this mean RVS spectrum: it is the number of CCD spectra that have been deblended.

The number of non-blended spectra is obtained from: `combined_ccds−deblended_ccds`

12.2 XP_SUMMARY

This tables contains auxiliary information about the mean BP/RP spectrum of a given source. It should be used in order to refine queries on spectra and build dedicated samples before interrogating the DataLink protocol to download the results of those queries.

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`.

BP_N_RELEVANT_BASES : Number of bases that are relevant for the representation of this mean BP spectrum (short)

Although all bases defined in the set of bases associated to this mean BP spectrum have been used for the source update process, only the coefficients of the first `bp_n_relevant_bases` bases are significant.

The criterion adopted to estimate the number of relevant basis functions is based on the standard deviation of the coefficients, normalised to their corresponding square root of variance. All coefficients are divided by the square root of variances, and the standard deviation of the last n values is computed, where n is increasing from 2 onwards. The resulting standard deviation for the last n coefficients is then compared with the (idealised) theoretical expectation of 1, plus a configurable threshold times the standard error on the standard deviation. The largest index for which the standard deviation exceeds this limit is taken as the highest coefficient in the truncated representation and the number of relevant bases.

BP_RELATIVE_SHRINKING : Measure of the relative shrinking of the coefficient vector when truncation is applied for the mean BP spectrum (float)

This parameter is defined as the ratio between the lengths of the truncated and full BP spectrum defined by the array of coefficients to be applied to the basis functions.

BP_N_MEASUREMENTS : Number of measurements used for the BP spectrum generation (short)

Number of measurements contributing to solution.

BP_N_REJECTED_MEASUREMENTS : Number of rejected measurements in the BP spectrum generation (short)

Number of measurements that have been rejected.

BP_STANDARD_DEVIATION : Standard deviation for the BP spectrum representation (float, Flux[e^{-} pix^{-1} s^{-1}])

Standard deviation of the solution.

BP_CHI_SQUARED : Chi squared for the BP spectrum representation (float)

χ^2 of the solution.

BP_N_TRANSITS : Number of transits contributing to the mean in BP (short)

Number of BP epoch spectra that contributed to the mean spectrum (some samples from these spectra may still have been rejected).

BP_N_CONTAMINATED_TRANSITS : Number of contaminated transits in BP (short)

Number of BP epoch spectra (considering only spectra that contributed to the mean spectrum) matched to this source that were marked as contaminated.

BP_N_BLENDED_TRANSITS : Number of blended transits in BP (short)

Number of BP epoch spectra (considering only spectra that contributed to the mean spectrum) matched to this source that were marked as blended.

RP_N_RELEVANT_BASES : Number of bases that are relevant for the representation of this mean RP spectrum (short)

Although all bases defined in the set of bases associated to this mean RP spectrum have been used for the source update process, only the coefficients of the first `rp_n_relevant_bases` bases are significant.

The criterion adopted to estimate the number of relevant basis functions is based on the standard deviation of the coefficients, normalised to their corresponding square root of variance. All coefficients are divided by the square root of variances, and the standard deviation of the last n values is computed, where n is increasing from 2 onwards. The resulting standard deviation for the last n coefficients is then compared with the (idealised) theoretical expectation of 1, plus a configurable threshold times the standard error on the standard deviation. The largest index for which the standard deviation exceeds this limit is taken as the highest coefficient in the truncated representation and the number of relevant bases.

RP_RELATIVE_SHRINKING : Measure of the relative shrinking of the coefficient vector when truncation is applied for the mean RP spectrum (float)

This parameter is defined as the ratio between the lengths of the truncated and full RP spectrum defined by the array of coefficients to be applied to the basis functions.

RP_N_MEASUREMENTS : Number of measurements used for the RP spectrum generation (short)

Number of measurements contributing to solution.

RP_N_REJECTED_MEASUREMENTS : Number of rejected measurements in the RP spectrum generation (short)

Number of measurements that have been rejected.

RP_STANDARD_DEVIATION : Standard deviation for the RP spectrum representation (float, Flux[e^{-} pix^{-1} s^{-1}])

Standard deviation of the solution.

RP_CHI_SQUARED : Chi squared for the RP spectrum representation (float)

χ^2 of the solution.

RP_N_TRANSITS : Number of transits contributing to the mean in RP (short)

Number of RP epoch spectra that contributed to the mean spectrum (some samples from these spectra may still have been rejected).

RP_N_CONTAMINATED_TRANSITS : Number of contaminated transits in RP (short)

Number of RP epoch spectra (considering only spectra that contributed to the mean spectrum) matched to this source that were marked as contaminated.

RP_N_BLENDED_TRANSITS : Number of blended transits in RP (short)

Number of RP epoch spectra (considering only spectra that contributed to the mean spectrum) matched to this source that were marked as blended.

12.3 XP_CONTINUOUS_MEAN_SPECTRUM

Table hosting the mean BP and RP spectra based on the continuous representation in basis functions (see Sect. ??).

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`.

BP_BASIS_FUNCTION_ID : Identifier defining the set of basis functions for the BP spectrum representation (short)

Identifier defining the set of basis functions used for the continuous representation of this spectrum.

BP_DEGREES_OF_FREEDOM : Degrees of freedom for the BP spectrum representation (short)

Number of degrees of freedom in the LSQ system.

BP_N_PARAMETERS : Number of parameters for the BP spectrum representation (byte)

Number of parameters in the LSQ system.

BP_N_MEASUREMENTS : Number of measurements used for the BP spectrum generation (short)

Number of measurements contributing to solution.

BP_N_REJECTED_MEASUREMENTS : Number of rejected measurements in the BP spectrum generation (short)

Number of measurements that have been rejected.

BP_STANDARD_DEVIATION : Standard deviation for the BP spectrum representation (float)

Standard deviation of the solution.

BP_CHI_SQUARED : Chi squared for the BP spectrum representation (float)

χ^2 of the solution.

BP_COEFFICIENTS : Basis function coefficients for the BP spectrum representation (double[`bp_n_parameters` array)

Array of basis function coefficients for the representation of the BP spectrum.

BP_COEFFICIENT_ERRORS : Basis function coefficient errors for the BP spectrum representation (float[`bp_n_parameters`] array)

Errors on the basis function coefficients for BP

BP_COEFFICIENT_CORRELATIONS : Correlation matrix for BP coefficients (float[`bp_n_parameters*(bp_n_` array)

Upper-triangular (non-zero, non-unity) part of the correlation matrix **M** of the coefficients C for the representation of the BP spectrum as basis functions. The matrix elements are stored as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

BP_N_RELEVANT_BASES : Number of bases that are relevant for the representation of this mean BP spectrum (short)

Although all bases defined in the set of bases associated to this mean BP spectrum have been used for the source update process, only the coefficients of the first `bp_n_relevant_bases` bases are significant.

The criterion adopted to estimate the number of relevant basis functions is based on the standard deviation of the coefficients, normalised to their corresponding square root of variance. All coefficients are divided by the square root of variances, and the standard deviation of the last n values is computed, where n is increasing from 2 onwards. The resulting standard deviation for the last n coefficients is then compared with the (idealised) theoretical expectation of 1, plus a configurable threshold times the standard error on the standard deviation. The largest index for which the standard deviation exceeds this limit is taken as the highest coefficient in the truncated representation and the number of relevant bases.

BP_RELATIVE_SHRINKING : Measure of the relative shrinking of the coefficient vector when truncation is applied for the mean BP spectrum (float)

This parameter is defined as the ratio between the lengths of the truncated and full BP spectrum defined by the array of coefficients to be applied to the basis functions.

RP_BASIS_FUNCTION_ID : Identifier defining the set of basis functions for the BP spectrum representation (short)

Identifier defining the set of basis functions used for the continuous representation of this spectrum.

RP_DEGREES_OF_FREEDOM : Degrees of freedom for the RP spectrum representation (short)

Number of degrees of freedom in the LSQ system.

RP_N_PARAMETERS : Number of parameters for the RP spectrum representation (byte)

Number of parameters in the LSQ system.

RP_N_MEASUREMENTS : Number of measurements used for the RP spectrum generation (short)

Number of measurements contributing to solution.

RP_N_REJECTED_MEASUREMENTS : Number of rejected measurements in the RP spectrum generation (short)

Number of measurements that have been rejected.

RP_STANDARD_DEVIATION : Standard deviation for the RP spectrum representation (float)

Standard deviation of the solution.

RP_CHI_SQUARED : Chi squared for the RP spectrum representation (float)

χ^2 of the solution.

RP_COEFFICIENTS : Basis function coefficients for the RP spectrum representation (double[`rp_n_parameter`
array)

Array of basis function coefficients for the representation of the RP spectrum.

RP_COEFFICIENT_ERRORS : Basis function coefficient errors for the RP spectrum representation (float[`rp_n_parameters`] array)

Errors on the basis function coefficients for RP

RP_COEFFICIENT_CORRELATIONS : Correlation matrix for RP coefficients (float[`rp_n_parameters*(rp_n_`
array)

Upper-triangular (non-zero, non-unity) part of the correlation matrix **M** of the coefficients C for the representation of the RP spectrum as basis functions. The matrix elements are stored as a linear array of constant size $S = n(n-1)/2$ corresponding to the full normal matrix of dimension $n \times n$. The ordering of the elements in the linear array follows a column-major storage scheme, i.e.:

$$\mathbf{M} = \begin{bmatrix} 1 & C[0] & C[1] & C[3] & C[6] & \cdots & C[S-(n-1)] \\ & 1 & C[2] & C[4] & C[7] & \cdots & C[S-(n-2)] \\ & & 1 & C[5] & C[8] & \cdots & C[S-(n-3)] \\ & & & 1 & C[9] & \cdots & C[S-(n-4)] \\ & & & & \ddots & \ddots & \vdots \\ & & & & & 1 & C[S-1] \\ & & & & & & 1 \end{bmatrix}$$

RP_N_RELEVANT_BASES : Number of bases that are relevant for the representation of this mean RP spectrum (short)

Although all bases defined in the set of bases associated to this mean RP spectrum have been used for the source update process, only the coefficients of the first `rp_n_relevant_bases` bases are significant.

The criterion adopted to estimate the number of relevant basis functions is based on the standard deviation of the coefficients, normalised to their corresponding square root of variance. All coefficients are divided by the square root of variances, and the standard deviation of the last n values is computed, where n is increasing from 2 onwards. The resulting standard deviation for the last n coefficients is then compared with the (idealised) theoretical expectation of 1, plus a configurable threshold times the standard error on the standard deviation. The largest index for which the standard deviation exceeds this limit is taken as the highest coefficient in the truncated representation and the number of relevant bases.

RP_RELATIVE_SHRINKING : Measure of the relative shrinking of the coefficient vector when truncation is applied for the mean RP spectrum (float)

This parameter is defined as the ratio between the lengths of the truncated and full RP spectrum defined by the array of coefficients to be applied to the basis functions.

12.4 XP_SAMPLED_MEAN_SPECTRUM

This is the BP/RP externally calibrated sampled mean spectrum. All mean spectra are sampled to the same set of absolute wavelength positions, which can be found in the field `wavelength` of table `XpMerge`.

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

RA : Right Ascension (double, Angle[deg])

Barycentric Right Ascension α of object in ICRS at reference epoch `ref_epoch` as given in the main `gaia_source` table.

DEC : Declination (double, Angle[deg])

Barycentric Declination δ of object in ICRS at reference epoch `ref_epoch` as given in the main `gaia_source` table.

FLUX : mean BP + RP combined spectrum flux (float[] array, Flux[W m^{-2} nm^{-1}])

Externally-calibrated combined BP and RP flux.

FLUX_ERROR : mean BP + RP combined spectrum flux error (float[] array, Flux[W m^{-2} nm^{-1}])

Externally-calibrated combined BP and RP flux error.

13 Variability tables

13.1 VARI_SUMMARY

Summary table that provides the information on where a `source_id` can be found in the different `Variability` tables and statistical parameters of time series, using only transits not rejected.

Note that NULL is reported when the statistical parameter value is missing or cannot be calculated.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NUM_SELECTED_G_FOV : Total number of G FOV transits selected for variability analysis (short)

The number of processed observations for variability analyses of this source, using only transits not rejected.

MEAN_OBS_TIME_G_FOV : Mean observation time for G FoV transits (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Name: The mean observation time

Control parameters: None

Output: Let y_i be a time series of size N at times t_i. The mean $\bar{t}$ is defined as

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_i. \tag{1}$$

TIME_DURATION_G_FOV : Time duration of the time series for G FoV transits (float, Time[day])

Name: The time duration of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The time duration of the time series is equal to $t_N - t_1$.

MIN_MAG_G_FOV : Minimum G FoV magnitude (float, Magnitude[mag])

Name: The minimum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The minimum value of the time series is defined as:

$$min(y_i)\ \forall i \in (1, N) \tag{2}$$

MAX_MAG_G_FOV : Maximum G FoV magnitude (float, Magnitude[mag])

Name: The maximum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The maximum value of the time series is defined as:

$$max(y_i)\ \forall i \in (1, N) \tag{3}$$

MEAN_MAG_G_FOV : Mean G FoV magnitude (float, Magnitude[mag])

Name: The mean of the time series

Control parameters: None

Output: Let y_i be a time series of size N. The mean $\overline{y}$ is defined as

$$\overline{y} = \frac{1}{N}\sum_{i=1}^{N} y_i. \tag{4}$$

MEDIAN_MAG_G_FOV : Median G FoV magnitude (float, Magnitude[mag])

Name: The median of the time series

Control parameters: None

Output: The 50th percentile unweighted value.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{5}$$

RANGE_MAG_G_FOV : Difference between the highest and lowest G FoV magnitudes (float, Magnitude[mag])

Name: The range of the time series

Control parameters: None

Output: Let y_i be a time series, $y_{\max}$ its largest element, and $y_{\min}$ its smallest element, then the range is defined as

$$R = y_{\max} - y_{\min} \tag{6}$$

TRIMMED_RANGE_MAG_G_FOV : Trimmed difference between the highest and lowest G FoV magnitudes (float, Magnitude[mag])

Name: The trimmed range

Control parameters: trim level $\alpha \in]0, 50[$

Output: The trimmed unweighted range.

Let y_i be a time series of size N, with error bars Δy_i. Let Y_α be the αth percentile, and $Y_{100-\alpha}$ be the $(100 - \alpha)$th percentile. Let y'_i be the trimmed time series of size N' which is derived by iteratively removing the smallest or the largest values of the y_i time series until $Y_\alpha < y'_i < Y_{100-\alpha}$ for all $i \in \{1, \cdots, N'\}$. The trimmed range R' is defined as

$$R' = y'_{\max} - y'_{\min} \tag{7}$$

For DR3, the trim level α was set to 5.0.

STD_DEV_MAG_G_FOV : Square root of the unweighted G FoV magnitude variance (float, Magnitude[mag])

Name: The square root of the unbiased unweighted variance.

Output: Let y_i be a time series of size N. The unweighted standard deviation $\hat{\sigma}$ is defined as the square root of the sample-size unbiased unweighted variance:

$$\hat{\sigma} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(y_i - \overline{y})^2}.$$

SKEWNESS_MAG_G_FOV : Standardized unweighted G FoV magnitude skewness (float)

Name: The standardised unbiased unweighted skewness.

Output: Let y_i be a time series of size $N > 2$. The sample-size unbiased unweighted skewness moment $\mathcal{E}$ is defined as:

$$\mathcal{E} = \frac{N}{(N-1)(N-2)}\sum_{i=1}^{N}(y_i - \overline{y})^3.$$

The standardized unbiased skewness E is defined as:

$$E = \frac{\mathcal{E}}{\hat{\sigma}^3}$$

where $\hat{\sigma}$ is the square root of the unbiased unweighted variance around the unweighted mean. While $\mathcal{E}$ is an unbiased estimate of the population value, E becomes unbiased in the limit of large N.

KURTOSIS_MAG_G_FOV : Standardized unweighted G FoV magnitude kurtosis (float)

Name: The standardised unbiased unweighted kurtosis.

Output: Let y_i be a time series of size $N > 3$. The sample-size unbiased unweighted kurtosis cumulant $\mathcal{K}$ is defined as:

$$\mathcal{K} = \frac{N(N+1)}{(N-1)(N-2)(N-3)} \sum_{i=1}^{N} (y_i - \overline{y})^4 - \frac{3}{(N-2)(N-3)} \left[\sum_{i=1}^{N} (y_i - \overline{y})^2 \right]^2.$$

The standardized unbiased kurtosis K is defined as:

$$K = \frac{\mathcal{K}}{\hat{\sigma}^4}$$

where $\hat{\sigma}^2$ is the unbiased unweighted variance around the unweighted mean. While $\mathcal{K}$ is an unbiased estimate of the population value, K becomes unbiased in the limit of large N.

MAD_MAG_G_FOV : Median Absolute Deviation (MAD) for G FoV transits (float, Magnitude[mag])

Name: The Median Absolute Deviation (MAD)

Control parameters: None

Output: Let y_i be a time series of size N. The MAD is defined as the median of the absolute deviations from the median of the data, scaled by a factor of $1/\Phi^{-1}(3/4) \approx 1.4826$ (where Φ^{-1} is the inverse of the cumulative distribution function for the standard normal distribution), so that the expectation of the scaled MAD at large N equals the standard deviation of a normal distribution:

$$\mathrm{MAD} = 1.4826 \ \mathrm{median}\{|y_i - \mathrm{median}\{y_j, \forall j \in (1, N)\}|, \forall i \in (1, N)\}. \tag{8}$$

ABBE_MAG_G_FOV : Abbe value for G FoV transits (float)

Name: The Abbe value

Control parameters: None

Output: Let $\{t_i, y_i\}$ be a time-sorted time series of size N, such that $t_i < t_{i+1}$ for all $i < N$. The Abbe value $\mathcal{A}$ is defined as

$$\mathcal{A} = \frac{\sum_{i=1}^{N-1} (y_{i+1} - y_i)^2}{2 \sum_{i=1}^{N} (y_i - \bar{y})^2} \tag{9}$$

where $\bar{y}$ is the unweighted mean.

IQR_MAG_G_FOV : Interquartile range for G FoV transits (float, Magnitude[mag])

Name: The Interquartile Range (IQR)

Control parameters: None

Output: The difference between the (unweighted) 75th and 25th percentile values: IQR= $P_{75} - P_{25}$.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{10}$$

STETSON_MAG_G_FOV : Stetson G FoV variability index (float)

Name: The single-band Stetson variability index

Control parameters: The pairing time interval

Output: Let y_i be a time series of size N, with error bars Δy_i. The Stetson value (Stetson 1996) is based on paired observations closely separated in time (within a chosen time interval). The time difference between the components of a pair should be small compared to the shortest time-scale of variation being sought. If this condition is not satisfied, a transformation is applied to the unpaired measurement, in order to include its information together with paired observations. The maximum number n of pairs may exceed $N/2$, since multiple pairs can be formed within a given time interval (as long as the latter is much smaller than the minimum variability time-scale sought). The Stetson J index is defined as

$$J = \frac{1}{n} \sum_{k=1}^{n} \operatorname{sgn}(P_k) \sqrt{|P_k|},$$

where the index k refers to the k-th pair, composed of measurements i and j, such that

$$P_k = \begin{cases} \delta_{i(k)} \delta_{j(k)}, & \text{if } i(k) \neq j(k) \\ \delta_{i(k)}^2 - 1, & \text{if } i(k) = j(k) \end{cases}$$

with the normalized deviation of the i-th measurement from the time-series mean $\bar{y}$ expressed by:

$$\delta_{i(k)} = \sqrt{\frac{N}{N-1}} \frac{y_{i(k)} - \bar{y}}{\Delta y_{i(k)}}.$$

STD_DEV_OVER_RMS_ERR_MAG_G_FOV : Signal-to-Noise G FoV estimate (float)

Name: The signal-to-noise estimate

Control parameters: None

Output: Let y_i be a time series of size N, with error bars Δy_i. The signal-to-noise ratio (S/N) is estimated as

$$\mathrm{S/N} = \sqrt{\frac{\sum_{i=1}^{N} (y_i - \overline{y})^2}{\sum_{i=1}^{N} \Delta y_i^2}} \tag{11}$$

where $\overline{y}$ is the mean of the time-series values.

