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Emergency
Management

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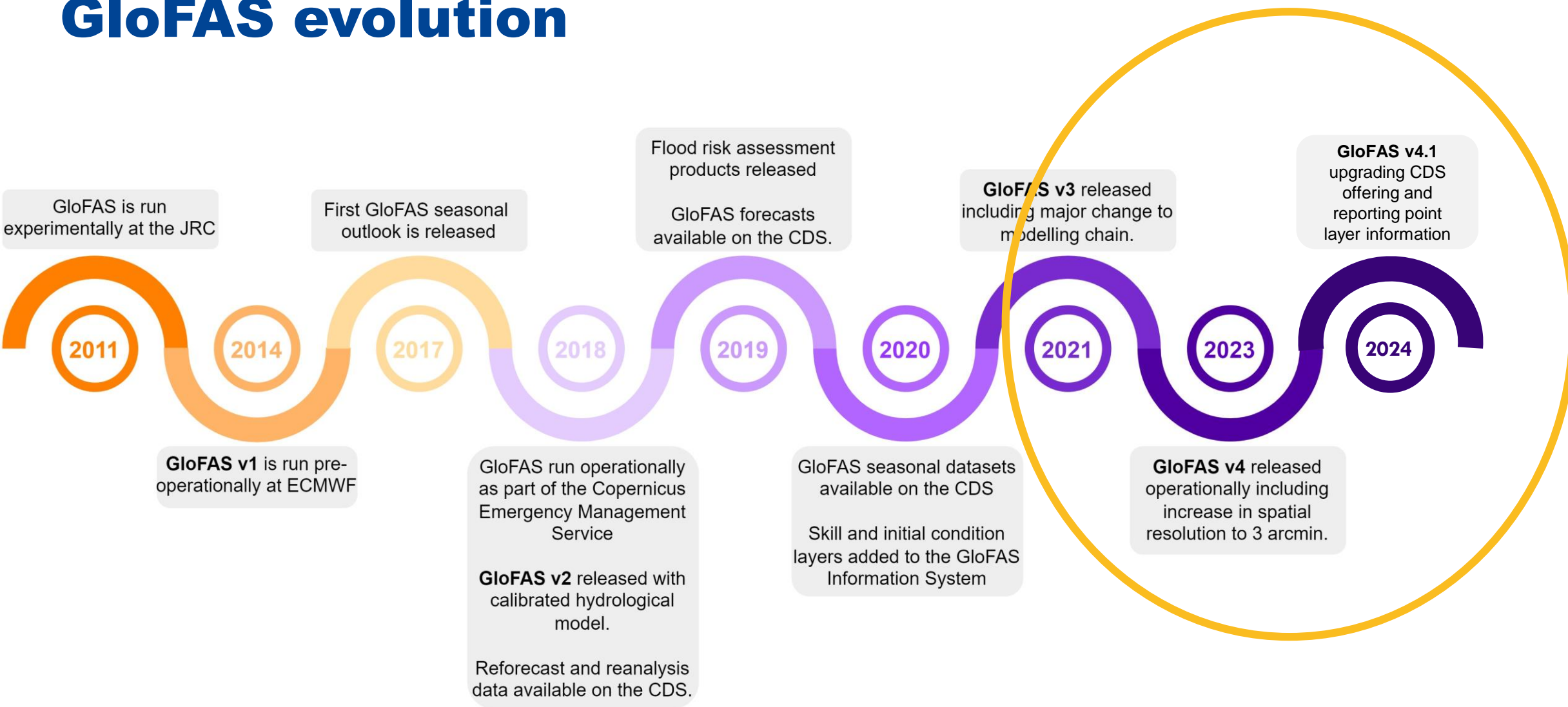
What is new in the Global Flood Awareness System GloFAS