OUTLIER_MEDIAN_G_FOV : Greatest absolute deviation from the G FoV median normalized by the error (float)

Name: The most outlying measurement with respect to the median

Control parameters: None

Output: Let y_i be a time series of size N, with error bars Δy_i. The most outlying measurement is defined as the greatest absolute deviation from the median normalized by the error:

$$\mathrm{outlierMedian} = \max\left\{\frac{|y_i - \mathrm{median}\{y_j, \forall j \in (1, N)\}|}{\Delta y_i}, \forall i \in (1, N)\right\}. \tag{12}$$

NUM_SELECTED_BP : Total number of BP observations selected for variability analysis (short)

The number of processed observations for variability analyses of this source, using only transits not rejected.

MEAN_OBS_TIME_BP : Mean observation time for BP observations (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Name: The mean observation time

Control parameters: None

Output: Let y_i be a time series of size N at times t_i. The mean $\bar{t}$ is defined as

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_i. \tag{13}$$

TIME_DURATION_BP : Time duration of the BP time series (float, Time[day])

Name: The time duration of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The time duration of the time series is equal to $t_N - t_1$.

MIN_MAG_BP : Minimum BP magnitude (float, Magnitude[mag])

Name: The minimum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The minimum value of the time series is defined as:

$$min(y_i)\ \forall i \in (1, N) \tag{14}$$

MAX_MAG_BP : Maximum BP magnitude (float, Magnitude[mag])

Name: The maximum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The maximum value of the time series is defined as:

$$max(y_i)\ \forall i \in (1, N) \tag{15}$$

MEAN_MAG_BP : Mean BP magnitude (float, Magnitude[mag])

Name: The mean of the time series

Control parameters: None

Output: Let y_i be a time series of size N. The mean $\overline{y}$ is defined as

$$\overline{y} = \frac{1}{N}\sum_{i=1}^{N} y_i. \tag{16}$$

MEDIAN_MAG_BP : Median BP magnitude (float, Magnitude[mag])

Name: The median of the time series

Control parameters: None

Output: The 50th unweighted percentile value.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{17}$$

RANGE_MAG_BP : Difference between the highest and lowest BP magnitudes (float, Magnitude[mag])

Name: The range of the time series

Control parameters: None

Output: Let y_i be a time series, $y_{\max}$ its largest element, and $y_{\min}$ its smallest element, then the range is defined as

$$R = y_{\max} - y_{\min} \tag{18}$$

TRIMMED_RANGE_MAG_BP : Trimmed difference between the highest and lowest BP magnitudes (float, Magnitude[mag])

Name: The trimmed range

Control parameters: trim level $\alpha \in]0, 50[$

Output: The trimmed unweighted range.

Let y_i be a time series of size N, with error bars Δy_i. Let Y_α be the αth percentile, and $Y_{100-\alpha}$ be the $(100-\alpha)$th percentile. Let y'_i be the trimmed time series of size N' which is derived by iteratively removing the smallest or the largest values of the y_i time series until $Y_\alpha < y'_i < Y_{100-\alpha}$ for all $i \in \{1, \cdots, N'\}$. The trimmed range R' is defined as

$$R' = y'_{\max} - y'_{\min} \tag{19}$$

For DR3, the trim level α was set to 5.0.

STD_DEV_MAG_BP : Square root of the unweighted BP magnitude variance (float, Magnitude[mag])

Name: The square root of the unbiased unweighted variance.

Output: Let y_i be a time series of size N. The unweighted standard deviation $\hat{\sigma}$ is defined as the square root of the sample-size unbiased unweighted variance:

$$\hat{\sigma} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(y_i - \overline{y})^2}.$$

SKEWNESS_MAG_BP : Standardized unweighted BP magnitude skewness (float)

Name: The standardised unbiased unweighted skewness.

Output: Let y_i be a time series of size $N > 2$. The sample-size unbiased unweighted skewness moment $\mathcal{E}$ is defined as:

$$\mathcal{E} = \frac{N}{(N-1)(N-2)}\sum_{i=1}^{N}(y_i - \overline{y})^3.$$

The standardized unbiased skewness E is defined as:

$$E = \frac{\mathcal{E}}{\hat{\sigma}^3}$$

where $\hat{\sigma}$ is the square root of the unbiased unweighted variance around the unweighted mean. While $\mathcal{E}$ is an unbiased estimate of the population value, E becomes unbiased in the limit of large N.

KURTOSIS_MAG_BP : Standardized unweighted BP magnitude kurtosis (float)

Name: The standardised unbiased unweighted kurtosis.

Output: Let y_i be a time series of size $N > 3$. The sample-size unbiased unweighted kurtosis cumulant $\mathcal{K}$ is defined as:

$$\mathcal{K} = \frac{N(N+1)}{(N-1)(N-2)(N-3)}\sum_{i=1}^{N}(y_i - \overline{y})^4 - \frac{3}{(N-2)(N-3)}\left[\sum_{i=1}^{N}(y_i - \overline{y})^2\right]^2.$$

The standardized unbiased kurtosis K is defined as:

$$K = \frac{\mathcal{K}}{\hat{\sigma}^4}$$

where $\hat{\sigma}^2$ is the unbiased unweighted variance around the unweighted mean. While $\mathcal{K}$ is an unbiased estimate of the population value, K becomes unbiased in the limit of large N.

MAD_MAG_BP : Median Absolute Deviation (MAD) for BP observations (float, Magnitude[mag])

Name: The Median Absolute Deviation (MAD)

Control parameters: None

Output: Let y_i be a time series of size N. The MAD is defined as the median of the absolute deviations from the median of the data, scaled by a factor of $1/\Phi^{-1}(3/4) \approx 1.4826$ (where Φ^{-1} is the inverse of the cumulative distribution function for the standard normal distribution), so that the expectation of the scaled MAD at large N equals the standard deviation of a normal distribution:

$$\mathrm{MAD} = 1.4826 \,\mathrm{median}\{|y_i - \mathrm{median}\{y_j, \forall j \in (1, N)\}|, \forall i \in (1, N)\}. \tag{20}$$

ABBE_MAG_BP : Abbe value for BP observations (float)

Name: The Abbe value

Control parameters: None

Output: Let $\{t_i, y_i\}$ be a time-sorted time series of size N, such that $t_i < t_{i+1}$ for all $i < N$. The Abbe value $\mathcal{A}$ is defined as

$$\mathcal{A} = \frac{\sum_{i=1}^{N-1}(y_{i+1} - y_i)^2}{2\sum_{i=1}^{N}(y_i - \bar{y})^2} \tag{21}$$

where $\bar{y}$ is the unweighted mean.

IQR_MAG_BP : Interquartile BP magnitude range (float, Magnitude[mag])

Name: The Interquartile Range (IQR)

Control parameters: None

Output: The difference between the (unweighted) 75th and 25th percentile values: IQR= $P_{75} - P_{25}$.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \quad (22)$$

STETSON_MAG_BP : Stetson BP variability index (float)

Name: The single-band Stetson variability index

Control parameters: The pairing time interval

Output: Let y_i be a time series of size N, with error bars Δy_i. The Stetson value (Stetson 1996) is based on paired observations closely separated in time (within a chosen time interval). The time difference between the components of a pair should be small compared to the shortest time-scale of variation being sought. If this condition is not satisfied, a transformation is applied to the unpaired measurement, in order to include its information together with paired observations. The maximum number n of pairs may exceed $N/2$, since multiple pairs can be formed within a given time interval (as long as the latter is much smaller than the minimum variability time-scale sought).

$$J = \frac{1}{n} \sum_{k=1}^{n} \mathrm{sgn}(P_k) \sqrt{|P_k|},$$

where the index k refers to the k-th pair, composed of measurements i and j, such that

$$P_k = \begin{cases} \delta_{i(k)} \delta_{j(k)}, & \text{if } i(k) \neq j(k) \\ \delta^2_{i(k)} - 1, & \text{if } i(k) = j(k) \end{cases}$$

with the normalized deviation of the i-th measurement from the time-series mean $\bar{y}$ expressed by:

$$\delta_{i(k)} = \sqrt{\frac{N}{N-1}} \frac{y_{i(k)} - \bar{y}}{\Delta y_{i(k)}}.$$

STD_DEV_OVER_RMS_ERR_MAG_BP : Signal-to-Noise BP estimate (float)

Name: The signal-to-noise estimate

Control parameters: None

Output: Let y_i be a time series of size N, with error bars Δy_i. The signal-to-noise ratio (S/N) is estimated as

$$\mathrm{S/N} = \sqrt{\frac{\sum_{i=1}^{N} (y_i - \overline{y})^2}{\sum_{i=1}^{N} \Delta y_i^2}} \tag{23}$$

where $\overline{y}$ is the mean of the time-series values.

OUTLIER_MEDIAN_BP : Greatest absolute deviation from the BP median normalized by the error (float)

Name: The most outlying measurement with respect to the median

Control parameters: None

Output: Let y_i be a time series of size N, with error bars Δy_i. The most outlying measurement is defined as the greatest absolute deviation from the median normalized by the error:

$$\mathrm{outlierMedian} = \max\left\{\frac{|y_i - \mathrm{median}\{y_j, \forall j \in (1, N)\}|}{\Delta y_i}, \forall i \in (1, N)\right\}. \tag{24}$$

NUM_SELECTED_RP : Total number of RP observations selected for variability analysis (short)

The number of processed observations for variability analyses of this source, using only transits not rejected.

MEAN_OBS_TIME_RP : Mean observation time for RP observations (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Name: The mean observation time

Control parameters: None

Output: Let y_i be a time series of size N at times t_i. The mean $\bar{t}$ is defined as

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_i. \tag{25}$$

TIME_DURATION_RP : Time duration of the RP time series (float, Time[day])

Name: The time duration of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The time duration of the time series is equal to $t_N - t_1$.

MIN_MAG_RP : Minimum RP magnitude (float, Magnitude[mag])

Name: The minimum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The minimum value of the time series is defined as:

$$min(y_i)\ \forall i \in (1, N) \tag{26}$$

MAX_MAG_RP : Maximum RP magnitude (float, Magnitude[mag])

Name: The maximum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The maximum value of the time series is defined as:

$$max(y_i)\ \forall i \in (1, N) \tag{27}$$

MEAN_MAG_RP : Mean RP magnitude (float, Magnitude[mag])

Name: The mean of the time series

Control parameters: None

Output: Let y_i be a time series of size N. The mean $\overline{y}$ is defined as

$$\overline{y} = \frac{1}{N}\sum_{i=1}^{N} y_i. \tag{28}$$

MEDIAN_MAG_RP : Median RP magnitude (float, Magnitude[mag])

Name: The median of the time series

Control parameters: None

Output: The 50th unweighted percentile value.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{29}$$

RANGE_MAG_RP : Difference between the highest and lowest RP magnitudes (float, Magnitude[mag])

Name: The range of the time series

Control parameters: None

Output: Let y_i be a time series, $y_{\max}$ its largest element, and $y_{\min}$ its smallest element, then the range is defined as

$$R = y_{\max} - y_{\min} \tag{30}$$

TRIMMED_RANGE_MAG_RP : Trimmed difference between the highest and lowest RP magnitudes (float, Magnitude[mag])

Name: The trimmed range

Control parameters: trim level $\alpha \in]0, 50[$

Output: The trimmed unweighted range.

Let y_i be a time series of size N, with error bars Δy_i. Let Y_α be the αth percentile, and $Y_{100-\alpha}$ be the $(100-\alpha)$th percentile. Let y'_i be the trimmed time series of size N' which is derived by iteratively removing the smallest or the largest values of the y_i time series until $Y_\alpha < y'_i < Y_{100-\alpha}$ for all $i \in \{1, \cdots, N'\}$. The trimmed range R' is defined as

$$R' = y'_{\max} - y'_{\min} \tag{31}$$

For DR3, the trim level α was set to 5.0.

STD_DEV_MAG_RP : Square root of the unweighted RP magnitude variance (float, Magnitude[mag])

Name: The square root of the unbiased unweighted variance.

Output: Let y_i be a time series of size N. The unweighted standard deviation $\hat{\sigma}$ is defined as the square root of the sample-size unbiased unweighted variance:

$$\hat{\sigma} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(y_i - \overline{y})^2}.$$

SKEWNESS_MAG_RP : Standardized unweighted RP magnitude skewness (float)

Name: The standardised unbiased unweighted skewness.

Output: Let y_i be a time series of size $N > 2$. The sample-size unbiased unweighted skewness moment $\mathcal{E}$ is defined as:

$$\mathcal{E} = \frac{N}{(N-1)(N-2)}\sum_{i=1}^{N}(y_i - \overline{y})^3.$$

The standardized unbiased skewness E is defined as:

$$E = \frac{\mathcal{E}}{\hat{\sigma}^3}$$

where $\hat{\sigma}$ is the square root of the unbiased unweighted variance around the unweighted mean. While $\mathcal{E}$ is an unbiased estimate of the population value, E becomes unbiased in the limit of large N.

KURTOSIS_MAG_RP : Standardized unweighted RP magnitude kurtosis (float)

Name: The standardised unbiased unweighted kurtosis.

Output: Let y_i be a time series of size $N > 3$. The sample-size unbiased unweighted kurtosis cumulant $\mathcal{K}$ is defined as:

$$\mathcal{K} = \frac{N(N+1)}{(N-1)(N-2)(N-3)}\sum_{i=1}^{N}(y_i - \overline{y})^4 - \frac{3}{(N-2)(N-3)}\left[\sum_{i=1}^{N}(y_i - \overline{y})^2\right]^2.$$

The standardized unbiased kurtosis K is defined as:

$$K = \frac{\mathcal{K}}{\hat{\sigma}^4}$$

where $\hat{\sigma}^2$ is the unbiased unweighted variance around the unweighted mean. While $\mathcal{K}$ is an unbiased estimate of the population value, K becomes unbiased in the limit of large N.

MAD_MAG_RP : Median Absolute Deviation (MAD) for RP observations (float, Magnitude[mag])

Name: The Median Absolute Deviation (MAD)

Control parameters: None

Output: Let y_i be a time series of size N. The MAD is defined as the median of the absolute deviations from the median of the data, scaled by a factor of $1/\Phi^{-1}(3/4) \approx 1.4826$ (where Φ^{-1} is the inverse of the cumulative distribution function for the standard normal distribution), so that the expectation of the scaled MAD at large N equals the standard deviation of a normal distribution:

$$\mathrm{MAD} = 1.4826\ \mathrm{median}\{|y_i - \mathrm{median}\{y_j, \forall j \in (1,N)\}|, \forall i \in (1,N)\}. \tag{32}$$

ABBE_MAG_RP : Abbe value for RP observations (float)

Name: The Abbe value

Control parameters: None

Output: Let $\{t_i, y_i\}$ be a time-sorted time series of size N, such that $t_i < t_{i+1}$ for all $i < N$. The Abbe value $\mathcal{A}$ is defined as

$$\mathcal{A} = \frac{\sum_{i=1}^{N-1} (y_{i+1} - y_i)^2}{2 \sum_{i=1}^{N} (y_i - \bar{y})^2} \tag{33}$$

where $\bar{y}$ is the unweighted mean.

IQR_MAG_RP : Interquartile RP magnitude range (float, Magnitude[mag])

Name: The Interquartile Range (IQR)

Control parameters: None

Output: The difference between the (unweighted) 75th and 25th percentile values: IQR= $P_{75} - P_{25}$.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{34}$$

STETSON_MAG_RP : Stetson RP variability index (float)

Name: The single-band Stetson variability index

Control parameters: The pairing time interval

Output: Let y_i be a time series of size N, with error bars Δy_i. The Stetson value (Stetson 1996) is based on paired observations closely separated in time (within a chosen time interval). The time difference between the components of a pair should be small compared to the shortest time-scale of variation being sought. If this condition is not satisfied, a transformation is applied to the unpaired measurement, in order to include its information together with paired observations. The maximum number n of pairs may exceed $N/2$, since multiple pairs can be formed within a given time interval (as long as the latter is much smaller than the minimum variability time-scale sought). The Stetson J index is defined as

$$J = \frac{1}{n} \sum_{k=1}^{n} \operatorname{sgn}(P_k) \sqrt{|P_k|},$$

where the index k refers to the k-th pair, composed of measurements i and j, such that

$$P_k = \begin{cases} \delta_{i(k)} \delta_{j(k)}, & \text{if } i(k) \neq j(k) \\ \delta^2_{i(k)} - 1, & \text{if } i(k) = j(k) \end{cases}$$

with the normalized deviation of the i-th measurement from the time-series mean $\bar{y}$ expressed by:

$$\delta_{i(k)} = \sqrt{\frac{N}{N-1}} \frac{y_{i(k)} - \bar{y}}{\Delta y_{i(k)}}.$$

STD_DEV_OVER_RMS_ERR_MAG_RP : Signal-to-Noise RP estimate (float)

Name: The signal-to-noise estimate

Control parameters: None

Output: Let y_i be a time series of size N, with error bars Δy_i. The signal-to-noise ratio (S/N) is estimated as

$$\mathrm{S/N} = \sqrt{\frac{\sum_{i=1}^{N} (y_i - \bar{y})^2}{\sum_{i=1}^{N} \Delta y_i^2}} \tag{35}$$

where $\bar{y}$ is the mean of the time-series values.

OUTLIER_MEDIAN_RP : Greatest absolute deviation from the RP median normalized by the error (float)

Name: The most outlying measurement with respect to the median

Control parameters: None

Output: Let y_i be a time series of size N, with error bars Δy_i. The most outlying measurement is defined as the greatest absolute deviation from the median normalized by the error:

$$\text{outlierMedian} = \max\left\{\frac{|y_i - \text{median}\{y_j, \forall j \in (1, N)\}|}{\Delta y_i}, \forall i \in (1, N)\right\}. \quad (36)$$

IN_VARI_CLASSIFICATION_RESULT : Source is present in `vari_classifier_result` (boolean)

Source is present in `vari_classifier_result` (and not `VariClassificationResult` as the column name suggests).

IN_VARI_RRLYRAE : Source is present in `vari_rrlyrae` (boolean)

Source is present in `vari_rrlyrae`

IN_VARI_CEPHEID : Source is present in `vari_cepheid` (boolean)

Source is present in `vari_cepheid`

IN_VARI_PLANETARY_TRANSIT : Source is present in `vari_planetary_transit` (boolean)

Source is present in `vari_planetary_transit`

IN_VARI_SHORT_TIMESCALE : Source is present in `vari_short_timescale` (boolean)

Source is present in `vari_short_timescale`

IN_VARI_LONG_PERIOD_VARIABLE : Source is present in `vari_long_period_variable` (boolean)

Source is present in `vari_long_period_variable`

IN_VARI_ECLIPSING_BINARY : Source is present in `vari_eclipsing_binary` (boolean)

Source is present in `vari_eclipsing_binary`

IN_VARI_ROTATION_MODULATION : Source is present in `vari_rotation_modulation` (boolean)

Source is present in `vari_rotation_modulation`

IN_VARI_MS_OSCILLATOR : Source is present in `vari_ms_oscillator` (boolean)

Source is present in `vari_ms_oscillator`

IN_VARI_AGN : Source is present in `vari_agn` (boolean)

Source is present in `vari_agn`

IN_VARI_MICROLENSING : Source is present in `vari_microlensing` (boolean)

Source is present in `vari_microlensing`

IN_VARI_COMPACT_COMPANION : Source is present in `vari_compact_companion` (boolean)

Source is present in `vari_compact_companion`

13.2 VARI_CLASSIFIER_RESULT

Table with variability classification results of all classifiers, which are identified by the `classifier_name` column. In DR3, multiple classifiers (depending on class) are combined into a single classifier with `classifier_name`='n_transits:5+', which is described in `vari_classifier_definition` and identifies the classes defined in `vari_classifier_class_definition`.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

CLASSIFIER_NAME : Classifier name used to produce this result, use for lookup in `vari_classifier_defini` table (string)

Classifier name used to produce this result, to be used for lookup in table `vari_classifier_definition` (only `classifier_name`='n_transits:5+' is available in DR3).

BEST_CLASS_NAME : Name of best class, see table `vari_classifier_class_definition` for details of the class (string)

Best class name with corresponding classification score in `best_class_score`. For the 'n_transits:5+' classifier in DR3, the following classes are published: 'ACV|CP|MCP|ROAM|ROAP|SXARI', 'ACYG', 'AGN', 'BCEP', 'BE|GCAS|SDOR|WR', 'CEP', 'CV', 'DSCT|GDOR|SXPHE', 'ECL', 'ELL', 'EP', 'LPV', 'MICROLENSING', 'RCB', 'RR', 'RS', 'S', 'SDB', 'SN', 'SOLAR_LIKE', 'SPB', 'SYST', 'WD', and 'YSO'. The 'GALAXY' classifications are largely due to artificial variability (see Section **??** of the release documentation for details) and their probabilities are published exclusively in column vari_best_class_score of table Galaxy.

See vari_classifier_class_definition for a detailed description of this classifier and its published classes.

BEST_CLASS_SCORE : Score of the best class (float)

It describes a quantity between 0 and 1 which is related to the (median) normalised rank of the confidence of the classifier(s) in the identification of the best class (best_class_name). In the special case of class 'EP', all scores are set to 1. See Section **??** of the release documentation for details.

13.3 VARI_CLASSIFIER_DEFINITION

Table with detailed descriptions of all classifiers used in table `vari_classifier_result`. Details of the published classes for each classifier can be found in `vari_classifier_class_def`

In DR3, this table contains the details of a classifier with `classifier_name`='n_transits:5+'.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

CLASSIFIER_NAME : Name of the classifier that is detailed in this entry (string)

Name of the classifier that is detailed in this entry.

CLASSIFIER_DESCRIPTION : Description of this classifier (string)

Human readable description of the classifier.

13.4 VARI_CLASSIFIER_CLASS_DEFINITION

Table with detailed descriptions of published classes for each classifier described in `vari_classifier_definition` and used in table `vari_classifier_result`.

In DR3, this table contains the details of a classifier with `classifier_name`=‘n_transits:5+’.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

CLASSIFIER_NAME : Name of the classifier that is detailed in this entry (string)

Name of the classifier that is detailed in this entry.

CLASS_NAME : Name of the published class from this classifier (string)

Name of the published class from this classifier.

CLASS_DESCRIPTION : Description of the published class from this classifier (string)

Descriptions of the published class from this classifier.

13.5 VARI_AGN

This table provides information on AGN properties.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

FRACTIONAL_VARIABILITY_G : Fractional variability in the G band (float)

The fractional variability is calculated as $\sqrt{\mathrm{MAD}^2(F) - \mathrm{RMS}^2(\sigma_F)}/\mathrm{median}(F)$, where $\mathrm{MAD}(F)$ is the Median Absolute Deviation (MAD) of the field-of-view transit fluxes F in the G band, $\mathrm{RMS}^2(\sigma_F)$ the mean square of flux uncertainties σ_F, and $\mathrm{median}(F)$ is the median flux of the field-of-view transits in the G band.

STRUCTURE_FUNCTION_INDEX : Index of the first-order structure function in the G band (float)

Index of the first-order structure function (SF; Simonetti et al. 1985), i.e., slope in the logSF vs logTau space, where Tau is the time lag. The SF is expressed in magnitude squared and computed from field-of-view transit magnitudes in the G band. The index is linked to that of the Fourier power spectrum and indicates the type of noise process at work.

STRUCTURE_FUNCTION_INDEX_SCATTER : Standard deviation of the index of the structure function (float)

Standard deviation of the index α of the structure function (i.e., slope in the logSF vs logTau space). The structure function is expressed in magnitude square. The index is linked to the power of the Fourier power spectrum and indicates the type of noise process at work. AGN should show $\alpha = 0.5$, in between flicker noise ($\alpha = 0$) and shot (random walk) noise ($\alpha = 1$).

QSO_VARIABILITY : Quasar variability metric in the G band (float)

Quasar variability metric from field-of-view transit magnitudes in the G band in log format, $\log(\chi^2_{\rm QSO}/\nu)$, from Butler & Bloom (2011), after adaptation to Gaia data.

NON_QSO_VARIABILITY : Non-quasar variability metric in the G band (float)

Non-quasar variability metric from field-of-view transit magnitudes in the G band in log format, $\log(\chi^2_{\rm false}/\nu)$, from Butler & Bloom (2011), after adaptation to Gaia data.

13.6 VARI_CEPHEID

This table describes the Cepheid stars.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

PF : Period corresponding to the fundamental pulsation mode in the G band time series (double, Time[day])

For single-mode pulsators classified as fundamental mode pulsators, this parameter is filled with the periodicity found in the time-series.

This value is obtained by modelling the *G* band time series using the Levenberg-Marquardt non–linear fitting algorithm (Clementini et al. 2016).

Information for `vari_rrlyrae`: For double-mode RR Lyrae this parameter is filled with the period corresponding to the longer periodicity.

Information for `vari_cepheid`: For double-mode DCEPs this parameter is filled with the period corresponding to the longer periodicity if the DCEP is classified as 'F/1O' or 'F/2O'. For triple-mode DCEPs this parameter is filled with the period corresponding to the longer periodicity if the DCEP is classified as 'F/1O/2O'.

PF_ERROR : Uncertainty of the `pf` period (float, Time[day])

This parameter is filled with the uncertainty of the `pf` parameter, computed via a bootstrap technique.

P1_O : Period corresponding to the first overtone pulsation mode in the G band time series (double, Time[day])

For single-mode pulsators classified as first-overtone pulsators, this parameter is filled with the periodicity found in the time-series.

This value is obtained by modelling the *G* time series using the Levenberg-Marquardt non linear fitting algorithm (see Clementini et al. 2016).

Information for `vari_rrlyrae`: For double-mode RR Lyrae this parameter is filled with the period corresponding to the shortest periodicity.

Information for `vari_cepheid`: For double-mode DCEPs this parameter is filled with the period corresponding to the shortest periodicity if the DCEP is classified as 'F/1O'; otherwise it is filled with the longest one if the classification is '1O/2O' or '1O/3O'. For triple-mode DCEPs this parameter is filled with the period corresponding to the intermediate periodicity if the DCEP is classified as 'F/1O/2O'; it is filled with the longest periodicity if the classification is '1O/2O/3O'.

P1_O_ERROR : Uncertainty of the `p1_o` period (float, Time[day])

This parameter is filled with the uncertainty of the `p1_o` parameter, computed via a bootstrap technique.

EPOCH_G : Epoch of the maximum of the light curve in the G band (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of maximum light for the Gaia *G* band light curve. It corresponds to the barycentric Julian day (BJD) of the maximum value of the light curve model which is closest to the BJD of the first observations -3 times the period of the source (first periodicity depending on the pulsation mode).

The aforementioned BJD is offset by JD 2 455 197.5 (= J2010.0).

EPOCH_G_ERROR : Uncertainty on the epoch parameter `epoch_g` (float, Time[day])

Value of the uncertainty of the `epoch_g` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

EPOCH_BP : Epoch of the maximum of the light curve in the BP band (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of maximum light for the Gaia integrated $G_{\rm BP}$ band light curve. It corresponds to the barycentric Julian day (BJD) of the maximum value of the light curve model which is closest to the BJD of the first observations -3 times the period of the source (first periodicity depending on the pulsation mode).

The aforementioned BJD is offset by JD 2 455 197.5 (= J2010.0).

EPOCH_BP_ERROR : Uncertainty on the epoch parameter `epoch_bp` (float, Time[day])

Value of the uncertainty of the `epoch_bp` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

EPOCH_RP : Epoch of the maximum of the light curve in the RP band (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of maximum light for the Gaia integrated $G_{\rm RP}$ band light curve. It corresponds to the barycentric Julian day (BJD) of the maximum value of the light curve model which is closest to the BJD of the first observations -3 times the period of the source (first periodicity depending on the pulsation mode).

The aforementioned BJD is offset by JD 2 455 197.5 (= J2010.0).

EPOCH_RP_ERROR : Uncertainty on the epoch parameter `epoch_rp` (float, Time[day])

Value of the uncertainty of the `epoch_rp` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

EPOCH_RV : Epoch of the minimum of the radial velocity curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of minimum radial velocity for the Gaia radial velocity curve.

EPOCH_RV_ERROR : Uncertainty on the epoch parameter `epoch_rv` (float, Time[day])

Value of the uncertainty of the `epoch_rv` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

INT_AVERAGE_G : Intensity-averaged magnitude in the G band (float, Magnitude[mag])

Value of the intensity-averaged magnitude in the G-band. The intensity-averaged magnitude is obtained by computing the average flux and then converting the average flux to magnitude.

INT_AVERAGE_G_ERROR : Uncertainty on `int_average_g` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty of the `int_average_g` parameter, computed via a bootstrap technique.

INT_AVERAGE_BP : Intensity-averaged magnitude in the BP band (float, Magnitude[mag])

Value of the intensity-averaged magnitude in the $G_{\rm BP}$-band. The intensity-averaged magnitude is obtained by computing the average flux and then converting the average flux to magnitude.

INT_AVERAGE_BP_ERROR : Uncertainty on `int_average_bp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty of the `int_average_bp` parameter, computed via a bootstrap technique.

INT_AVERAGE_RP : Intensity-averaged magnitude in the RP band (float, Magnitude[mag])

Value of the intensity-averaged magnitude in the $G_{\rm RP}$-band. The intensity-averaged magnitude is obtained by computing the average flux and then converting the average flux to magnitude.

INT_AVERAGE_RP_ERROR : Uncertainty on `int_average_rp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty of the `int_average_rp` parameter, computed via a bootstrap technique.

AVERAGE_RV : Mean radial velocity (float, Velocity[km s^{-1}])

Average value of the Fourier modelled radial velocity curve, provided by the A_0 parameter of the

Fourier fit.

AVERAGE_RV_ERROR : Uncertainty on `average_rv` parameter (float, Velocity[km s^{-1}])

Error of `average_rv` computed via bootstrap technique.

PEAK_TO_PEAK_G : Peak-to-peak amplitude of the G band light curve (float, Magnitude[mag])

This parameter is filled with the peak-to-peak amplitude value of the G band light curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modelled folded light curve in the G band. The light curve of the target star is modelled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the G-band light curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_G_ERROR : Uncertainty on the `peak_to_peak_g` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty value of the `peak_to_peak_g` parameter, computed via a bootstrap technique.

PEAK_TO_PEAK_BP : Peak-to-peak amplitude of the BP band light curve (float, Magnitude[mag])

This parameter is filled with the peak-to-peak amplitude value of the $G_{\rm BP}$ light curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modelled folded light curve in the $G_{\rm BP}$ band. The light curve of the target star is modelled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the $G_{\rm BP}$-band light curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_BP_ERROR : Uncertainty on the `peak_to_peak_bp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty value of the `peak_to_peak_bp` parameter, computed via a bootstrap technique.

PEAK_TO_PEAK_RP : Peak-to-peak amplitude of the RP band light curve (float, Magnitude[mag])

This parameter is filled with the peak-to-peak amplitude value of the G_{RP} light curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modelled folded light curve in the G_{RP} band. The light curve of the target star is modelled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the G_{RP}-band light curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_RP_ERROR : Uncertainty on the `peak_to_peak_rp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty value of the `peak_to_peak_rp` parameter, computed via a bootstrap technique.

PEAK_TO_PEAK_RV : Peak-to-peak amplitude of the radial velocity curve (double, Velocity[km s^{-1}])

This parameter is filled with the peak-to-peak amplitude value of the radial velocity curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modeled folded RV curve. The RV curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the RV curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_RV_ERROR : Uncertainty on the `peak_to_peak_rv` parameter (double, Velocity[km s^{-1}])

This parameter is filled with the uncertainty value of the `peak_to_peak_rv` parameter, computed via a bootstrap technique.

METALLICITY : Metallicity of the star from the Fourier parameters of the light curve (float, Abundances[dex])

This parameter is filled with the [Fe/H] metallicity derived for the source from the Fourier parameters of the G-band light curve.

METALLICITY_ERROR : Uncertainty of the `metallicity` parameter (float, Abundances[dex])

This parameter is filled with the uncertainty of the `metallicity` derived from the Fourier parameters of the G-band light curve.

R21_G : Fourier decomposition parameter `r21_g`: A2/A1 (for G band) (float)

This parameter is filled with the Fourier decomposition parameter $R_{21} = A_2/A_1$, where A_2 is the amplitude of the 2nd harmonic and A_1 is the amplitude of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

R21_G_ERROR : Uncertainty on the `r21_g` parameter: A2/A1 (for G band) (float)

This parameter is filled with the uncertainty value on the `r21_g` parameter, computed via a bootstrap technique.

R31_G : Fourier decomposition parameter `r31_g`: A3/A1 (for G band) (float)

This parameter is filled with the Fourier decomposition parameter $R_{21} = A_3/A_1$, where A_3 is the amplitude of the 3rd harmonic and A_1 is the amplitude of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

R31_G_ERROR : Uncertainty on the `r31_g` parameter: A3/A1 (for G band) (float)

This parameter is filled with the uncertainty value of the `r31_g` parameter, computed via a bootstrap technique.

PHI21_G : Fourier decomposition parameter `phi21_g`: phi2 - 2*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the Fourier decomposition parameter ϕ_{21}: $\phi_2 - 2\phi_1$ value, where ϕ_2 is the phase of the 2nd harmonic and ϕ_1 is the phase of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

PHI21_G_ERROR : Uncertainty on the `phi21_g` parameter: phi2 - 2*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the uncertainty of the `phi21_g` parameter, computed via a bootstrap technique.

PHI31_G : Fourier decomposition parameter `phi31_g`: phi3 - 3*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the Fourier decomposition parameter ϕ_{31}: $\phi_3 - 3\phi_1$ value, where ϕ_3 is the phase of the 3rd harmonic and ϕ_1 is the phase of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

PHI31_G_ERROR : Uncertainty on the `phi31_g` parameter: phi3 - 3*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the uncertainty of the `phi31_g`: $\phi_3 - 3\phi_1$ parameter, computed via a bootstrap technique.

NUM_CLEAN_EPOCHS_G : Number of G FoV epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the G-band light curve after the SOS Cep & RRLyrae outlier removal process.

NUM_CLEAN_EPOCHS_BP : Number of BP epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the $G_{\rm BP}$-band light curve after the SOS Cep & RRLyrae outlier removal process.

NUM_CLEAN_EPOCHS_RP : Number of RP epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the $G_{\rm RP}$-band light curve after the SOS Cep & RRLyrae outlier removal process.

NUM_CLEAN_EPOCHS_RV : Number of radial velocity epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the radial velocity curve after the SOS Cep & RRLyrae outlier removal process.

ZP_MAG_G : Zero point (mag) of the final model of the G band light curve (float, Magnitude[mag])

Zero point (mag) of the final model of the G-band light curve for Cepheids and RR Lyrae stars.

ZP_MAG_BP : Zero point (mag) of the final model of the BP band light curve (float, Magnitude[mag])

Zero point (mag) of the final model of the G_{BP} band light curve for Cepheids and RR Lyrae stars.

ZP_MAG_RP : Zero point (mag) of the final model of the RP band light curve (float, Magnitude[mag])

Zero point (mag) of the final model of the G_{RP} band light curve for Cepheids and RR Lyrae stars.

NUM_HARMONICS_FOR_P1_G : Number of harmonics used to model the first periodicity of the G-band light curve (byte)

This parameter is filled with the number of harmonics used to model the G-band light curve folded with the P1 period. The G-band light curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

NUM_HARMONICS_FOR_P1_BP : Number of harmonics used to model the first periodicity of the BP-band light curve (byte)

This parameter is filled with the number of harmonics used to model the $G_{\rm BP}$-band light curve folded with the P1 period. The $G_{\rm BP}$-band light curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

NUM_HARMONICS_FOR_P1_RP : Number of harmonics used to model the first periodicity of the RP-band light curve (byte)

This parameter is filled with the number of harmonics used to model the G_{RP}-band light curve folded with the P1 period. The G_{RP}-band light curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

NUM_HARMONICS_FOR_P1_RV : Number of harmonics used to model the first periodicity of the radial velocity curve (byte)

This parameter is filled with the number of harmonics used to model the radial velocity curve folded with the P1 period. The radial velocity curve of the target star is modeled with a truncated Fourier series ($rv(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

REFERENCE_TIME_G : Reference time of the Fourier modelled G-band light curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled G-band light curve.

REFERENCE_TIME_BP : Reference time of the Fourier modelled BP-band light curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled G_{BP}-band light curve.

REFERENCE_TIME_RP : Reference time of the Fourier modelled RP-band light curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled G_{RP}-band light curve.

REFERENCE_TIME_RV : Reference time of the Fourier modelled radial velocity curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled radial velocity curve.

FUND_FREQ1 : First frequency of the non-linear Fourier modelling (double, Frequency[day^{-1}])

First frequency of the non-linear Fourier modelling. It applies to all three G, $G_{\rm BP}$, and $G_{\rm RP}$ bands and the radial velocity curve.

FUND_FREQ1_ERROR : Error of the first frequency of the non-linear Fourier modelling (float, Frequency[day^{-1}])

Error of the first frequency of the non-linear Fourier modelling.