3rd Global Flood Forecasting and Monitoring Meeting

Christel Prudhomme and the CEMS-Flood teams at ECMWF and JRC

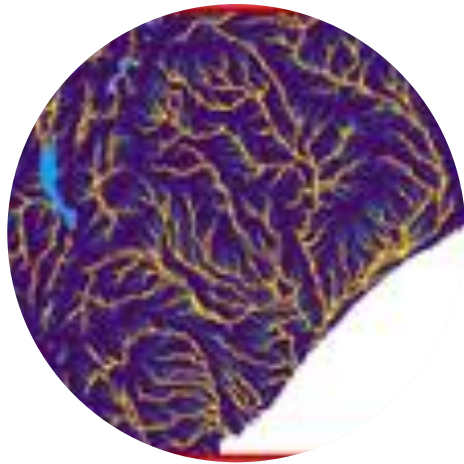


GloFAS evolution

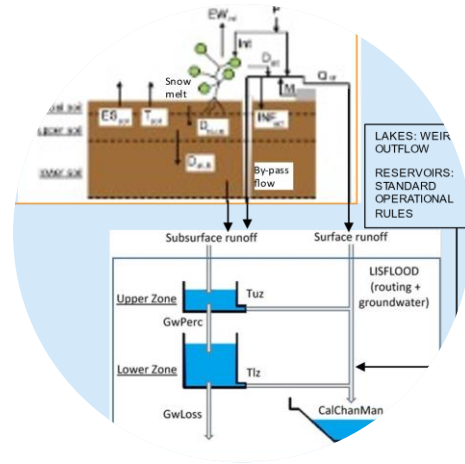




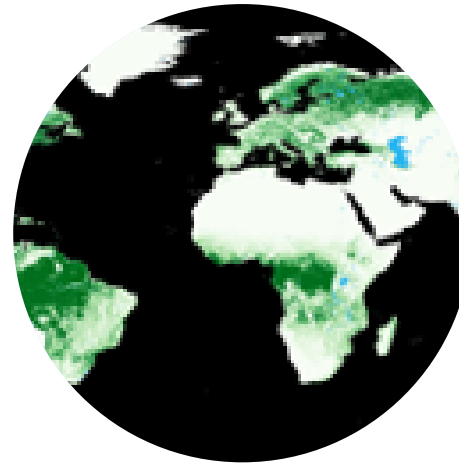
GloFAS v4.0 – Upgraded hydrological modelling chain



~5km resolution model grid and river network



Improved LISFLOOD-OS efficiency



Updated maps of physical properties

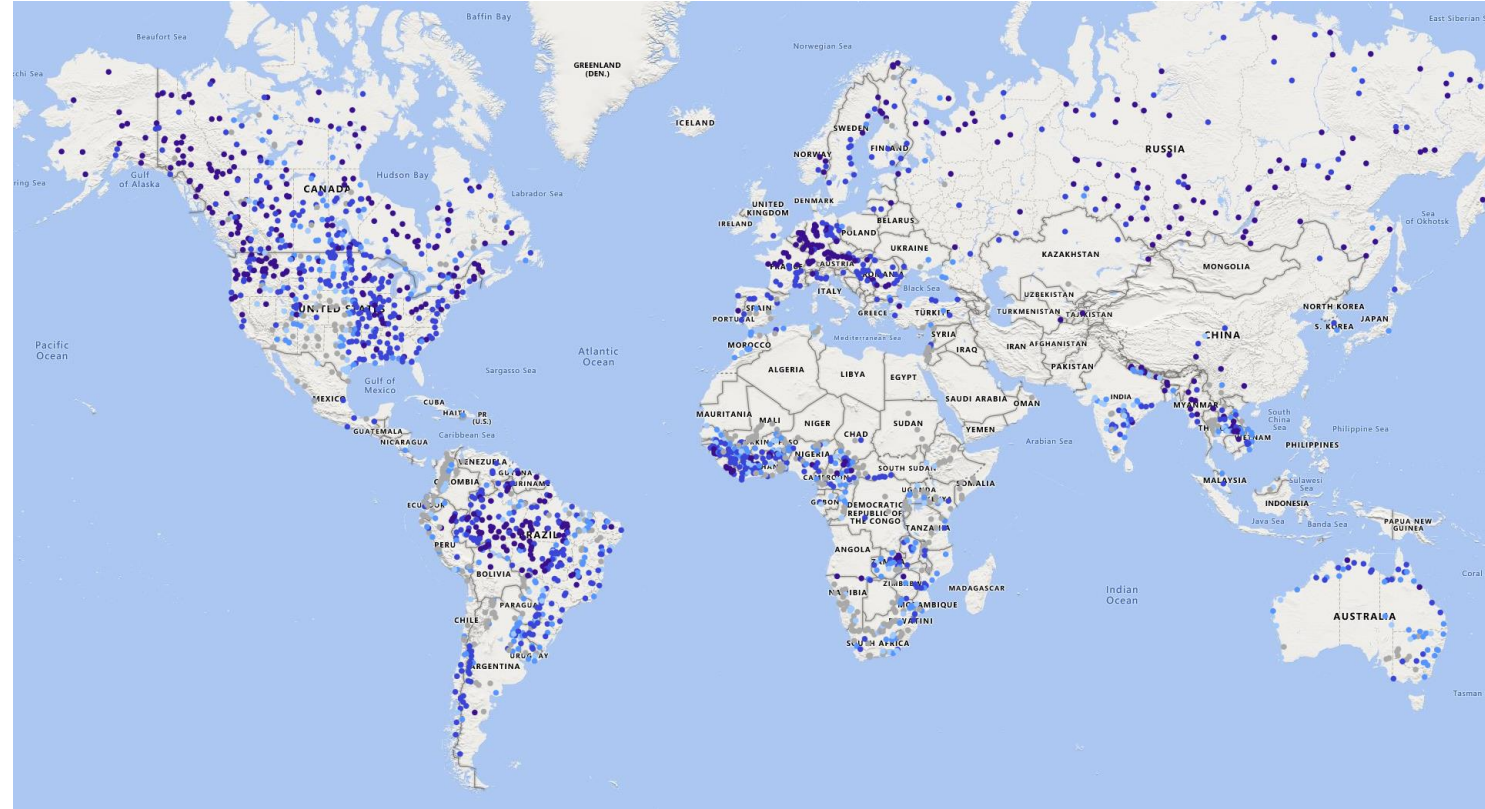


Regionalisation of model parameters for ungauged catchments



GloFAS v4.0 – Upgraded hydrological modelling chain

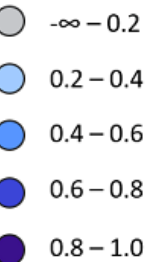
- Calibrated over nearly 2000 points
- ERA5 forcing
- Simulation available through CDS (1979-date)
- Lowest performance (grey) mainly in regulated rivers (KGE')
- Generally relatively high correlation