FUND_FREQ2 : Second frequency of the non-linear Fourier modelling in the G band (double, Frequency[day^{-1}])

Second frequency of the non-linear Fourier modelling for the G band only.

FUND_FREQ2_ERROR : Error of the second frequency of the non-linear Fourier modelling in the G band (float, Frequency[day^{-1}])

Error of the second frequency of the non-linear Fourier modelling. It applies to the G band only.

FUND_FREQ1_HARMONIC_AMPL_G : Amplitudes of the Fourier model for the first frequency in the G band (float[16] array, Magnitude[mag])

Amplitudes of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_AMPL_G_ERROR : Errors of the amplitudes of the Fourier model for the first frequency in the G band (float[16] array, Magnitude[mag])

Errors of the amplitudes of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_PHASE_G : Phases of the Fourier model for the first frequency in the G band (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_PHASE_G_ERROR : Errors of the phases of the Fourier model for the first frequency in the G band (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_AMPL_BP : Amplitudes of the Fourier model for the first frequency in the BP band (float[16] array, Magnitude[mag])

Amplitudes of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_BP_ERROR : Errors of the amplitudes of the Fourier model for the first frequency in the BP band (float[16] array, Magnitude[mag])

Errors of the amplitudes of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_BP : Phases of the Fourier model for the first frequency in the BP band (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_BP_ERROR : Errors of the phases of the Fourier model for the first frequency in the BP band (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_RP : Amplitudes of the Fourier model for the first frequency in the RP band (float[16] array, Magnitude[mag])

Amplitudes of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_RP_ERROR : Errors of the amplitudes of the Fourier model for the first frequency in the RP band (float[16] array, Magnitude[mag])

Errors of the amplitudes of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_RP : Phases of the Fourier model for the first frequency in the RP band (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_RP_ERROR : Errors of the phases of the Fourier model for the first frequency in the RP band (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_RV : Amplitudes of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Velocity[km s^{-1}])

Amplitudes of the Fourier model fitted to the observed radial velocity curve.

FUND_FREQ1_HARMONIC_AMPL_RV_ERROR : Errors of the amplitudes of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Velocity[km s^{-1}])

Errors of the amplitudes of the Fourier model fitted to the observed radial velocity curve.

FUND_FREQ1_HARMONIC_PHASE_RV : Phases of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed radial velocity curve.

FUND_FREQ1_HARMONIC_PHASE_RV_ERROR : Errors of the phases of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed radial velocity curve.

P2_O : Period corresponding to the second overtone pulsation mode (for multi mode pulsators) in the G band time series (double, Time[day])

For double-mode DCEPs, this parameter is filled with the period corresponding to the shortest periodicity if the DCEP is classified as '1O/2O' of 'F/2O'; otherwise it is filled with the longest periodicity if the classification is ‘2O/3O’.

For triple-mode DCEPs this parameter is filled with the period corresponding to the shortest periodicity if the DCEP is classified as ‘F/1O/2O’; it is filled with the intermediate periodicity if the classification is ‘1O/2O/3O’.

This value is obtained by modelling the G time series using the Levenberg-Marquardt non linear fitting algorithm (see Clementini et al. 2016).

P2_O_ERROR : Uncertainty of the p2_o period (float, Time[day])

This parameter is filled with the uncertainty of the `p2_o` parameter, computed via a bootstrap technique.

TYPE_BEST_CLASSIFICATION : Best type classification estimate out of: ‘DCEP’, ‘T2CEP’, ‘ACEP’ (string)

Classification of a Cepheid into ‘DCEP’, ‘T2CEP’ or ‘ACEP’ using the period-luminosity relations, which are different for the three different types of Cepheids.

TYPE2_BEST_SUB_CLASSIFICATION : Best subclassification estimate for type_best_classification=‘T2CEP’ out of: ‘BL_HER’, ‘W_VIR’,‘RV_TAU’ (string)

Sub-classification of a T2CEP Cepheids into BL Herculis (‘BL_HER’), W Virginis (‘W_VIR’) or RV Tauris (‘RV_TAU’) sub-types depending on the source periodicity.

MODE_BEST_CLASSIFICATION : Best mode classification estimate out of: ‘FUNDAMENTAL’, ‘FIRST_OVERTONE’, ‘SECOND_OVERTONE’, ‘MULTI’,‘UNDEFINED’, ‘NOT_APPLICABLE’ (string)

Best mode classification estimate:

- ‘FUNDAMENTAL’: fundamental mode for `type_best_classification`=‘DCEP’ or ‘ACEP’
- ‘FIRST_OVERTONE’: first overtone for `type_best_classification`=‘DCEP’ or ‘ACEP’
- ‘SECOND_OVERTONE’: second overtone for `type_best_classification`=‘DCEP’

- 'MULTI': multi-mode pulsators for `type_best_classification`='DCEP'
- 'UNDEFINED': if mode could not be clearly determined for `type_best_classification`='DCE or 'ACEP'
- 'NOT_APPLICABLE': when `type_best_classification`='T2CEP'

The Cepheid pulsation mode is assigned using the period-luminosity and period-Wesenheit relations, which are different for the various pulsation modes as well as analysing the Fourier parameters vs period plots. The type 'MULTI' is assigned to stars pulsating in two or more modes simultaneously.

MULTI_MODE_BEST_CLASSIFICATION : Best multi mode DCEP classification out of: 'F/1O', 'F/2O', '1O/2O', '1O/3O', '2O/3O', 'F/1O/2O', '1O/2O/3O' (string)

Sub-classification of multi mode DCEP variables according to their position in the 'Petersen diagram' — see for example Fig. 1 in Soszyński et al. (2015). F,1O,2O and 3O correspond with fundamental, first, second and third overtone, respectively.

13.7 VARI_COMPACT_COMPANION

This table describes the compact companion candidates.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

PERIOD : Orbital period (double, Time[day])

Orbital period of the binary system.

PERIOD_ERROR : Orbital period error (float, Time[day])

Orbital period 1-sigma uncertainty.

T0_G : G-band reference time (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

G-band light-curve model reference time (see `harmonic_model_params_g` description).

T0_G_ERROR : G-band reference time error (float, Time[day])

G-band light-curve model reference time error.

T0_BP : BP-band reference time (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

G_{BP}-band light-curve model reference time (see `harmonic_model_params_bp` description).

The parameter is NULL when the number of points in the G_{BP}-band time series is strictly less than 25.

T0_BP_ERROR : BP-band reference time error (float, Time[day])

G_{BP}-band light-curve model reference time error.

The parameter is NULL when the number of points in the G_{BP}-band time series is strictly less than 25.

T0_RP : RP-band reference time (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

G_{RP}-band light-curve model reference time (see `harmonic_model_params_rp` description).

The parameter is NULL when the number of points in the G_{RP}-band time series is strictly less than 25.

T0_RP_ERROR : RP-band reference time error (float, Time[day])

G_{RP}-band light-curve model reference time error.

The parameter is NULL when the number of points in the G_{RP}-band time series is strictly less than 25.

HARMONIC_MODEL_PARAMS_G : G-band harmonics (float[6] array, Magnitude[mag])

The G-band light curve is fitted by a three-harmonics model:

$\texttt{model\_mean\_g} + a1cG * \cos(\omega(t - \texttt{t0\_g})) + a2cG * \cos(2\omega * (t - \texttt{t0\_g})) + a3cG * \cos(3\omega * (t - \texttt{t0\_g})) + a1sG * \sin(\omega(t - \texttt{t0\_g})) + a2sG * \sin(2\omega(t - \texttt{t0\_g})) + a3sG * \sin(3\omega * (t - \texttt{t0\_g}))$.

ω is the orbital frequency $2\pi/\texttt{period}$, and the reference time `t0_g` is set to obtain `a2sG` = 0. t is a Barycentric JD in TCB − 2 455 197.5 (day).

Fourier coefficients are given in `harmonic_model_params_g`: [`a1cG`, `a2cG`, `a3cG`, `a1sG`, `a2sG`, a3sG], and their errors are given in `harmonic_model_params_g_error` in the same order.

HARMONIC_MODEL_PARAMS_G_ERROR : G-band harmonics errors (float[6] array, Magnitude[mag])

G-band harmonics parameters 1-sigma uncertainty.

HARMONIC_MODEL_PARAMS_BP : BP-band harmonics (float[6] array, Magnitude[mag])

The G_{BP}-band light curve is fitted by a three-harmonics model:

$\mathtt{model\_mean\_bp} + a1cBp * \cos(\omega(t - \mathtt{t0\_bp})) + a2cBp * \cos(2\omega * (t - \mathtt{t0\_bp})) + a3cBp * \cos(3\omega * (t - \mathtt{t0\_bp})) + a1sBp * \sin(\omega(t - \mathtt{t0\_bp})) + a2sBp * \sin(2\omega(t - \mathtt{t0\_bp})) + a3sBp * \sin(3\omega * (t - \mathtt{t0\_bp}))$.

ω is the orbital frequency $2\pi/\mathtt{period}$, and the reference time `t0_bp` is set to obtain `a2sBp` = 0. t is a Barycentric JD in TCB − 2 455 197.5 (day).

Fourier coefficients are given in `harmonic_model_params_bp`: [a1cBp, a2cBp, a3cBp, a1sBp, a2sBp, a3sBp], and their errors are given in `harmonic_model_params_bp_error` in the same order.

The parameter is an array of NaN when the number of points in the G_{BP}-band time series is strictly less than 25.

HARMONIC_MODEL_PARAMS_BP_ERROR : BP-band harmonics errors (float[6] array, Magnitude[mag])

G_{BP}-band harmonics parameters 1-sigma uncertainty.

The parameter is an array of NaN when the number of points in the G_{BP}-band time series is strictly less than 25.

HARMONIC_MODEL_PARAMS_RP : RP-band harmonics (float[6] array, Magnitude[mag])

The G_{RP}-band light curve is fitted by a three-harmonics model:

$\mathtt{model\_mean\_rp} + a1cRp * \cos(\omega(t - \mathtt{t0\_rp})) + a2cRp * \cos(2\omega * (t - \mathtt{t0\_rp})) + a3cRp * \cos(3\omega * (t - \mathtt{t0\_rp})) + a1sRp * \sin(\omega(t - \mathtt{t0\_rp})) + a2sRp * \sin(2\omega(t - \mathtt{t0\_rp})) + a3sRp * \sin(3\omega * (t - \mathtt{t0\_rp}))$.

ω is the orbital frequency $2\pi/\texttt{period}$, and the reference time `t0_rp` is set to obtain `a2sRp` = 0. t is a Barycentric JD in TCB − 2 455 197.5 (day).

Fourier coefficients are given in `harmonic_model_params_rp`: [`a1cRp`, `a2cRp`, `a3cRp`, `a1sRp`, `a2sRp`, `a3sRp`], and their errors are given in `harmonic_model_params_rp_error` in the same order.

The parameter is an array of NaN when the number of points in the $G_{\rm RP}$-band time series is strictly less than 25.

HARMONIC_MODEL_PARAMS_RP_ERROR : RP-band harmonics errors (float[6] array, Magnitude[mag])

$G_{\rm RP}$-band harmonics parameters 1-sigma uncertainty.

The parameter is an array of NaN when the number of points in the $G_{\rm RP}$-band time series is strictly less than 25.

MODEL_MEAN_G : Harmonics model mean G-band magnitude (float, Magnitude[mag])

G-band mean magnitude derived by the three-harmonics model.

MODEL_MEAN_G_ERROR : Harmonics model mean G-band magnitude error (float, Magnitude[mag])

G-band model mean magnitude 1-sigma uncertainty.

MODEL_MEAN_BP : Harmonics model mean BP-band magnitude (float, Magnitude[mag])

$G_{\rm BP}$-band mean magnitude derived by the three-harmonics model.

The parameter is NULL when the number of points in the $G_{\rm BP}$-band time series is strictly less than 25.

MODEL_MEAN_BP_ERROR : Harmonics model mean BP-band magnitude error (float, Magnitude[mag])

$G_{\rm BP}$-band model mean magnitude 1-sigma uncertainty.

The parameter is NULL when the number of points in the G_{BP}-band time series is strictly less than 25.

MODEL_MEAN_RP : Harmonics model mean RP-band magnitude (float, Magnitude[mag])

G_{RP}-band mean magnitude derived by the three-harmonics model.

The parameter is NULL when the number of points in the G_{RP}-band time series is strictly less than 25.

MODEL_MEAN_RP_ERROR : Harmonics model mean RP-band magnitude error (float, Magnitude[mag])

G_{RP}-band model mean magnitude 1-sigma uncertainty.

The parameter is NULL when the number of points in the G_{RP}-band time series is strictly less than 25.

MOD_MIN_MASS_RATIO : Modified minimum mass ratio (float)

Mass ratio of the system — ratio of secondary (less luminous) to primary mass. Modified minimum value is found by assuming primary fills its Roche-Lobe and inclination is 90 deg ('edge-on'). Mathematical expressions are given by Gomel, Faigler, & Mazeh (2021).

MOD_MIN_MASS_RATIO_ONE_SIGMA : 15.9 percentile modified minimum mass ratio (float)

The 15.9 percentile modified minimum mass ratio of the system, considering the leading harmonic (`a2c`) and `alpha` uncertainties.

MOD_MIN_MASS_RATIO_THREE_SIGMA : 0.135 percentile modified minimum mass ratio (float)

The 0.135 percentile modified minimum mass ratio of the system, considering the leading harmonic (`a2c`) and `alpha` uncertainties.

ALPHA : alpha ellipsoidal coefficient (float)

The alpha ellipsoidal coefficient of the leading second harmonic term is assumed to be 1.3 for almost all systems. When mod_min_mass_ratio cannot be derived using this value (1.3), we find the minimum value of alpha, derived for mod_min_mass_ratio of 100, and this value is given instead of 1.3. See Section **??** of the release documentation for details.

13.8 VARI_ECLIPSING_BINARY

This table describes the properties of the eclipsing binaries resulting from the variability analysis.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

GLOBAL_RANKING : Number between 0 (worst) and 1 (best) (float)

Number between 0 (worst) and 1 (best), based on the fraction of variance unexplained (FVU) for the geometrical model fit.

REFERENCE_TIME : Reference time used for the geometric model fit (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Time with respect to which the phases of the gaussian components refer in the geometrical model, or of the cosine(s) if no gaussian component is present in the model.

FREQUENCY : Frequency of geometric model of the eclipsing binary light curve (double, Frequency[day^{-1}])

Frequency of geometric model of the eclipsing binary light curve.

FREQUENCY_ERROR : Uncertainty of `frequency` (float, Frequency[day^{-1}])

Uncertainty of `frequency`.

GEOM_MODEL_REFERENCE_LEVEL : Magnitude reference level of geometric model (float, Magnitude[mag])

Magnitude reference level of geometric model.

GEOM_MODEL_REFERENCE_LEVEL_ERROR : Uncertainty of `geom_model_reference_level` (float, Magnitude[mag])

Uncertainty of `geom_model_reference_level`.

GEOM_MODEL_GAUSSIAN1_PHASE : Phase of the Gaussian 1 component (float)

Phase with respect to reference_time. NaN if no Gaussian component in the model. Note: Gaussian1 does not necessarily correspond to the deepest eclipse.

GEOM_MODEL_GAUSSIAN1_PHASE_ERROR : Uncertainty of `geom_model_gaussian1_phase` (float)

Uncertainty of `geom_model_gaussian1_phase`.

GEOM_MODEL_GAUSSIAN1_SIGMA : Standard deviation [phase] of Gaussian 1 component (float)

NaN if no Gaussian component in the model. Note: Gaussian1 does not necessarily correspond to the deepest eclipse.

GEOM_MODEL_GAUSSIAN1_SIGMA_ERROR : Uncertainty of `geom_model_gaussian1_sigma` (float)

Uncertainty of `geom_model_gaussian1_sigma`.

GEOM_MODEL_GAUSSIAN1_DEPTH : Magnitude depth of Gaussian 1 component (float, Magnitude[mag])

NaN if no Gaussian component in the model. Note: Gaussian1 does not necessarily correspond to the deepest eclipse.

GEOM_MODEL_GAUSSIAN1_DEPTH_ERROR : Uncertainty of `geom_model_gaussian1_depth` (float, Magnitude[mag])

Uncertainty of `geom_model_gaussian1_depth`. It can be null when the model could not derive it.

GEOM_MODEL_GAUSSIAN2_PHASE : Phase of Gaussian 2 component (float)

Phase with respect to reference_time. NaN if no second Gaussian component in the model

GEOM_MODEL_GAUSSIAN2_PHASE_ERROR : Uncertainty of `geom_model_gaussian2_phase` (float)

Uncertainty of `geom_model_gaussian2_phase`.

GEOM_MODEL_GAUSSIAN2_SIGMA : Standard deviation [phase] of Gaussian 2 component (float)

NaN if no second Gaussian component in the model

GEOM_MODEL_GAUSSIAN2_SIGMA_ERROR : Uncertainty of `geom_model_gaussian2_sigma` (float)

Uncertainty of `geom_model_gaussian2_sigma`.

GEOM_MODEL_GAUSSIAN2_DEPTH : Magnitude depth of Gaussian2 component (float, Magnitude[mag])

NaN if no second Gaussian component in the model

GEOM_MODEL_GAUSSIAN2_DEPTH_ERROR : Uncertainty of `geom_model_gaussian2_depth` (float, Magnitude[mag])

Uncertainty of `geom_model_gaussian2_depth`. It can be null when the model could not derive it.

GEOM_MODEL_COSINE_HALF_PERIOD_AMPLITUDE : Amplitude of the cosine component with half the period of the geometric model (float, Magnitude[mag])

The amplitude is half peak-to-peak. NaN if no cosine component with half the period of the geometric model.

GEOM_MODEL_COSINE_HALF_PERIOD_AMPLITUDE_ERROR : Uncertainty of `geom_model_cosine_half_` (float, Magnitude[mag])

Uncertainty of `geom_model_cosine_half_period_amplitude`.

GEOM_MODEL_COSINE_HALF_PERIOD_PHASE : Reference phase of the cosine component with half the period of the geometric model (float)

Phase with respect to `reference_time`. When model contains Gaussian(s) this phase is equal to either `geom_model_gaussian1_phase` or `geom_model_gaussian2_phase`. NaN if no cosine component with half the period of the geometric model.

GEOM_MODEL_COSINE_HALF_PERIOD_PHASE_ERROR : Uncertainty of `geom_model_cosine_half_peri` (float)

When model contains Gaussian(s) this uncertainty is the same as either `geom_model_gaussian1_phase_err` or `geom_model_gaussian2_phase_error`.

MODEL_TYPE : Type of geometrical model of the light curve (string)

Type of eclipsing binary geometric model of the G-band light curve. For each model the `frequency` and `geom_model_reference_level` as well as their uncertainties (`_error`) are set. The additional fields (and their uncertainty) that are available for each `model_type` are specified below:

- `ONEGAUSSIAN`
  Geometric model parameters defined:
  - `geom_model_gaussian1_phase`
  - `geom_model_gaussian1_sigma`
  - `geom_model_gaussian1_depth`

Derived parameters defined:

- derived_primary_ecl_phase
- derived_primary_ecl_duration
- derived_primary_ecl_depth

- ONEGAUSSIAN_WITH_ELLIPSOIDAL
  Geometric model parameters defined:
  - geom_model_gaussian1_phase
  - geom_model_gaussian1_sigma
  - geom_model_gaussian1_depth
  - geom_model_cosine_half_period_amplitude
  - geom_model_cosine_half_period_phase

  Derived parameters defined:
  - derived_primary_ecl_phase
  - derived_primary_ecl_duration
  - derived_primary_ecl_depth
- TWOGAUSSIANS
  Geometric model parameters defined:
  - geom_model_gaussian1_phase
  - geom_model_gaussian1_sigma
  - geom_model_gaussian1_depth
  - geom_model_gaussian2_phase
  - geom_model_gaussian2_sigma
  - geom_model_gaussian2_depth

  Derived parameters defined:
  - derived_primary_ecl_phase
  - derived_primary_ecl_duration
  - derived_primary_ecl_depth
  - derived_secondary_ecl_phase
  - derived_secondary_ecl_duration
  - derived_secondary_ecl_depth

- TWOGAUSSIANS_WITH_ELLIPSOIDAL_ON_ECLIPSE1
  In this model geom_model_cosine_half_period_phase is the same as geom_model_gaussia
  Geometric model parameters defined:
  - geom_model_gaussian1_phase
  - geom_model_gaussian1_sigma
  - geom_model_gaussian1_depth
  - geom_model_gaussian2_phase
  - geom_model_gaussian2_sigma
  - geom_model_gaussian2_depth
  - geom_model_cosine_half_period_amplitude
  - geom_model_cosine_half_period_phase

  Derived parameters defined:
  - derived_primary_ecl_phase
  - derived_primary_ecl_duration
  - derived_primary_ecl_depth
  - derived_secondary_ecl_phase
  - derived_secondary_ecl_duration
  - derived_secondary_ecl_depth
- TWOGAUSSIANS_WITH_ELLIPSOIDAL_ON_ECLIPSE2
  In this model geom_model_cosine_half_period_phase is the same as geom_model_gaussia
  Geometric model parameters defined:
  - geom_model_gaussian1_phase
  - geom_model_gaussian1_sigma
  - geom_model_gaussian1_depth
  - geom_model_gaussian2_phase
  - geom_model_gaussian2_sigma
  - geomModelGaussian2Fepth
  - geom_model_cosine_half_period_amplitude
  - geom_model_cosine_half_period_phase

  Derived parameters defined:
  - derived_primary_ecl_phase

- derived_primary_ecl_duration
- derived_primary_ecl_depth
- derived_secondary_ecl_phase
- derived_secondary_ecl_duration
- derived_secondary_ecl_depth

• ELLIPSOIDAL
Geometric model parameters defined:

- geom_model_cosine_half_period_amplitude
- geom_model_cosine_half_period_phase

NUM_MODEL_PARAMETERS : Number of free parameters of the geometric model (byte)

The number of parameters fitted for each model type. For each model the frequency and geom_model_reference_level are fitted, as well as the geometeric model parameters listed in the detailed description of model_type.

model_type	Number of parameters
ONEGAUSSIAN	5
ONEGAUSSIAN_WITH_ELLIPSOIDAL	6
TWOGAUSSIANS	8
TWOGAUSSIANS_WITH_ELLIPSOIDAL_ON_ECLIPSE1	9
TWOGAUSSIANS_WITH_ELLIPSOIDAL_ON_ECLIPSE2	9
ELLIPSOIDAL	4

REDUCED_CHI2 : Reduced Chi2 of the geometrical model fit (float)

The reduced Chi-square: χ^2/ν computed over all observations, where ν is the number of degrees of freedom.

Note that for high signal to noise observations (i.e. small uncertainties), the reduced Chi-square will increase when the simple geometric model cannot sufficiently model the more complex true light curve shape. A low Chi-square is therefore not a good measure for eclipsing binary detection on itself.

DERIVED_PRIMARY_ECL_PHASE : Primary eclipse: phase at geometrically deepest point (float)

Phase with respect to reference_time. This value is derived from the geometrical model. It can be offset from geom_model_gaussian1_phase or geom_model_gaussian2_phase if a cosine component is present. NaN if no Gaussian component in the geometric model.

DERIVED_PRIMARY_ECL_PHASE_ERROR : Primary eclipse: uncertainty of `derived_primary_ecl_phase` (float)

Primary eclipse: uncertainty of `derived_primary_ecl_phase` estimated by a Jackknife resampling method.

DERIVED_PRIMARY_ECL_DURATION : Primary eclipse: duration [phase fraction] (float)

This value is derived from the geometrical model, taking the Gaussian width estimated at a depth of 2% of the Gaussian, with an upper limit of 0.4. NaN if no Gaussian component in the geometric model.

DERIVED_PRIMARY_ECL_DURATION_ERROR : Primary eclipse: uncertainty of `derived_primary_ecl_dur` (float)

Primary eclipse: uncertainty of `derived_primary_ecl_duration`. Uncertainties are derived by a Jackknife resampling method. In rare instances, the uncertainty can be artificially larger than 1.

DERIVED_PRIMARY_ECL_DEPTH : Primary eclipse: depth (float, Magnitude[mag])

This value is derived from the geometrical model. NaN if no Gaussian component in the geometric model.

DERIVED_PRIMARY_ECL_DEPTH_ERROR : Primary eclipse: uncertainty of `derived_primary_ecl_depth` (float, Magnitude[mag])

Primary eclipse: uncertainty of `derived_primary_ecl_depth` estimated by a Jackknife resampling method. It can be null when the model could not derive it.

DERIVED_SECONDARY_ECL_PHASE : Secondary eclipse: phase at geometrically second deepest point (float)

This value is derived from the geometrical model. It can be offset from `geom_model_gaussian1_phase` or `geom_model_gaussian2_phase` if a cosine component is present. NaN if no secondary

Gaussian component in the geometric model.

DERIVED_SECONDARY_ECL_PHASE_ERROR : Secondary eclipse: uncertainty of `derived_secondary_ecl_`
(float)

Secondary eclipse: uncertainty of `derived_secondary_ecl_phase` estimated by a Jackknife resampling method.

DERIVED_SECONDARY_ECL_DURATION : Secondary eclipse: duration [phase fraction] (float)

This value is derived from the geometrical model, taking the Gaussian width estimated at a depth of 2% of the Gaussian, with an upper limit of 0.4. NaN if no secondary Gaussian component in the geometric model.

DERIVED_SECONDARY_ECL_DURATION_ERROR : Secondary eclipse: uncertainty of `derived_secondary_e`
(float)

Secondary eclipse: uncertainty of `derived_secondary_ecl_duration`. Uncertainties are derived by a Jackknife resampling method. In rare instances, the uncertainty can be artificially larger than 1.

DERIVED_SECONDARY_ECL_DEPTH : Secondary eclipse: depth (float, Magnitude[mag])

This value is derived from the geometrical model. NaN if no secondary Gaussian component in the geometric model.

DERIVED_SECONDARY_ECL_DEPTH_ERROR : Secondary eclipse: uncertainty of `derived_secondary_ecl_`
(float, Magnitude[mag])

Secondary eclipse: uncertainty of `derived_secondary_ecl_depth` estimated by a Jackknife resampling method. It can be null when the model could not derive it.

13.9 VARI_EPOCH_RADIAL_VELOCITY

This table contains the epoch radial velocity data points for a sub-set of variable stars. Each entry is a radial velocity in the solar barycentric reference frame for a given object and observation time.

Columns description:

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

TRANSIT_ID : Transit unique identifier (long)

The `transit_id` is a unique identifier assigned to each detected (and confirmed) source as it transits the Gaia focal plane. Each time a given source is detected as Gaia scans and re-scans the sky a new `transit_id` will be created to badge that apparition. Hence the along–scan time and the across–scan position along with the telescope in which the source was detected are used to form a unique integer with which to label the transit.

The several features of a detection that are encoded in `transit_id` can be easily retrieved using bit masks (&) and shifts (>>) as follows:

- On-Board Mission Time line [ns]
  = 204800 * ((`transit_id` >> 17) & (0x000003FFFFFFFFFF))
- Field-of-view = 1 + (`transit_id` >> 15) & 0x03 [1 for 'preceding' and 2 for 'following' fields-of-view respectively]
- CCD row = (`transit_id` >> 12) & 0x07 [dimensionless, in the range 1 to 7]
- Across-scan 'reference acquisition pixel' in strip AF1 = (`transit_id`) & 0x0FFF [pixels] (this is the across-scan centre of the AF1 window and is odd if immediately below the mid-point of the window and even if immediately above)

where the bit mask prefix '0x' denotes hexadecimal.

For further details see Portell et al. (2020). For convenience a decoder for `transit_id` is available on-line at https://gaia.esac.esa.int/decoder/transitidDecoder.jsp

RV_OBS_TIME : Observing time of the transit (double, Time[Barycentric JD in TCB – 2 455 197.5 (day)])

Observation time of the radial velocity in the solar barycentric reference frame. It corresponds to the mean of the observation times of the three CCDs used to collect spectra in the RVS during that transit.

RADIAL_VELOCITY : Barycentric radial velocity (double, Velocity[km s^{-1}])

Radial velocity in the solar barycentric frame for the transit of interest.

RADIAL_VELOCITY_ERROR : Barycentric radial velocity error (double, Velocity[km s^{-1}])

Error on the radial velocity for the transit of interest.

REJECTED_BY_VARIABILITY : Rejected by DPAC variability processing (or variability analysis) (boolean)

Indicates whether the radial velocity at this transit was rejected by the DPAC variability processing (or variability analysis)

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit https://gaia.esac.esa.int/decoder/solnDecoder.jsp.

13.10 VARI_RAD_VEL_STATISTICS

Statistical parameters of radial velocity time series, using only transits not rejected, see `rejected_by_variability` column in `vari_epoch_radial_velocity`.

Note that NaN will be reported when the parameter value is missing or cannot be calculated.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NUM_SELECTED_RV : Total number of radial velocity transits selected for variability analysis (short)

The number of processed observations for variability analyses of this source, using only transits not rejected, see `rejected_by_variability` column in `vari_epoch_radial_velocity`.

MEAN_OBS_TIME_RV : Mean observation time for radial velocity transits (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Name: The mean observation time

Control parameters: None

Output: Let y_i be a time series of size N at times t_i. The mean $\bar{t}$ is defined as

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} t_i. \tag{37}$$

TIME_DURATION_RV : Time duration of the time series for radial velocity transits (float, Time[day])

Name: The time duration of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The time duration of the time series is equal to $t_N - t_1$.

MIN_RV : Minimum radial velocity (float, Velocity[km s^{-1}])

Name: The minimum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The minimum value of the time series is defined as:

$$min(y_i)\ \forall i \in (1, N) \tag{38}$$

MAX_RV : Maximum radial velocity (float, Velocity[km s^{-1}])

Name: The maximum value of the time series

Control parameters: None

Output: Let y_i be a time series of size N at times t_i, with $i = 1$ to N. The maximum value of the time series is defined as:

$$max(y_i)\ \forall i \in (1, N) \tag{39}$$

MEAN_RV : Mean radial velocity (float, Velocity[km s^{-1}])

Name: The mean of the time series

Control parameters: None

Output: Let y_i be a time series of size N. The mean $\overline{y}$ is defined as

$$\overline{y} = \frac{1}{N} \sum_{i=1}^{N} y_i. \tag{40}$$

MEDIAN_RV : Median radial velocity (float, Velocity[km s^{-1}])

Name: The median of the time series

Control parameters: None

Output: The 50th percentile unweighted value.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{41}$$

RANGE_RV : Difference between the highest and lowest radial velocity transits (float, Velocity[km s^{-1}])

Name: The range of the time series

Control parameters: None

Output: Let y_i be a time series, $y_{\max}$ its largest element, and $y_{\min}$ its smallest element, then the range is defined as

$$R = y_{\max} - y_{\min} \tag{42}$$

STD_DEV_RV : Square root of the unweighted radial velocity variance (float, Velocity[km s^{-1}])

Name: The square root of the unbiased unweighted variance.

Output: Let y_i be a time series of size N. The unweighted standard deviation $\hat{\sigma}$ is defined as the square root of the sample-size unbiased unweighted variance:

$$\hat{\sigma} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(y_i - \overline{y})^2}.$$

SKEWNESS_RV : Standardized unweighted radial velocity skewness (float)

Name: The standardised unbiased unweighted skewness.

Output: Let y_i be a time series of size $N > 2$. The sample-size unbiased unweighted skewness moment $\mathcal{E}$ is defined as:

$$\mathcal{E} = \frac{N}{(N-1)(N-2)} \sum_{i=1}^{N} (y_i - \overline{y})^3.$$

The standardized unbiased skewness E is defined as:

$$E = \frac{\mathcal{E}}{\hat{\sigma}^3}$$

where $\hat{\sigma}$ is the square root of the unbiased unweighted variance around the unweighted mean. While $\mathcal{E}$ is an unbiased estimate of the population value, E becomes unbiased in the limit of large N.

KURTOSIS_RV : Standardized unweighted radial velocity kurtosis (float)

Name: The standardised unbiased unweighted kurtosis.

Output: Let y_i be a time series of size $N > 3$. The sample-size unbiased unweighted kurtosis cumulant $\mathcal{K}$ is defined as:

$$\mathcal{K} = \frac{N(N+1)}{(N-1)(N-2)(N-3)} \sum_{i=1}^{N} (y_i - \overline{y})^4 - \frac{3}{(N-2)(N-3)} \left[\sum_{i=1}^{N} (y_i - \overline{y})^2 \right]^2.$$

The standardized unbiased kurtosis K is defined as:

$$K = \frac{\mathcal{K}}{\hat{\sigma}^4}$$

where $\hat{\sigma}^2$ is the unbiased unweighted variance around the unweighted mean. While $\mathcal{K}$ is an unbiased estimate of the population value, K becomes unbiased in the limit of large N.

MAD_RV : Median Absolute Deviation (MAD) for radial velocity transits (float, Velocity[km s^{-1}])

Name: The Median Absolute Deviation (MAD)

Control parameters: None

Output: Let y_i be a time series of size N. The MAD is defined as the median of the absolute deviations from the median of the data, scaled by a factor of $1/\Phi^{-1}(3/4) \approx 1.4826$ (where Φ^{-1} is the inverse of the cumulative distribution function for the standard normal distribution), so that the expectation of the scaled MAD at large N equals the standard deviation of a normal distribution:

$$\text{MAD} = 1.4826 \text{ median}\{|y_i - \text{median}\{y_j, \forall j \in (1,N)\}|, \forall i \in (1,N)\}. \quad (43)$$

ABBE_RV : Abbe value for radial velocity transits (float)

Name: The Abbe value

Control parameters: None

Output: Let $\{t_i, y_i\}$ be a time-sorted time series of size N, such that $t_i < t_{i+1}$ for all $i < N$. The Abbe value $\mathcal{A}$ is defined as

$$\mathcal{A} = \frac{\sum_{i=1}^{N-1}(y_{i+1} - y_i)^2}{2\sum_{i=1}^{N}(y_i - \bar{y})^2} \tag{44}$$

where $\bar{y}$ is the unweighted mean.

IQR_RV : Interquartile range for radial velocity transits (float, Velocity[km s^{-1}])

Name: The Interquartile Range (IQR)

Control parameters: None

Output: The difference between the (unweighted) 75th and 25th percentile values: IQR= $P_{75} - P_{25}$.

Let y_i be a time series of size N ordered such as $y_{(1)} \leq y_{(2)} \leq \cdots \leq y_{(N)}$. The m-th (per cent) percentile P_m is defined for $0 < m \leq 100$ as follows:

$$P_m = \begin{cases} y_{(1)} & \text{if } 0 < m < 100/N, \\ y_{(i)} & \text{if } Nm/100 - i = 0, \\ y_{(i+1)} & \text{otherwise.} \end{cases} \tag{45}$$

13.11 VARI_LONG_PERIOD_VARIABLE

This table describes the Long Period Variable stars.

Some entries can be NaN when absent.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

FREQUENCY : Frequency of the LPV (double, Frequency[day^{-1}])

This field is the frequency found for the Long Period Variable star.

FREQUENCY_ERROR : Error on the frequency (float, Frequency[day^{-1}])

This field gives the error on the frequency for the Long Period Variable star.

AMPLITUDE : Amplitude of the LPV variability (float, Magnitude[mag])

This field gives the (half peak-to-peak) variability amplitude, in magnitude, of the frequency for the Long Period Variable star.

MEDIAN_DELTA_WL_RP : Median of the pseudo-wavelength separations between the two highest peaks in RP spectra (float)

Median among all $G_{\rm RP}$ epoch spectra of the pseudo-wavelength separations between the two highest peaks in the $G_{\rm RP}$ spectra. It is set to Null when the spectrum does not allow an automatic identification of two maxima. This value is used in the definition of the `is_cstar` parameter.

IS_CSTAR : Flag to mark C-stars (Boolean)

The parameter `is_cstar` is set to TRUE if a star has been identified as a C-star based on the value of the `median_delta_wl_rp` parameter derived from the $G_{\rm RP}$ spectrum shape. It is set to FALSE if it is an O-rich star. It is set to NULL when the shape of the spectrum cannot allow an automatic classification between these two types of LPVs. A note on S-type stars: the method cannot classify correctly the nature of these stars. As a consequence, they may have the `is_cstar` flag set to either TRUE or FALSE.