$$KGE' = 1 - \sqrt{\underbrace{(r - 1)^2}_{\text{Correlation}} + \underbrace{(\beta - 1)^2}_{\text{Bias ratio}} + \underbrace{(\gamma - 1)^2}_{\text{Variability ratio}}}$$

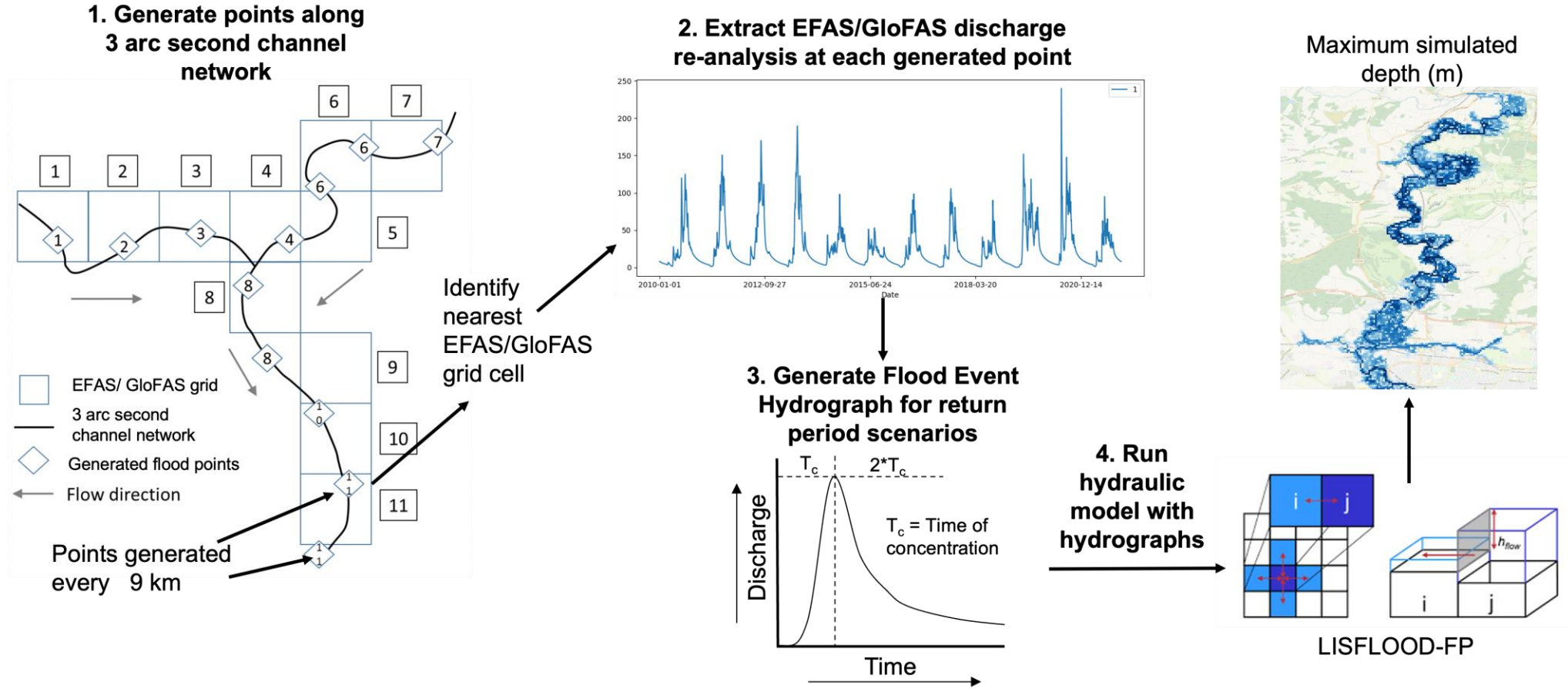
Correlation Bias ratio Variability ratio