13.12 VARI_MICROLENSING

This table describes the microlensing events.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

PACZYNSKI0_G0 : G-band magnitude baseline (level 0) (float, Magnitude[mag])

G-band magnitude of the baseline from the Paczynski standard model fit without blending

PACZYNSKI0_G0_ERROR : Error of G-band magnitude baseline (level 0) (float, Magnitude[mag])

Error of the G-band magnitude of the baseline from the Paczynski standard model fit without blending

PACZYNSKI0_BP0 : BP-band magnitude baseline (level 0) (float, Magnitude[mag])

G_{BP}-band magnitude of the baseline from the Paczynski standard model fit without blending

PACZYNSKI0_BP0_ERROR : Error of BP-band magnitude baseline (level 0) (float, Magnitude[mag])

Error of the G_{BP}-band magnitude of the baseline from the Paczynski standard model fit without blending

PACZYNSKI0_RP0 : RP-band magnitude baseline (level 0) (float, Magnitude[mag])

G_{RP}-band magnitude of the baseline from the Paczynski standard model fit without blending

PACZYNSKI0_RP0_ERROR : Error of RP-band magnitude baseline (level 0) (float, Magnitude[mag])

Error of the G_{RP}-band magnitude of the baseline from the Paczynski standard model fit without blending

PACZYNSKI0_U0 : Impact parameter (level 0) (double)

Impact parameter from the Paczynski standard model fit without blending

PACZYNSKI0_U0_ERROR : Error of the impact parameter (level 0) (double)

Error of the impact parameter from the Paczynski standard model fit without blending

PACZYNSKI0_TE : Event timescale (level 0) (float, Time[day])

Event time-scale in days from the Paczynski standard model fit without blending

PACZYNSKI0_TE_ERROR : Error of event timescale (level 0) (float, Time[day])

Error of the event time-scale in days from the Paczynski standard model fit without blending

PACZYNSKI0_TMAX : Time of maximum amplification (level 0) (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Time of the maximum amplification from the Paczynski standard model fit without blending

PACZYNSKI0_TMAX_ERROR : Error of time of maximum amplification (level 0) (double, Time[day]

)

Error of time of the maximum amplification from the Paczynski standard model fit without blending

PACZYNSKI0_CHI2 : Chi square of level 0 Paczynski fit (float)

Chi square of the Paczynski standard model fit without blending

PACZYNSKI0_CHI2_DOF : Reduced chi square of level 0 Paczynski fit (float)

Reduced chi square of the Paczynski standard model fit without blending

PACZYNSKI1_G0 : G-band magnitude baseline (level 1) (float, Magnitude[mag])

G-band magnitude of the baseline from the Paczynski standard model fit with blending

PACZYNSKI1_G0_ERROR : Error of G-band magnitude baseline (level 1) (float, Magnitude[mag])

Error of the G-band magnitude of the baseline from the Paczynski standard model fit with blending

PACZYNSKI1_BP0 : BP-band magnitude baseline (level 1) (float, Magnitude[mag])

$G_{\rm BP}$-band magnitude of the baseline from the Paczynski standard model fit with blending

PACZYNSKI1_BP0_ERROR : Error of BP-band magnitude baseline (level 1) (float, Magnitude[mag])

Error of the $G_{\rm BP}$-band magnitude of the baseline from the Paczynski standard model fit with blending

PACZYNSKI1_RP0 : RP-band magnitude baseline (level 1) (float, Magnitude[mag])

$G_{\rm RP}$-band magnitude of the baseline from the Paczynski standard model fit with blending

PACZYNSKI1_RP0_ERROR : Error of RP-band magnitude baseline (level 1) (float, Magnitude[mag])

Error of the G_{RP}-band magnitude of the baseline from the Paczynski standard model fit with blending

PACZYNSKI1_U0 : Impact parameter (level 1) (double)

Impact parameter from the Paczynski standard model fit with blending

PACZYNSKI1_U0_ERROR : Error of the impact parameter (level 1) (double)

Error of the impact parameter from the Paczynski standard model fit with blending

PACZYNSKI1_TE : Event timescale (level 1) (float, Time[day])

Event time-scale in days from the Paczynski standard model fit with blending

PACZYNSKI1_TE_ERROR : Error of event timescale (level 1) (float, Time[day])

Error of the event time-scale in days from the Paczynski standard model fit with blending

PACZYNSKI1_TMAX : Time of maximum amplification (level 1) (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Time of the maximum amplification from the Paczynski standard model fit with blending

PACZYNSKI1_TMAX_ERROR : Error of time of maximum amplification (level 1) (double, Time[day])

Error of time of the maximum amplification from the Paczynski standard model fit with blending

PACZYNSKI1_FS_G : Blending factor in G-band (level 1) (float)

Blending factor in G-band from the Paczynski standard model fit with blending

PACZYNSKI1_FS_G_ERROR : Error of blending factor in G-band (level 1) (float)

Error of the blending factor in G-band from the Paczynski standard model fit with blending

PACZYNSKI1_FS_BP : Blending factor in BP-band (level 1) (float)

Blending factor in G_{BP}-band from the Paczynski standard model fit with blending

PACZYNSKI1_FS_BP_ERROR : Error of blending factor in BP-band (level 1) (float)

Error of the blending factor in G_{BP}-band from the Paczynski standard model fit with blending

PACZYNSKI1_FS_RP : Blending factor in RP-band (level 1) (float)

Blending factor in G_{RP}-band from the Paczynski standard model fit with blending

PACZYNSKI1_FS_RP_ERROR : Error of blending factor in RP-band (level 1) (float)

Error of the blending factor in G_{RP}-band from the Paczynski standard model fit with blending

PACZYNSKI1_CHI2 : Chi square of level 1 Paczynski fit (float)

Chi square of the Paczynski standard model fit with blending

PACZYNSKI1_CHI2_DOF : Reduced chi square of level 1 Paczynski fit (float)

Reduced chi square of the Paczynski standard model fit with blending

13.13 VARI_MS_OSCILLATOR

This table describes the main-sequence oscillators.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

FREQUENCY1 : Best frequency (double, Frequency[day^{-1}])

Best frequency corresponding to the highest peak in the frequencygramme.

FAP_G_FREQ1 : False alarm probability corresponding to the best frequency (float, Dimensionless[percentage/100])

False alarm probability corresponding to the best frequency.

AMPLITUDE_G_FREQ1 : Half peak-to-peak amplitude in the G band of the best frequency (float, Magnitude[mag])

Half peak-to-peak amplitude in the G band of the best frequency, referred to as $A_{G,1}$.

PHASE_G_FREQ1 : Phase of the oscillation in the G band corresponding to best frequency (float, Angle[rad])

Phase of the oscillation in the G band corresponding to the best frequency, referred to as $\phi_{G,1}$.

NUM_HARMONICS : Number of significant harmonics of the best frequency (byte)

Number of significant harmonics of the best frequency.

AMPLITUDE_G_FREQ1_HARM2 : Half peak-to-peak amplitude in the G band of the second harmonic of the best frequency (float, Magnitude[mag])

Half peak-to-peak amplitude in the G band of the second harmonic of the best frequency, referred to as $A_{G,2}$.

PHASE_G_FREQ1_HARM2 : Phase of the oscillation in the G band corresponding to the second harmonic of the best frequency (float, Angle[rad])

Phase of the oscillation in the G band corresponding to the second harmonic of the best frequency, referred to as $\phi_{G,2}$.

AMPLITUDE_G_FREQ1_HARM3 : Half peak-to-peak amplitude in the G band of the third harmonic of the best frequency (float, Magnitude[mag])

Half peak-to-peak amplitude in the G band of the third harmonic of the best frequency, referred to as $A_{G,3}$.

PHASE_G_FREQ1_HARM3 : Phase of the oscillation in the G band corresponding to the third harmonic of the best frequency (float, Angle[rad])

Phase of the oscillation in the G band corresponding to the third harmonic of the best frequency, referred to as $\phi_{G,3}$.

13.14 VARI_PLANETARY_TRANSIT

This table describes the Planetary Transit candidate events.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

TRANSIT_REFERENCE_TIME : Mid-transit reference time (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

A representative time of a planetary mid-transit during the Gaia mission, used as the reference epoch. Usually it will be chosen to be a time close to the mean of all Gaia observing epochs used in the analysis, in order to reduce its error.

An observation time t is considered to occur within a transit if:

$$\mathrm{abs}(\mathrm{mod}(t - T_0 + P/2, P) - P/2) < w/2$$

where T_0 stands for `transit_reference_time`, P for `transit_period`, and w for `transit_duration`.

TRANSIT_PERIOD : Most probable transit period (double, Time[day])

We restrict ourselves to strictly periodic planetary transits, otherwise we cannot identify them. This is the most probable period we found.

TRANSIT_DEPTH : Transit depth (float, Magnitude[mmag])

Transit depth is the amount by which the observed star brightness dims when the planet transits between the Solar System and the star. Physically it may hint to the size of the planet.

TRANSIT_DURATION : Transit duration (float, Time[day])

Transit duration is the length of time the transit lasts. The low cadence of Gaia photometry does not allow a detailed transit model with ingress and egress, so our assumption is that the transit has a simple box-like shape, and so the duration is well defined. Physically it is mainly related to the stellar radius and the orbital inclination.

NUM_IN_TRANSIT : Number of in-transit observations (byte)

Number of Gaia photometric observations that occurred during planetary transits. Only above a certain number we consider this a detection.

13.15 VARI_ROTATION_MODULATION

This table describes the solar-like stars with rotational modulation.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

NUM_SEGMENTS : Number of segments (byte)

This is the number of time intervals (segments) in which the magnitude and colour time-series are splitted. The segmentation of time-series is needed because the spots due to the stellar magnetic activity have a life-time shorter than the whole Gaia time-series. The rotational modulation induced by spots can therefore be detected only in segments whose duration is comparable with the spots life-time.

SEGMENTS_START_TIME : Times at which segments start (double[`num_segments`] array, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

An array filled with the starting times of segments.

SEGMENTS_END_TIME : Times at which segments end (double[`num_segments`] array, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

An array filled with the ending times of segments.

SEGMENTS_COLOUR_MAG_INTERCEPT : Colour-Magnitude Intercept in segments (float[`num_segments`] array)

A robust linear regression is applied to the points ($G_{\rm BP}$-$G_{\rm RP}$, G) in each segment. This array is filled with the intercepts given by the fitting procedure in the different segments.

SEGMENTS_COLOUR_MAG_INTERCEPT_ERROR : Colour-Magnitude Intercept uncertainty in segments (float[`num_segments`] array)

This array is filled with the uncertainties associated with the intercepts given by the fitting procedure.

SEGMENTS_COLOUR_MAG_SLOPE : Colour-Magnitude Slope in segments (float[`num_segments`] array)

A robust linear regression is applied to the points ($G_{\rm BP}$-$G_{\rm RP}$, G) in each segment. This array is filled with the slopes given by the fitting procedure in the different segments.

SEGMENTS_COLOUR_MAG_SLOPE_ERROR : Colour-Magnitude Slope uncertainty in segments (float[`num_segments`] array)

This array is filled with the uncertainties associated with the slopes given by the fitting procedure.

SEGMENTS_CORRELATION_COEFFICIENT : Correlation coefficient in segments (float[`num_segments`] array)

The Pearson correlation coefficient r between $G_{\rm BP}$-$G_{\rm RP}$ and G is computed in each segment. The higher is the Pearson coefficient the higher is the probability that the stellar variability is due to rotational modulation. This array is filled with the Pearson coefficients obtained in the different segments.

SEGMENTS_CORRELATION_SIGNIFICANCE : Correlation coefficient significance in segments (float[`num_segments`] array)

This array is filled with the statistical significances associated with the Pearson coefficients computed in the different segments. The significance p associated with a given $r = r_0$ gives the probability $P(r \geq r_0)$ that two sets of uncorrelated measurements have a Pearson coefficient $\geq r_0$.

NUM_OUTLIERS : Number of outliers (short)

The number of outliers detected by the robust linear regression procedure.

OUTLIERS_TIME : Times at which outliers occurs (double[`num_outliers`] array, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Times at which the detected outliers occurred.

SEGMENTS_ROTATION_PERIOD : Rotation period in segment (double[`num_segments`] array, Time[day])

A period search algorithm is applied to the different time-series segments. If the star is a solar-like variable the detected period is a measure of the stellar rotation period. This array is filled with the periods detected in the different segments (for each segment the period with the highest statistical significance is stored).

SEGMENTS_ROTATION_PERIOD_ERROR : Rotation period uncertainty in segment (float[`num_segments`] array, Time[day])

This array is filled with the errors associated with the periods found in the different segments.

SEGMENTS_ROTATION_PERIOD_FAP : FAP on rotation period in segment (float[`num_segments`] array)

False Alarm Probability = Probability that that a white noise sequence produces a peak similar or higher than the computed one; i.e., small FAP = little probability of noise, high FAP = noise is an acceptable explanation for the peak.

BEST_ROTATION_PERIOD : Best rotation period (double, Time[day])

This field is the best estimate of the stellar rotation period and is obtained by taking the mode of the `segments_rotation_period` distribution. The distribution is built only with the periods, whose associated FAP is less than 0.05. See Section **??** of the release documentation for further details.

BEST_ROTATION_PERIOD_ERROR : Error on best rotation period (float, Time[day])

Error on the best rotation period.

SEGMENTS_G_UNSPOTTED : The unspotted G mags in segment (float[num_segments] array, Magnitude[mag])

In a given segment the G magnitude corresponding to the unspotted state is estimated by taking the minimum G value in the segment.

SEGMENTS_G_UNSPOTTED_ERROR : The unspotted G mag uncertainties in segment (float[num_segments] array, Magnitude[mag])

This array stores the errors associated to the unspotted G values registered in the different segments.

SEGMENTS_BP_UNSPOTTED : The unspotted BP mag in segment (float[num_segments] array, Magnitude[mag])

In a given segment the G_{BP} magnitude corresponding to the unspotted state is estimated by taking the G_{BP} magnitude occurring at the same time of the unspotted G. If the G_{BP} transit corresponding to segment's unspotted G transit is not available, a NaN value is provided.

SEGMENTS_BP_UNSPOTTED_ERROR : The unspotted BP mag uncertainties in segment (float[num_segments] array, Magnitude[mag])

This array stores the errors associated to the unspotted G_{BP} values registered in the different segments.

SEGMENTS_RP_UNSPOTTED : The unspotted RP mag in segment (float[num_segments] array, Magnitude[mag])

In a given segment the G_{RP} magnitude corresponding to the unspotted state is estimated by taking the G_{RP} magnitude occurring at the same time of the unspotted G. If the G_{RP} transit corresponding to segment's unspotted G transit is not available, a NaN value is provided.

SEGMENTS_RP_UNSPOTTED_ERROR : The unspotted RP mag uncertainties in segment (float[num_segments] array, Magnitude[mag])

This array stores the errors associated to the unspotted G_{RP} values registered in the different segments.

G_UNSPOTTED : Unspotted G mag (float, Magnitude[mag])

Final estimate of the G magnitude corresponding to the unspotted state. It is computed by taking the minimum G magnitude in the whole time-series.

G_UNSPOTTED_ERROR : Unspotted G mag uncertainty (float, Magnitude[mag])

This field stores the photometric error associated with `g_unspotted`.

BP_UNSPOTTED : Unspotted BP mag (float, Magnitude[mag])

Final estimate of the G_{BP} magnitude corresponding to the unspotted state. It is estimated by taking the G_{BP} magnitude occurring at the same time in which the minimum G magnitude has been measured. If the G_{BP} transit corresponding to unspotted G transit is not available, a Null value is provided.

BP_UNSPOTTED_ERROR : Unspotted BP mag uncertainty (float, Magnitude[mag])

Error associated with the `bp_unspotted` value.

RP_UNSPOTTED : Unspotted RP mag (float, Magnitude[mag])

Final estimate of the G_{RP} magnitude corresponding to the unspotted state. It is estimated by taking the G_{RP} magnitude occurring at the same time in which the minimum G magnitude has been measured. If the G_{RP} transit corresponding to unspotted G transit is not available, a Null value is provided.

RP_UNSPOTTED_ERROR : Unspotted RP mag uncertainty (float, Magnitude[mag])

Error associated with the `rp_unspotted` value.

SEGMENTS_G_COS_TERM : Coefficient of cosine term of linear fit in segment in the G band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \quad (46)$$

This array stores the A terms obtained by the fitting procedure in the different segments in the G band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_G_COS_TERM_ERROR : Errors on cosine terms in the G band (float[num_segments] array, Magnitude[mag])

This array is filled with the errors associated with the A terms obtained from the fitting procedure in the different segments in the G band.

SEGMENTS_G_SIN_TERM : Coefficient of sine term of linear fit in segment in the G band (float[num_segments] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \quad (47)$$

This array stores the B terms obtained by the fitting procedure in the different segments in the G band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_G_SIN_TERM_ERROR : Errors on sine terms in the G band (float[num_segments] array, Magnitude[mag])

This array is filled with the errors associated with the B terms obtained from the fitting procedure in the different segments in the G band.

SEGMENTS_G_A0_TERM : Constant term (A0) of linear fit in segment in the G band (float[num_segments] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \quad (48)$$

This array stores the mag_0 terms obtained by the fitting procedure in the different segments in the G band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_G_A0_TERM_ERROR : Errors on constant terms in the G band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the mag_0 terms obtained from the fitting procedure in the different segments in the G band.

SEGMENTS_BP_COS_TERM : Coefficient of cosine term of linear fit in segment in the BP band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \tag{49}$$

This array stores the A terms obtained by the fitting procedure in the different segments in the $G_{\rm BP}$ band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_BP_COS_TERM_ERROR : Errors on cosine terms in the BP band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the A terms obtained from the fitting procedure in the different segments in the $G_{\rm BP}$ band.

SEGMENTS_BP_SIN_TERM : Coefficient of sine term of linear fit in segment in the BP band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \tag{50}$$

This array stores the B terms obtained by the fitting procedure in the different segments in the $G_{\rm BP}$ band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_BP_SIN_TERM_ERROR : Errors on sine terms in the BP band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the B terms obtained from the fitting procedure in the different segments in the G_{BP} band.

SEGMENTS_BP_A0_TERM : Constant term (A0) of linear fit in segment in the BP band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \tag{51}$$

This array stores the mag_0 terms obtained by the fitting procedure in the different segments in the G_{BP} band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_BP_A0_TERM_ERROR : Errors on constant terms in the BP band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the mag_0 terms obtained from the fitting procedure in the different segments in the G_{BP} band.

SEGMENTS_RP_COS_TERM : Coefficient of cosine term of linear fit in segment in the RP band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \tag{52}$$

This array stores the A terms obtained by the fitting procedure in the different segments in the G_{RP} band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_RP_COS_TERM_ERROR : Errors on cosine terms in the RP band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the A terms obtained from the fitting procedure in the different segments in the G_{RP} band.

SEGMENTS_RP_SIN_TERM : Coefficient of sine term of linear fit in segment in the RP band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \tag{53}$$

This array stores the B terms obtained by the fitting procedure in the different segments in the G_{RP} band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_RP_SIN_TERM_ERROR : Errors on sine terms in the RP band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the B terms obtained from the fitting procedure in the different segments in the G_{RP} band.

SEGMENTS_RP_A0_TERM : Constant term (A0) of linear fit in segment in the RP band (float[`num_segments`] array, Magnitude[mag])

If a significative period T_0 is detected in a time-series segment, then the points of the time-series segment are fitted with the function

$$mag(t) = mag_0 + A\cos(\frac{2\pi}{T_0}t) + B\sin(\frac{2\pi}{T_0}t) \tag{54}$$

This array stores the mag_0 terms obtained by the fitting procedure in the different segments in the G_{RP} band. The fit is computed only if the FAP associated with the period T_0 is less than 0.05.

SEGMENTS_RP_A0_TERM_ERROR : Errors on constant terms in the RP band (float[`num_segments`] array, Magnitude[mag])

This array is filled with the errors associated with the mag_0 terms obtained from the fitting procedure in the different segments in the G_{RP} band.

SEGMENTS_G_ACTIVITY_INDEX : Activity Index in segment (computed in G band) (float[`num_segments`] array, Magnitude[mag])

This array stores the activity indexes measured in the different segments in the G band. In a given segment the amplitude of variability A is taken as an index of the magnetic activity level. The amplitude of variability is measured by means of the equation:

$$A = mag_{95} - mag_5 \tag{55}$$

where mag_{95} and mag_5 are the 95-th and the 5-th percentiles of the magnitude values.

SEGMENTS_G_ACTIVITY_INDEX_ERROR : error on Activity index in segment (computed in G band) (float[`num_segments`] array, Magnitude[mag])

This array stores the errors associated with the activity indexes in the G band. In a given segment the error on the activity index A is computed by means of the equation:

$$\sigma_A = \sqrt{\sigma^2_{mag95} + \sigma^2_{mag5}} \tag{56}$$

SEGMENTS_BP_ACTIVITY_INDEX : Activity Index in segment (computed in BP band) (float[`num_segments`] array, Magnitude[mag])

This array stores the activity indexes measured in the different segments in the G_{BP} band. In a given segment the amplitude of variability A is taken as an index of the magnetic activity level. The amplitude of variability is measured by means of the equation:

$$A = mag_{95} - mag_5 \tag{57}$$

where mag_{95} and mag_5 are the 95-th and the 5-th percentiles of the magnitude values.