KGE





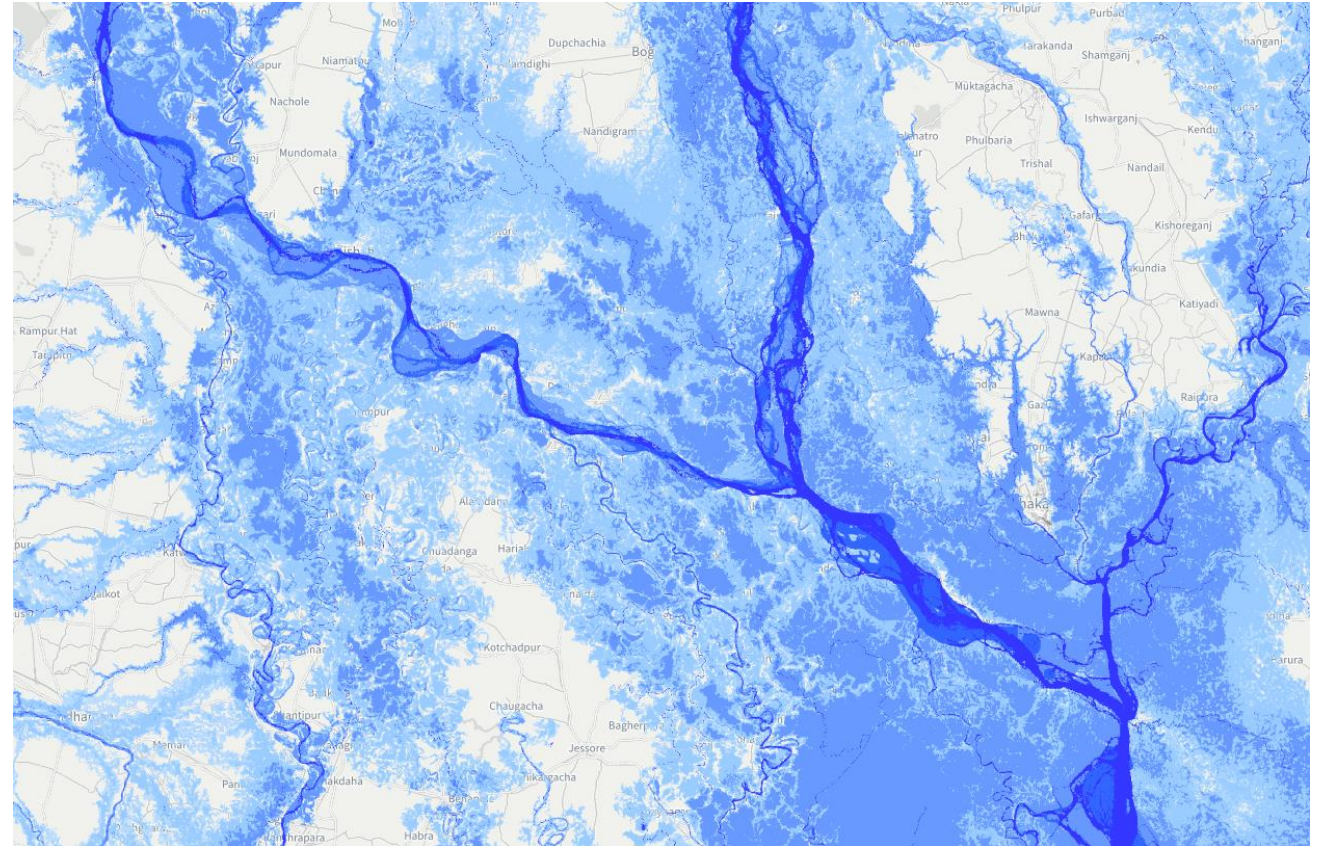
GloFAS v4.0 – High resolution flood inundation maps



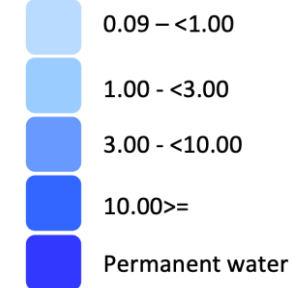


GloFAS v4.0 – High resolution flood inundation maps

- 90-m resolution
- Return periods: 10, 20, 50, 75, 100, 200, 500 years
- Only for catchments >500km²
- Based on flood threshold magnitude of GloFAS v4 reanalysis
- 2D hydraulic flood inundation model
- Soon available from JRC catalogue



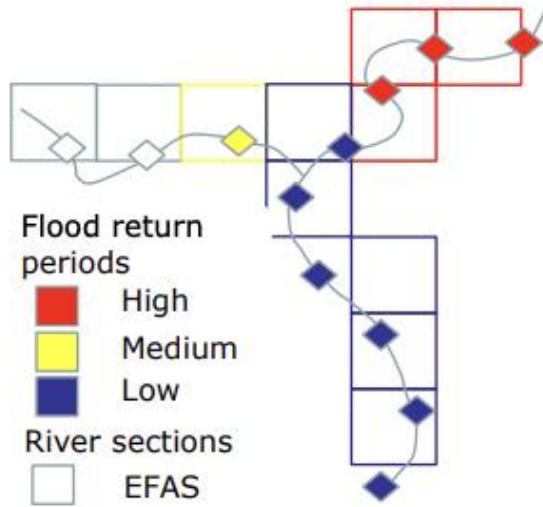
Ignite talk by Calum Baugh tomorrow



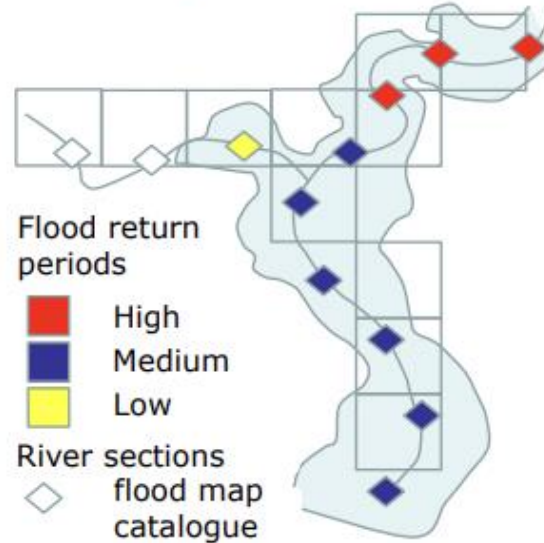


GloFAS v4.0 - Enhanced Rapid Risk Assessment

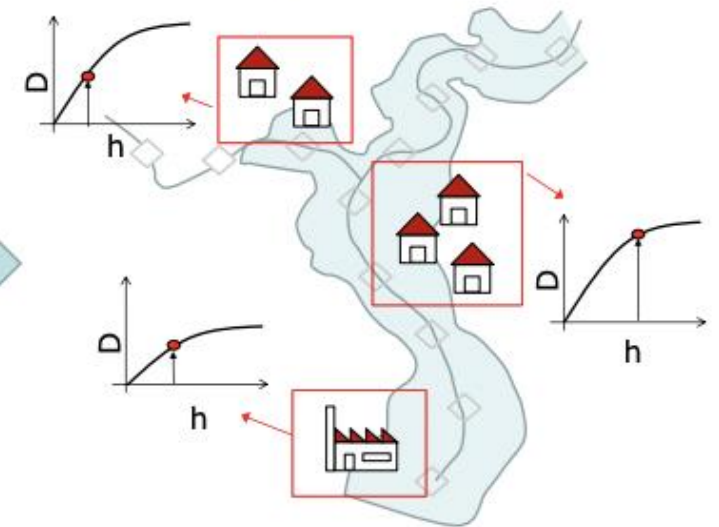
1: Flood forecast



2: Rapid flood mapping



3: Impact assessment





GloFAS v4.0 - Enhanced Rapid Risk Assessment

- Updated/ enhanced exposure information
 - Population data - Global Human Settlement Layer (GHSL): <https://ghsl.jrc.ec.europa.eu/>
 - Critical Infrastructure: Health, education and airport facility information: openstreetmap.org
- Flood event description

GloFAS impact tables. Tables showing exposure information and the maximum forecast flood characteristics over the next 30 days and expected associated impacts. Results are aggregated over NUTS administration units.

Exposure Information	Protected	Unprotected
Population affected [No. of people]	70100	70100
Population within floodplain affected [%]	69	69
Cities affected (% area affected)	N/A	N/A
Health facilities affected (No. of facilities)	3	3
Education facilities affected (No. of facilities)	3	3
Airport affected (No. of facilities)	N/A	N/A
Artificial surfaces affected [ha]	N/A	N/A
Agricultural surfaces affected [ha]	258	258
Forest and semi-natural surfaces affected [ha]	3061	3063

Exposure information. Potential impact of floods on population and land use (e.g. agriculture, urban).

Flood Event Information	Protected	Unprotected
Estimated mean return period [yr]	200	200
Estimated protection levels [yr]	6	6
Estimated peak time [d]	1	1
Estimated flooding duration (day)	13	13
Estimated flooded area (km ²)	4024	4026
Mean probability of exceeding 2-years threshold	100	100
Mean probability of exceeding 5-years threshold	100	100
Mean probability of exceeding 20-years threshold	100	100

Protected. Flood defenses accounted for in inundation extent estimates.

Unprotected. Inundation extent estimates assuming no flood defense.

Flood characteristics. Based on the maximum forecast median over the next 30 days.

Impact estimates. Defined by overlaying the inundation area with exposure data, aggregated over NUTS admin units.





GloFAS v4.1 – Increased CDS offering



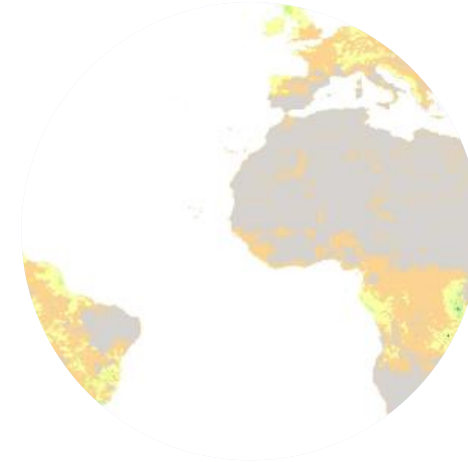
Soil Wetness Index (root zone)

Ratio (0-1) of volume of water stored in the top two soil layers between saturation and residual levels, given as an instantaneous value at the end of each model time step



Snow Water Equivalent

Amount of water stored (kg/m²) as ice and snow given as an instantaneous value at the end of each model time step



Runoff water equivalent (surface and sub-surface)

Sum of surface and sub-surface runoff (kg/m²), representing all the water that would drain away from the grid box



GloFAS v4.1- Increased CDS offering

- Available as daily time series through Climate Data Store
- Consistent with initial condition layers shown on map viewer
- Available for reanalysis (historical simulation) and real-time forecasts
- During 2024, will also be made available for reforecasts

System version ?