SEGMENTS_BP_ACTIVITY_INDEX_ERROR : error on Activity index in segment (computed in BP band) (float[`num_segments`] array, Magnitude[mag])

This array stores the errors associated with the activity indexes in the G_{BP} band. In a given segment the error on the activity index A is computed by means of the equation:

$$\sigma_A = \sqrt{\sigma^2_{mag95} + \sigma^2_{mag5}} \tag{58}$$

SEGMENTS_RP_ACTIVITY_INDEX : Activity Index in segment (computed in RP band) (float[`num_segments`] array, Magnitude[mag])

This array stores the activity indexes measured in the different segments in the G_{RP} band. In a given segment the amplitude of variability A is taken as an index of the magnetic activity level. The amplitude of variability is measured by means of the equation:

$$A = mag_{95} - mag_5 \tag{59}$$

where mag_{95} and mag_5 are the 95-th and the 5-th percentiles of the magnitude values.

SEGMENTS_RP_ACTIVITY_INDEX_ERROR : error on Activity index in segment (computed in RP band) (float[`num_segments`] array, Magnitude[mag])

This array stores the errors associated with the activity indexes in the $G_{\rm RP}$ band. In a given segment the error on the activity index A is computed by means of the equation:

$$\sigma_A = \sqrt{\sigma^2_{mag95} + \sigma^2_{mag5}} \tag{60}$$

MAX_ACTIVITY_INDEX_G : The maximum Activity Index in the G band (float, Magnitude[mag])

This field is the maximum of measured the activity indexes in the G band.

MAX_ACTIVITY_INDEX_G_ERROR : Error on maximum activity index in the G band (float, Magnitude[mag])

This field stores the error associated with the maximum activity index in the G band.

SEGMENTS_BP_RP_CORR_COEFF : Pearson coefficient between BP and RP in segment (float[`num_segments`] array)

For each segment, this parameter provides the Pearson coefficient of the transits in the ($G_{\rm BP}$,$G_{\rm RP}$) magnitude plane. This correlation coefficient can be used to infer properties of stellar spots and faculae.

SEGMENTS_BP_RP_CORR_SIGNIF : Significance associated with Pearson coefficient (float[`num_segments`] array)

For each segment, this parameter provides the statistical significance associated with the Pearson coefficient `segments_bp_rp_corr_coeff`.

SEGMENTS_BP_RP_INTERCEPT : Intercept of regression fit of RP vs BP magnitudes in the segment (float[`num_segments`] array, Magnitude[mag])

This array provides the intercepts obtained for the line regression fit of the transits in the ($G_{\rm BP}$,$G_{\rm RP}$)

magnitude plane in each segment.

SEGMENTS_BP_RP_INTERCEPT_ERROR : Error on intercept of regression fit of RP vs BP magnitudes in the segment (float[`num_segments`] array, Magnitude[mag])

This array stores the errors associated with the intercepts stored in `segments_bp_rp_intercept`.

SEGMENTS_BP_RP_SLOPE : Slope of regression fit of RP vs BP magnitudes in the segment (float[`num_segments`] array)

This array provides the slopes obtained for the line regression fit of the transits in the ($G_{\rm BP}$,$G_{\rm RP}$) magnitude plane in each segment.

SEGMENTS_BP_RP_SLOPE_ERROR : Error on slope of regression fit of RP vs BP magnitudes in the segment (float[`num_segments`] array)

This array stores the errors associated with the slopes stored in `segments_bp_rp_slope`.

SEGMENTS_MODEL_REFERENCE_TIME : Time used as reference time for the period search procedure in the segment (double[`num_segments`] array, Time[Barycentric JD in TCB – 2 455 197.5 (day)])

For each segment, this parameter provides the reference time used when the data points are fitted to the models represented by the equations in the definitions of `segments_g_cos_term`, `segments_bp_cos_term`, and `segments_rp_cos_term`.

SEGMENTS_G_CHI_SQUARE : Array of chisquares for linear models (G band) (float[`num_segments`] array)

Array of chisquares for linear models (G band).

SEGMENTS_BP_CHI_SQUARE : Array of chisquares for linear models (BP band) (float[`num_segments`] array)

Array of chisquares for linear models ($G_{\rm BP}$ band).

SEGMENTS_RP_CHI_SQUARE : Array of chisquares for linear models (RP band) (float[`num_segments`] array)

Array of chisquares for linear models (G_{RP} band).

13.16 VARI_RRLYRAE

This table describes the RR Lyrae stars.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

PF : Period corresponding to the fundamental pulsation mode in the G band time series (double, Time[day])

For single-mode pulsators classified as fundamental mode pulsators, this parameter is filled with the periodicity found in the time-series.

This value is obtained by modelling the G band time series using the Levenberg-Marquardt non–linear fitting algorithm (Clementini et al. 2016).

Information for `vari_rrlyrae`: For double-mode RR Lyrae this parameter is filled with the period corresponding to the longer periodicity.

Information for `vari_cepheid`: For double-mode DCEPs this parameter is filled with the period corresponding to the longer periodicity if the DCEP is classified as 'F/1O' or 'F/2O'. For triple-mode DCEPs this parameter is filled with the period corresponding to the longer periodicity if the DCEP is classified as 'F/1O/2O'.

PF_ERROR : Uncertainty of the `pf` period (float, Time[day])

This parameter is filled with the uncertainty of the `pf` parameter, computed via a bootstrap technique.

P1_O : Period corresponding to the first overtone pulsation mode in the G band time series (double, Time[day])

For single-mode pulsators classified as first-overtone pulsators, this parameter is filled with the periodicity found in the time-series.

This value is obtained by modelling the *G* time series using the Levenberg-Marquardt non linear fitting algorithm (see Clementini et al. 2016).

Information for `vari_rrlyrae`: For double-mode RR Lyrae this parameter is filled with the period corresponding to the shortest periodicity.

Information for `vari_cepheid`: For double-mode DCEPs this parameter is filled with the period corresponding to the shortest periodicity if the DCEP is classified as 'F/1O'; otherwise it is filled with the longest one if the classification is '1O/2O' or '1O/3O'. For triple-mode DCEPs this parameter is filled with the period corresponding to the intermediate periodicity if the DCEP is classified as 'F/1O/2O'; it is filled with the longest periodicity if the classification is '1O/2O/3O'.

P1_O_ERROR : Uncertainty of the `p1_o` period (float, Time[day])

This parameter is filled with the uncertainty of the `p1_o` parameter, computed via a bootstrap technique.

EPOCH_G : Epoch of the maximum of the light curve in the G band (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of maximum light for the Gaia *G* band light curve. It corresponds to the barycentric Julian day (BJD) of the maximum value of the light curve model which is closest to the BJD of the first observations -3 times the period of the source (first periodicity depending on the pulsation mode).

The aforementioned BJD is offset by JD 2 455 197.5 (= J2010.0).

EPOCH_G_ERROR : Uncertainty on the epoch parameter `epoch_g` (float, Time[day])

Value of the uncertainty of the `epoch_g` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

EPOCH_BP : Epoch of the maximum of the light curve in the BP band (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of maximum light for the Gaia integrated G_{BP} band light curve. It corresponds to the barycentric Julian day (BJD) of the maximum value of the light curve model which is closest to the BJD of the first observations -3 times the period of the source (first periodicity depending on the pulsation mode).

The aforementioned BJD is offset by JD 2 455 197.5 (= J2010.0).

EPOCH_BP_ERROR : Uncertainty on the epoch parameter `epoch_bp` (float, Time[day])

Value of the uncertainty of the `epoch_bp` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

EPOCH_RP : Epoch of the maximum of the light curve in the RP band (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of maximum light for the Gaia integrated G_{RP} band light curve. It corresponds to the barycentric Julian day (BJD) of the maximum value of the light curve model which is closest to the BJD of the first observations -3 times the period of the source (first periodicity depending on the pulsation mode).

The aforementioned BJD is offset by JD 2 455 197.5 (= J2010.0).

EPOCH_RP_ERROR : Uncertainty on the epoch parameter `epoch_rp` (float, Time[day])

Value of the uncertainty of the `epoch_rp` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

EPOCH_RV : Epoch of the minimum of the radial velocity curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Epoch of minimum radial velocity for the Gaia radial velocity curve.

EPOCH_RV_ERROR : Uncertainty on the epoch parameter `epoch_rv` (float, Time[day])

Value of the uncertainty of the `epoch_rv` parameter. It corresponds to three times the error on the period of the source (first periodicity depending on the pulsation mode).

INT_AVERAGE_G : Intensity-averaged magnitude in the G band (float, Magnitude[mag])

Value of the intensity-averaged magnitude in the G-band. The intensity-averaged magnitude is obtained by computing the average flux and then converting the average flux to magnitude.

INT_AVERAGE_G_ERROR : Uncertainty on `int_average_g` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty of the `int_average_g` parameter, computed via a bootstrap technique.

INT_AVERAGE_BP : Intensity-averaged magnitude in the BP band (float, Magnitude[mag])

Value of the intensity-averaged magnitude in the $G_{\rm BP}$-band. The intensity-averaged magnitude is obtained by computing the average flux and then converting the average flux to magnitude.

INT_AVERAGE_BP_ERROR : Uncertainty on `int_average_bp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty of the `int_average_bp` parameter, computed via a bootstrap technique.

INT_AVERAGE_RP : Intensity-averaged magnitude in the RP band (float, Magnitude[mag])

Value of the intensity-averaged magnitude in the $G_{\rm RP}$-band. The intensity-averaged magnitude is obtained by computing the average flux and then converting the average flux to magnitude.

INT_AVERAGE_RP_ERROR : Uncertainty on `int_average_rp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty of the `int_average_rp` parameter, computed via a bootstrap technique.

AVERAGE_RV : Mean radial velocity (float, Velocity[km s^{-1}])

Average value of the Fourier modelled radial velocity curve, provided by the A_0 parameter of the

Fourier fit.

AVERAGE_RV_ERROR : Uncertainty on `average_rv` parameter (float, Velocity[km s^{-1}])

Error of `average_rv` computed via bootstrap technique.

PEAK_TO_PEAK_G : Peak-to-peak amplitude of the G band light curve (float, Magnitude[mag])

This parameter is filled with the peak-to-peak amplitude value of the G band light curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modelled folded light curve in the G band. The light curve of the target star is modelled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the G-band light curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_G_ERROR : Uncertainty on the `peak_to_peak_g` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty value of the `peak_to_peak_g` parameter, computed via a bootstrap technique.

PEAK_TO_PEAK_BP : Peak-to-peak amplitude of the BP band light curve (float, Magnitude[mag])

This parameter is filled with the peak-to-peak amplitude value of the $G_{\rm BP}$ light curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modelled folded light curve in the $G_{\rm BP}$ band. The light curve of the target star is modelled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the $G_{\rm BP}$-band light curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_BP_ERROR : Uncertainty on the `peak_to_peak_bp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty value of the `peak_to_peak_bp` parameter, computed via a bootstrap technique.

PEAK_TO_PEAK_RP : Peak-to-peak amplitude of the RP band light curve (float, Magnitude[mag])

This parameter is filled with the peak-to-peak amplitude value of the $G_{\rm RP}$ light curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modelled folded light curve in the $G_{\rm RP}$ band. The light curve of the target star is modelled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the $G_{\rm RP}$-band light curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_RP_ERROR : Uncertainty on the `peak_to_peak_rp` parameter (float, Magnitude[mag])

This parameter is filled with the uncertainty value of the `peak_to_peak_rp` parameter, computed via a bootstrap technique.

PEAK_TO_PEAK_RV : Peak-to-peak amplitude of the radial velocity curve (double, Velocity[km s^{-1}])

This parameter is filled with the peak-to-peak amplitude value of the radial velocity curve. The peak-to-peak amplitude is calculated as the (maximum) - (minimum) of the modeled folded RV curve. The RV curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, for the RV curve are determined using the Levenberg-Marquardt non linear fitting algorithm.

PEAK_TO_PEAK_RV_ERROR : Uncertainty on the `peak_to_peak_rv` parameter (double, Velocity[km s^{-1}])

This parameter is filled with the uncertainty value of the `peak_to_peak_rv` parameter, computed via a bootstrap technique.

METALLICITY : Metallicity of the star from the Fourier parameters of the light curve (float, Abundances[dex])

This parameter is filled with the [Fe/H] metallicity derived for the source from the Fourier parameters of the G-band light curve.

METALLICITY_ERROR : Uncertainty of the `metallicity` parameter (float, Abundances[dex])

This parameter is filled with the uncertainty of the `metallicity` derived from the Fourier parameters of the G-band light curve.

R21_G : Fourier decomposition parameter `r21_g`: A2/A1 (for G band) (float)

This parameter is filled with the Fourier decomposition parameter $R_{21} = A_2/A_1$, where A_2 is the amplitude of the 2nd harmonic and A_1 is the amplitude of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

R21_G_ERROR : Uncertainty on the `r21_g` parameter: A2/A1 (for G band) (float)

This parameter is filled with the uncertainty value on the `r21_g` parameter, computed via a bootstrap technique.

R31_G : Fourier decomposition parameter `r31_g`: A3/A1 (for G band) (float)

This parameter is filled with the Fourier decomposition parameter $R_{21} = A_3/A_1$, where A_3 is the amplitude of the 3rd harmonic and A_1 is the amplitude of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

R31_G_ERROR : Uncertainty on the `r31_g` parameter: A3/A1 (for G band) (float)

This parameter is filled with the uncertainty value of the `r31_g` parameter, computed via a bootstrap technique.

PHI21_G : Fourier decomposition parameter `phi21_g`: phi2 - 2*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the Fourier decomposition parameter ϕ_{21}: $\phi_2 - 2\phi_1$ value, where ϕ_2 is the phase of the 2nd harmonic and ϕ_1 is the phase of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

PHI21_G_ERROR : Uncertainty on the `phi21_g` parameter: phi2 - 2*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the uncertainty of the `phi21_g` parameter, computed via a bootstrap technique.

PHI31_G : Fourier decomposition parameter `phi31_g`: phi3 - 3*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the Fourier decomposition parameter ϕ_{31}: $\phi_3 - 3\phi_1$ value, where ϕ_3 is the phase of the 3rd harmonic and ϕ_1 is the phase of the fundamental harmonic of the truncated Fourier series defined as $(mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)])$ used to model the G-band light curve. Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics, are determined using the Levenberg-Marquardt non linear fitting algorithm.

PHI31_G_ERROR : Uncertainty on the `phi31_g` parameter: phi3 - 3*phi1 (for G band) (float, Angle[rad])

This parameter is filled with the uncertainty of the `phi31_g`: $\phi_3 - 3\phi_1$ parameter, computed via a bootstrap technique.

NUM_CLEAN_EPOCHS_G : Number of G FoV epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the G-band light curve after the SOS Cep & RRLyrae outlier removal process.

NUM_CLEAN_EPOCHS_BP : Number of BP epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the $G_{\rm BP}$-band light curve after the SOS Cep & RRLyrae outlier removal process.

NUM_CLEAN_EPOCHS_RP : Number of RP epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the $G_{\rm RP}$-band light curve after the SOS Cep & RRLyrae outlier removal process.

NUM_CLEAN_EPOCHS_RV : Number of radial velocity epochs used in the fitting algorithm (short)

This parameter is filled with the number of epochs that remain in the radial velocity curve after the SOS Cep & RRLyrae outlier removal process.

ZP_MAG_G : Zero point (mag) of the final model of the G band light curve (float, Magnitude[mag])

Zero point (mag) of the final model of the G-band light curve for Cepheids and RR Lyrae stars.

ZP_MAG_BP : Zero point (mag) of the final model of the BP band light curve (float, Magnitude[mag])

Zero point (mag) of the final model of the G_{BP} band light curve for Cepheids and RR Lyrae stars.

ZP_MAG_RP : Zero point (mag) of the final model of the RP band light curve (float, Magnitude[mag])

Zero point (mag) of the final model of the G_{RP} band light curve for Cepheids and RR Lyrae stars.

NUM_HARMONICS_FOR_P1_G : Number of harmonics used to model the first periodicity of the G-band light curve (byte)

This parameter is filled with the number of harmonics used to model the G-band light curve folded with the P1 period. The G-band light curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

NUM_HARMONICS_FOR_P1_BP : Number of harmonics used to model the first periodicity of the BP-band light curve (byte)

This parameter is filled with the number of harmonics used to model the $G_{\rm BP}$-band light curve folded with the P1 period. The $G_{\rm BP}$-band light curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max} t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

NUM_HARMONICS_FOR_P1_RP : Number of harmonics used to model the first periodicity of the RP-band light curve (byte)

This parameter is filled with the number of harmonics used to model the G_{RP}-band light curve folded with the P1 period. The G_{RP}-band light curve of the target star is modeled with a truncated Fourier series ($mag(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

NUM_HARMONICS_FOR_P1_RV : Number of harmonics used to model the first periodicity of the radial velocity curve (byte)

This parameter is filled with the number of harmonics used to model the radial velocity curve folded with the P1 period. The radial velocity curve of the target star is modeled with a truncated Fourier series ($rv(t_j) = zp + \sum[A_i sin(i \times 2\pi\nu_{max}t_j + \phi_i)]$). Zero-point (zp), period ($1/\nu_{max}$), number of harmonics (i), amplitudes (A_i), and phases (ϕ_i) of the harmonics are determined using the Levenberg-Marquardt non linear fitting algorithm.

REFERENCE_TIME_G : Reference time of the Fourier modelled G-band light curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled G-band light curve.

REFERENCE_TIME_BP : Reference time of the Fourier modelled BP-band light curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled G_{BP}-band light curve.

REFERENCE_TIME_RP : Reference time of the Fourier modelled RP-band light curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled G_{RP}-band light curve.

REFERENCE_TIME_RV : Reference time of the Fourier modelled radial velocity curve (double, Time[Barycentric JD in TCB − 2 455 197.5 (day)])

Reference time for the Fourier modelled radial velocity curve.

FUND_FREQ1 : First frequency of the non-linear Fourier modelling (double, Frequency[day^{-1}])

First frequency of the non-linear Fourier modelling. It applies to all three G, $G_{\rm BP}$, and $G_{\rm RP}$ bands and the radial velocity curve.

FUND_FREQ1_ERROR : Error of the first frequency of the non-linear Fourier modelling (float, Frequency[day^{-1}])

Error of the first frequency of the non-linear Fourier modelling.

FUND_FREQ2 : Second frequency of the non-linear Fourier modelling in the G band (double, Frequency[day^{-1}])

Second frequency of the non-linear Fourier modelling for the G band only.

FUND_FREQ2_ERROR : Error of the second frequency of the non-linear Fourier modelling in the G band (float, Frequency[day^{-1}])

Error of the second frequency of the non-linear Fourier modelling. It applies to the G band only.