Operational

Version 4.0

Legacy

Hydrological model ?

At least one selection must be made

LISFLOOD

Product type ?

At least one selection must be made

Consolidated

Variable ?

River discharge in the last 24 hours Snow depth water equivalent Soil wetness index (root zone)

MAIN VARIABLES		
Name	Units	Description
River discharge in the last 24 hours	m ³ s ⁻¹	Volume rate of water flow, including sediments, chemical and biological material, in the river channel averaged over a time step through a cross-section. The value is an average over a 24-hour period.
Snow depth water equivalent	kg m ⁻²	The mass of water per square meter if all the snow in the grid box would be melted. The value is instantaneous meaning that it is valid for the last time step of the integration at the issued model time step.
Soil wetness index	Dimensionless	The volume of water over the total volume of voids in the soil, expressed as an index with values between 0 (residual soil moisture) and 1 (saturation), representing the lower and upper soil moisture limits of the root zone. The root zone is the maximum depth at which plants can extract water from the soil. Voids are empty spaces in the soil column that can be filled with water or air. The value is instantaneous meaning that it is valid for the last time step of the integration at the issued model time step.

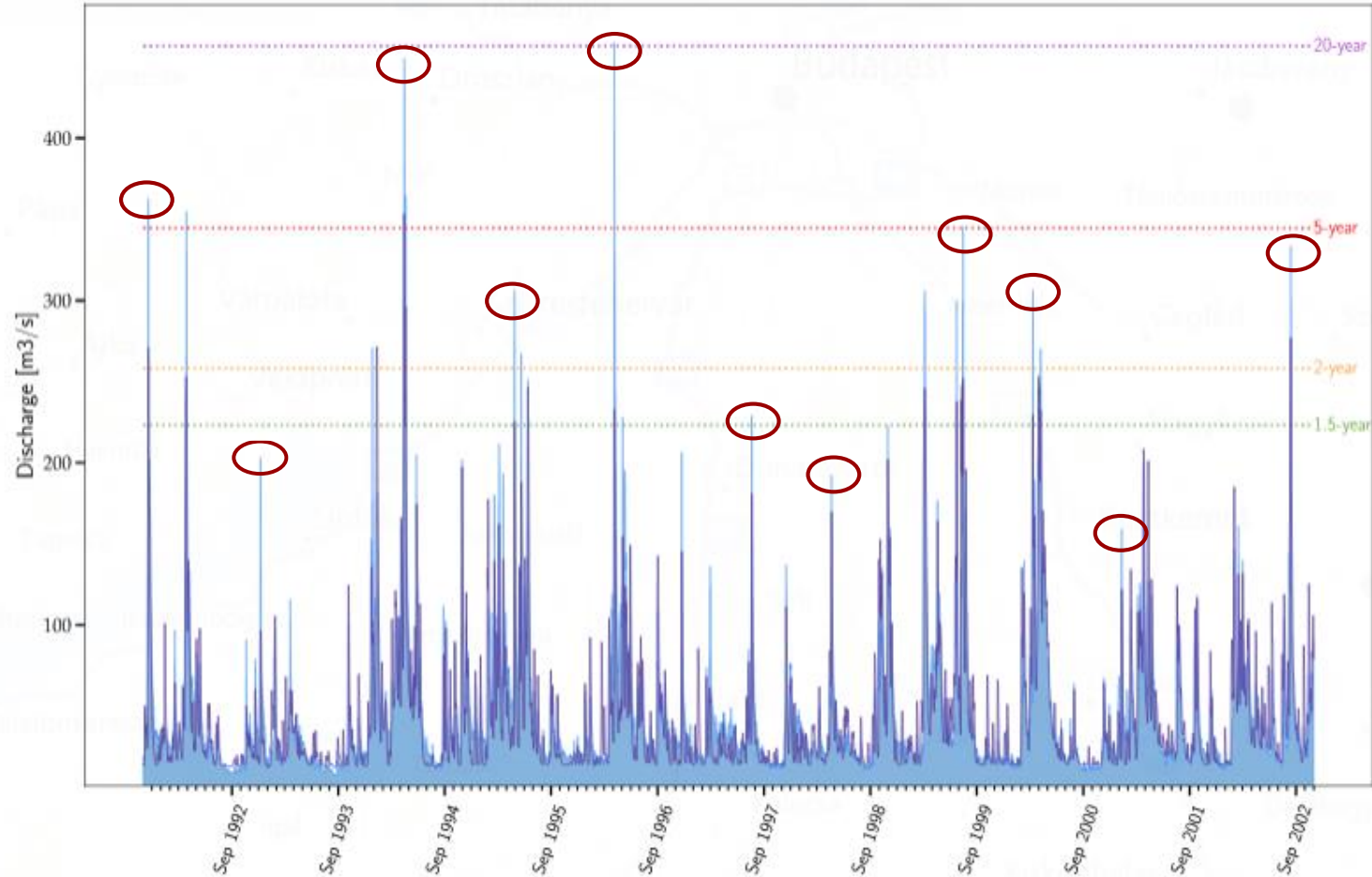


For more info

Want to know more? Visit us in GatherTown!