FUND_FREQ1_HARMONIC_AMPL_G : Amplitudes of the Fourier model for the first frequency in the G band (float[16] array, Magnitude[mag])

Amplitudes of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_AMPL_G_ERROR : Errors of the amplitudes of the Fourier model for the first frequency in the G band (float[16] array, Magnitude[mag])

Errors of the amplitudes of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_PHASE_G : Phases of the Fourier model for the first frequency in the G band (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_PHASE_G_ERROR : Errors of the phases of the Fourier model for the first frequency in the G band (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed G-band light curve.

FUND_FREQ1_HARMONIC_AMPL_BP : Amplitudes of the Fourier model for the first frequency in the BP band (float[16] array, Magnitude[mag])

Amplitudes of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_BP_ERROR : Errors of the amplitudes of the Fourier model for the first frequency in the BP band (float[16] array, Magnitude[mag])

Errors of the amplitudes of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_BP : Phases of the Fourier model for the first frequency in the BP band (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_BP_ERROR : Errors of the phases of the Fourier model for the first frequency in the BP band (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed $G_{\rm BP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_RP : Amplitudes of the Fourier model for the first frequency in the RP band (float[16] array, Magnitude[mag])

Amplitudes of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_RP_ERROR : Errors of the amplitudes of the Fourier model for the first frequency in the RP band (float[16] array, Magnitude[mag])

Errors of the amplitudes of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_RP : Phases of the Fourier model for the first frequency in the RP band (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_PHASE_RP_ERROR : Errors of the phases of the Fourier model for the first frequency in the RP band (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed $G_{\rm RP}$-band light curve.

FUND_FREQ1_HARMONIC_AMPL_RV : Amplitudes of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Velocity[km s^{-1}])

Amplitudes of the Fourier model fitted to the observed radial velocity curve.

FUND_FREQ1_HARMONIC_AMPL_RV_ERROR : Errors of the amplitudes of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Velocity[km s^{-1}])

Errors of the amplitudes of the Fourier model fitted to the observed radial velocity curve.

FUND_FREQ1_HARMONIC_PHASE_RV : Phases of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Angle[rad])

Phases of the Fourier model fitted to the observed radial velocity curve.

FUND_FREQ1_HARMONIC_PHASE_RV_ERROR : Errors of the phases of the Fourier model for the first frequency of the radial velocity curve (float[16] array, Angle[rad])

Errors of the phases of the Fourier model fitted to the observed radial velocity curve.

BEST_CLASSIFICATION : Best RR Lyrae classification estimate out of: ‘RRc’, ‘RRab’, ‘RRd’ (string)

Classification of an RR Lyrae star according to the pulsation mode: ‘RRc’ for first overtone, ‘RRab’ for fundamental mode, and ‘RRd’ for double modes, obtained using the period-amplitude diagram in the G-band; the plots of the Fourier parameters R21 and Phi2 vs period and the Petersen diagram.

G_ABSORPTION : Interstellar absorption in the G-band (float, Magnitude[mag])

This parameter is filled with values coming from the estimate of the interstellar extinction toward the investigated pulsators. The period-colour-amplitude relation was used.

G_ABSORPTION_ERROR : Error on the interstellar absorption in the G-band (float, Magnitude[mag])

Error on the interstellar absorption in the G-band (`g_absorption_error`): This parameter is filled with the r.m.s. errors of the relations used to estimate the interstellar absorption.

13.17 VARI_SHORT_TIMESCALE

This table describes the short-timescale sources.

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that were used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

SOURCE_ID : Unique source identifier (long)

A unique single numerical identifier of the source obtained from `gaia_source` (for a detailed description see `gaia_source.source_id`).

AMPLITUDE_ESTIMATE : Amplitude estimate of all per-CCD G-band photometry (95th quantile - 5th quantile) (float, Magnitude[mag])

This parameter is filled with the amplitude estimate from per-CCD G-band photometry. This amplitude estimate is calculated as the quantile difference (95th quantile − 5th quantile) of all per-CCD G-band measurements.

NUMBER_OF_FOV_TRANSITS : Number of FoV transits with more than 7 CCD measurements after time series cleaning (short)

Number of FoV transits that have more than 7 CCD measurements after time series cleaning (i.e., not necessarily from all the FoV transits available for the source).

MEAN_OF_FOV_ABBE_VALUES : Mean of per-FoV Abbe values derived from per-CCD G-band photometry (float)

This parameter represents the mean of per-FoV Abbe values derived from per-CCD G-band photometry. Considering a given source, for each of its FoV transits containing more than one per-CCD measurement, the associated Abbe value from per-CCD G-band photometry is derived as

$$\text{Abbe} = \frac{\sum_{i=1}^{n-1}(y_{i+1} - y_i)^2}{2\sum_{i=1}^{n}(y_i - \bar{y})^2}, \tag{61}$$

where $\{t_i, y_i\}$ is a time-sorted time series per FoV of size n, such that $t_i < t_{i+1}$ for all $i < n$, and $\bar{y}$ is the mean of the per-CCD measurements of the transit. The value of `mean_of_fov_abbe_values` is calculated as the mean of these per-FoV Abbe values.

VARIOGRAM_NUM_POINTS : Number of selected timescale(s) derived from the variogram (byte)

This parameter represents the number of selected timescale(s) derived from the variogram. For DR3, it is only 1.

VARIOGRAM_CHAR_TIMESCALES : Characteristic timescale(s) of variability (float[`variogram_num_points`] array, Time[day])

This parameter represents the variogram characteristic timescale(s) derived from the variogram analysis of the source, if it has been flagged as a short timescale variable candidate.

VARIOGRAM_VALUES : Variogram values associated with the `variogram_char_timescales` (double[`variogram_num_points`] array, Misc[mag^2])

This parameter represents the variogram value(s) associated with the variogram characteristic timescales `variogram_char_timescales`.

FREQUENCY : Frequency search result for either G CCD, G FoV, BP or RP photometry (double, Frequency[day^{-1}])

The parameter represents the frequency value resulting from the period search (method LEAST_SQUARE in DR3) performed either on the per-CCD G-band photometry, per-FoV G-band photometry, $G_{\rm BP}$ photometry or $G_{\rm RP}$ photometry. For DR3, only per-CCD G-band photometry is used to compute the frequency. It is set to NULL if the number of CCD measurements is less than 180.

14 Differences between the Gaia DR3 and EDR3/DR2 data models

Here we summarise the differences between the new (Gaia DR3) data model and that presented in the previous releases (EDR3 and DR2). Users of the archive systems (Chapter **??**) will be aware that ADQL provides the primary interface to the data, and that all table names are prefixed with a release identifier in ADQL scripts – for example, `gaiadr3.gaia_source` for the main catalogue table in the current release. At a minimum it will be necessary to update table prefixes in older scripts from `gaiadr2` or `gaiaedr3` to `gaiadr3` to enable them to work with the new data. Furthermore it is important to note that the set of tables presented in the new release is not identical to those released previously. Even when the same table name is present there are many new columns and a few columns that are not included in the new release.

For convenience the changes between Gaia DR3 and Gaia EDR3 are listed first, followed by a recapitulation of the differences between the interim Gaia EDR3 release and predecessor Gaia DR2. Note that the division into groups of various related tables in the data model presentation, both here and in the Gaia archive web interface tree-view, has been redefined in Gaia DR3 over that in Gaia EDR3 to present more clearly the expanded set.

14.1 Table changes between Gaia DR3 and Gaia EDR3

The following differences in Gaia DR3 with respect to Gaia EDR3 should be noted:

14.1.1 Astrophysical parameter tables

This entirely new group consists of the following new tables:

- `astrophysical_parameters` (Sect. 2.1);
- `astrophysical_parameters_supp` (Sect. 2.2);
- `total_galactic_extinction_map` (Sect. 2.3);
- `total_galactic_extinction_map_opt` (Sect. 2.4);
- `oa_neuron_information` (Sect. 2.5);
- `oa_neuron_xp_spectra` (Sect. 2.6);
- `mcmc_samples_gsp_phot` (Sect. 2.7);
- `mcmc_samples_msc` (Sect. 2.8).

14.1.2 Auxiliary tables

This category now contains `commanded_scan_law` (Sect. 3.1) alone. Tables pertaining to the celestial reference frame have been moved to their own group (see Sect. 14.1.7 below) while the Gaia DR3–to–DR2 source cross-match table has been moved to the cross-match group (next Section).

14.1.3 Cross-matches

New surveys cross-matched at this release are the Gaia–ESO spectroscopic survey and RAVEDR6. The group of neighbouring and neighbourhood cross-match tables now includes:

- `dr2_neighbourhood` (Sect. 4.1; table is identical to that published at Gaia EDR3);
- `gaia_eso_survey_best_neighbour` (Sect. 4.7);
- `gaia_eso_survey_neighbourhood` (Sect. 4.9);
- `gaia_eso_survey_join` (Sect. 4.8);
- `ravedr6_best_neighbour` (Sect. 4.21);
- `ravedr6_neighbourhood` (Sect. 4.23);
- `ravedr6_join` (Sect. 4.22).

Further details concerning the contents and use of the join tables in conjunction with the usual neighbour and neighbourhood tables can be found in Chapter **??**.

14.1.4 Extra-galactic tables

This new group of tables presents information concerning non-stellar sources serendipitously observed by Gaia and consists of:

- `galaxy_candidates` (Sect. 5.1);
- `galaxy_catalogue_name` (Sect. 5.2);
- `qso_candidates` (Sect. 5.3);
- `qso_catalogue_name` (Sect. 5.4).

The special analyses of extra-galactic observations is discussed in Chapter **??**.

14.1.5 Non-single stars

This new group of tables presents analysis of astrometrically and/or spectroscopically resolved multiple stellar systems and consists of:

- nss_two_body_orbit (Sect. 6.1);
- nss_acceleration_astro (Sect. 6.2);
- nss_non_linear_spectro (Sect. 6.3);
- nss_vim_fl (Sect. 6.4).

The various analyses contributing to these results are detailed in Chapter **??**.

14.1.6 Photometry

This new category contains epoch_photometry alone. Note that this table is not available for ADQL querying through the main archive Table Access Protocol but via the bulk data service (Chapter **??**).

14.1.7 Reference frame

This new group consists of tables giving information pertaining to the astrometric coordinate reference frame as realised by Gaia in optical band passes. The contents are:

- gaia_crf3_xm (Sect. 8.1);
- agn_cross_id (Sect. 8.2; table is identical to that published at Gaia EDR3);
- frame_rotator_source (Sect. 8.3; table is indentical to that published at Gaia EDR3).

14.1.8 Science alert tables

This new group consists of:

- science_alerts (Sect. 9.1);
- alerts_mixedin_sourceids (Sect. 9.2).

For further details see Sect. **??**.

14.1.9 Solar system object tables

This new group expands considerably on data released in preliminary form in Gaia DR2 and now consists of:

- `sso_source` (Sect. 11.1);
- `sso_observation` (Sect. 11.2);
- `sso_reflectance_spectrum` (Sect. 11.3).

The new aalysis is described in Chapter **??**.

14.1.10 Spectroscopic tables

This new group consists of:

- `rvs_mean_spectrum` (Sect. 12.1);
- `xp_summary` (Sect. 12.2);
- `xp_continuous_mean_spectrum` (Sect. 12.3);
- `xp_sampled_mean_spectrum` (Sect. 12.4).

Of the above four tables only `xp_summary` is avaiable for ADQL queries via the Table Access Protocol. The other three resources are provisioned via the bulk data access services (Chapter **??**).

14.1.11 Variability tables

This substantial group of tables expands enormously over the equivalent provided at Gaia DR2. The category now consists of:

- `vari_summary` (Sect. 13.1);
- `vari_classifier_result` (Sect. 13.2);
- `vari_classifier_definition` (Sect. 13.3);
- `vari_classifier_class_definition` (Sect. 13.4);

- vari_agn (Sect. 13.5);
- vari_cepheid (Sect. 13.6);
- vari_compact_companion (Sect. 13.7);
- vari_eclipsing_binary (Sect. 13.8);
- vari_epoch_radial_velocity (Sect. 13.9);
- vari_rad_vel_statistics (Sect. 13.10);
- vari_long_period_variable (Sect. 13.11);
- vari_microlensing (Sect. 13.12);
- vari_ms_oscillator (Sect. 13.13);
- vari_planetary_transit (Sect. 13.14);
- vari_rotation_modulation (Sect. 13.15);
- vari_rrlyrae (Sect. 13.16);
- vari_short_timescale (Sect. 13.17).

For full details concerning the various derived product pipelines see Chapter **??**.

14.2 Column changes between Gaia DR3 and Gaia EDR3

Where tables are common between Gaia DR3 and EDR3, the following alterations should be noted:

14.2.1 Main catalogue table

The following columns have been deleted from table gaia_source:

- dr2_radial_velocity;
- dr2_radial_velocity_error;
- dr2_rv_nb_transits;
- dr2_rv_template_teff;
- dr2_rv_template_logg;

- dr2_rv_template_fe_h.

The Gaia DR2 radial velocity quantities that were included for convenience in Gaia EDR3 are superseded by an expanded set of attributes for more sources as detailed in Tab. **??** in Gaia DR3.

The following flag columns have been added:

- phot_variable_flag;
- in_qso_candidates;
- in_galaxy_candidates;
- non_single_star;
- has_xp_continuous;
- has_xp_sampled;
- has_rvs;
- has_epoch_photometry;
- has_epoch_rv;
- has_mcmc_gspphot;
- has_mcmc_msc;
- in_andromeda_survey.

These all indicate availability of further data in relevant tables cross-referenced by source_id.

In addition to the above 27 selected astrophysical parameter columns are copied in to gaia_source from table astrophysical_parameters for convenience. These columns appear at the end of the table column list from classprob_dsc_combmod_quasar onwards.

14.3 Table changes between Gaia EDR3 and Gaia DR2

The following differences in the preliminary Gaia EDR3 with respect to Gaia DR2 should be noted (some of these older changes have been superseded in the latest release of course — see above):

14.3.1 Main catalogue tables

The following Gaia DR2 table was not present in Gaia EDR3:

- `ruwe`.

The single parameter contained therein, namely the renormalised unit–weight error, was included in `gaia_source` No further tables have been added in this part of the data model.

14.3.2 Solar system object tables

The following Gaia DR2 tables were not present in Gaia EDR3:

- `sso_observation`;
- `sso_source`.

No further tables were added in this part of the data model.

14.3.3 Variability tables

The following Gaia DR2 tables were not present in Gaia EDR3:

- `vari_cepheid`;
- `vari_classifier_class_definition`;
- `vari_classifier_definition`;
- `vari_classifier_result`;
- `vari_long_period_variable`;
- `vari_rotation_modulation`;
- `vari_rrlyrae`;
- `vari_short_timescale`;
- `vari_time_series_statistics`.

No further tables have been added in this part of the data model.

14.3.4 External catalogues

External catalogue tables added at Gaia EDR3 were:

- `tycho2_tdsc_merge`: a merge of the Tycho2 (Høg et al. 2000) and Tycho Double Star (TDSC; Fabricius et al. 2002) catalogues

At Gaia DR2 the data model descriptions for external catalogues served through the Gaia archive included those released and documented with Gaia DR1. For Gaia EDR3 we did not duplicate these descriptions, but users should note that the external catalogue tables themselves remain available in the archive for use in conjunction with the crossmatch tables. Moreover the associated online data model documentation remains available (Hambly et al. 2018).

14.3.5 Crossmatches

The following Gaia DR2 tables are no longer present from Gaia EDR3 onwards:

- `sdssdr9_best_neighbour` (superseded by SDSS DR13 – see below);
- `sdssdr9_neighbourhood` (superseded by SDSS DR13 – see below);
- `tmass_best_neighbour` (superseded by 2MASS PSC/XSC combined – see below);
- `tmass_neighbourhood` (superseded by 2MASS PSC/XSC combined – see below);
- `tycho2_best_neighbour` (superseded by Tycho2/TDSC combined – see below);
- `tycho2_neighbourhood` (superseded by Tycho2/TDSC combined – see below).

The following tables were added at Gaia EDR3:

- `panstarrs1_join`;
- `sdssdr13_best_neighbour`;
- `sdssdr13_neighbourhood`;
- `sdssdr13_join`;
- `skymapperdr2_best_neighbour`;

- skymapperdr2_neighbourhood;
- skymapperdr2_join;
- tycho2_tdsc_merge_best_neighbour;
- tycho2_tdsc_merge_neighbourhood;
- tmass_psc_xsc_best_neighbour;
- tmass_psc_xsc_neighbourhood;
- tmass_psc_xsc_join;
- allwise_best_neighbour;
- allwise_neighbourhood;
- apassdr9_best_neighbour;
- apassdr9_neighbourhood;
- gsc23_best_neighbour;
- gsc23_neighbourhood;
- gsc23_join;
- ravedr5_best_neighbour;
- ravedr5_neighbourhood;
- ravedr5_join.

14.3.6 Auxiliary tables

The following Gaia DR2 tables were not present in Gaia EDR3:

- aux_allwise_agn_gdr2_cross_id (superseded – see below);
- aux_iers_gdr2_cross_id (superseded – see below);
- aux_sso_orbit_residuals;
- aux_sso_orbits;
- dr1_neighbourhood (superseded – see below).

The following Gaia EDR3 tables were added:

- agn_cross_id;
- commanded_scan_law;
- dr2_neighbourhood;
- frame_rotator_source;
- gaia_source_simulation (see Sect. ??);
- gaia_universe_model (see Sect. ??).

14.3.7 Datalink tables

The following Gaia DR2 tables were not present in Gaia EDR3:

- light_curve;
- epoch_photometry.

Datalink resources (enormously expanded over those available at Gaia DR2) appear in Gaia DR3.

14.4 Column changes between Gaia EDR3 and Gaia DR2

Where tables were common between Gaia EDR3 and DR2, the following deletions and renamings should be noted (we do not include columns that were completely new in Gaia EDR3 in this digest):

14.4.1 Main catalogue tables

The following columns were deleted from table gaia_source:

- astrometric_weight_al;
- mean_varpi_factor_al;
- frame_rotator_object_type;
- phot_variable_flag;

- priam_flags;
- teff_val;
- teff_percentile_lower;
- teff_percentile_upper;
- a_g_val;
- a_g_percentile_lower;
- a_g_percentile_upper;
- e_bp_min_rp_val;
- e_bp_min_rp_percentile_upper;
- e_bp_min_rp_percentile_lower;
- flame_flags
- radius_val;
- radius_percentile_upper;
- radius_percentile_lower;
- lum_val;
- lum_percentile_upper;
- lum_percentile_lower.

The following columns were renamed in table gaia_source (old Gaia DR2 names in parentheses):

- pseudocolour (was astrometric_pseudo_colour);
- pseudocolour_error (was astrometric_pseudo_colour_error);
- astrometric_matched_transits (was astrometric_matched_observations);
- matched_transits (was matched_observations).

The following column remains in table gaia_source with the same name but the definition/derivation changed (see the linked description for more detail):

- astrometric_gof_al.

14.4.2 Crossmatches

The following columns were deleted in `_best_neighbour` tables:

- `gaia_astrometric_params`;
- `best_neighbour_multiplicity`.

The following column was deleted in `_neighbourhood` tables:

- `gaia_astrometric_params`.

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