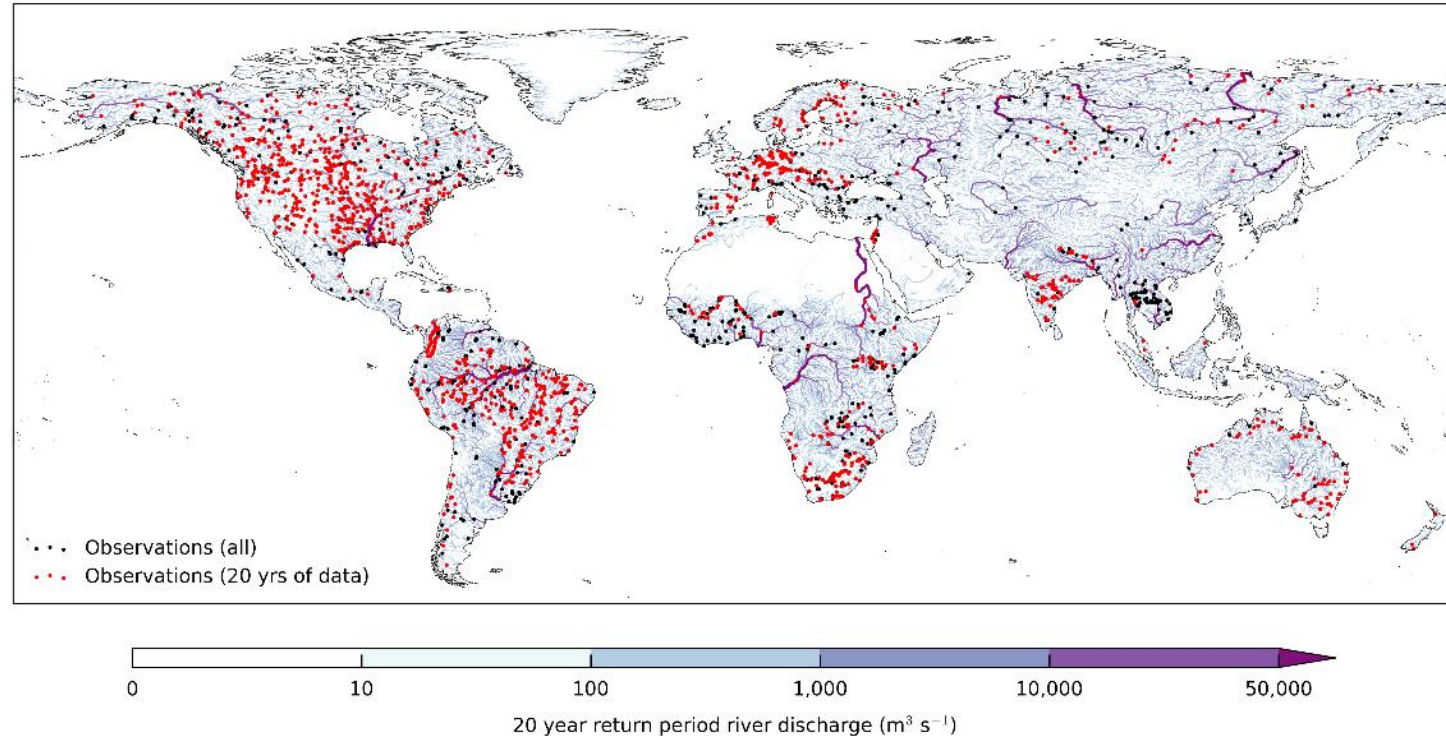
GloFAS v4.1- Flood thresholds





GloFAS v4.1- Flood Thresholds

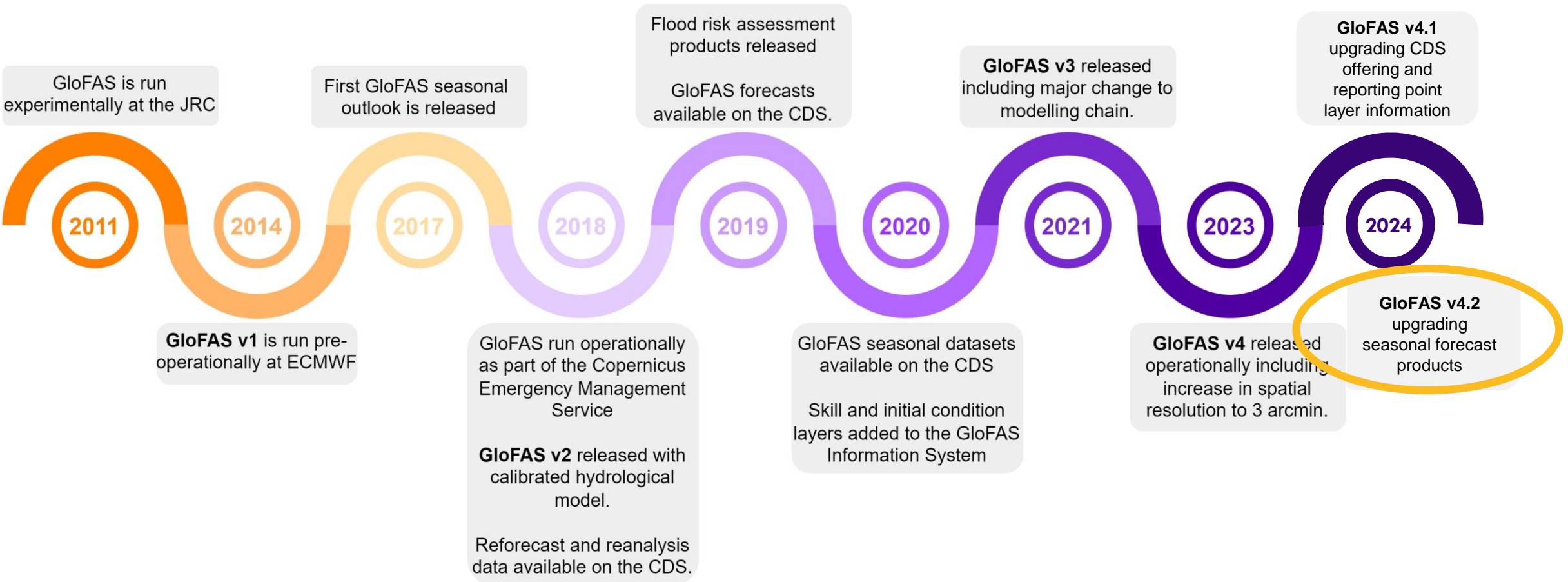
- Calculated for every GloFAS grid cell
- Based on GloFAS reanalysis simulation (1979-2022)
- Re-calculated at every major release (change in hydrological modelling)
- Used to define the reporting points shown in the map viewer
- Additional return periods



Ignite talk by Ervin Zsoter today!

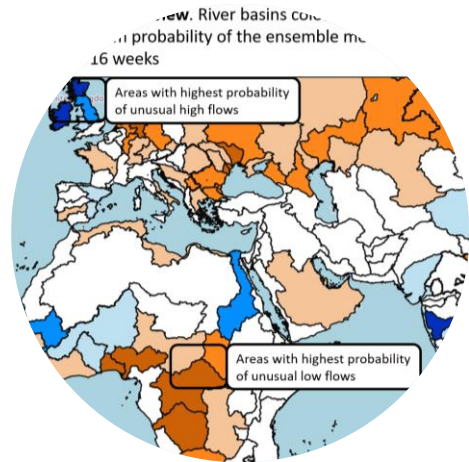


GloFAS evolution – what to expect in the future



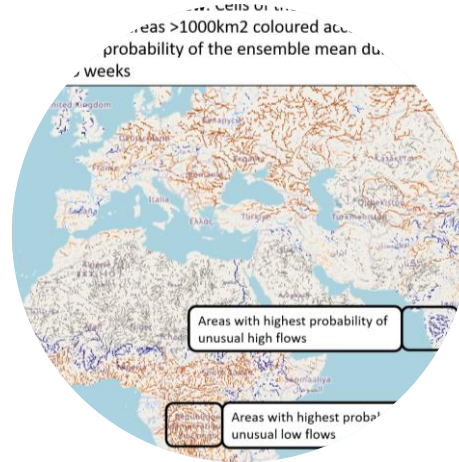


GloFAS v4.2 – Upgrade seasonal forecast products



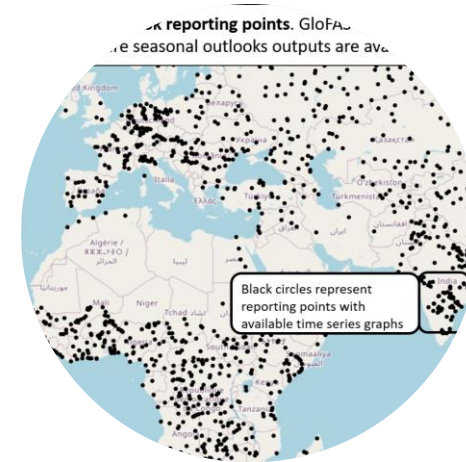
River basins overview

Map of maximum area-averaged probability of high/low flow weekly anomaly



River network overview

Map of river network with maximum basin-averaged probability of wet/dry weekly anomaly



Reporting points

Map of river station with available seasonal outlook hydrographs



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GloFAS v4.2- Upgrade seasonal forecast products

- Size of river basins
- Temporal aggregation (currently weekly)
- Definition of anomalies (currently 20/80th percentiles)
- How to convey forecast horizon information (instead of maximum anomaly)
- How to convey skill information



Flooded area (Situation as of 4 January 2024 at 17:24 UTC)

Sedan



2023

**GloFAS and GFM
Annual Survey**

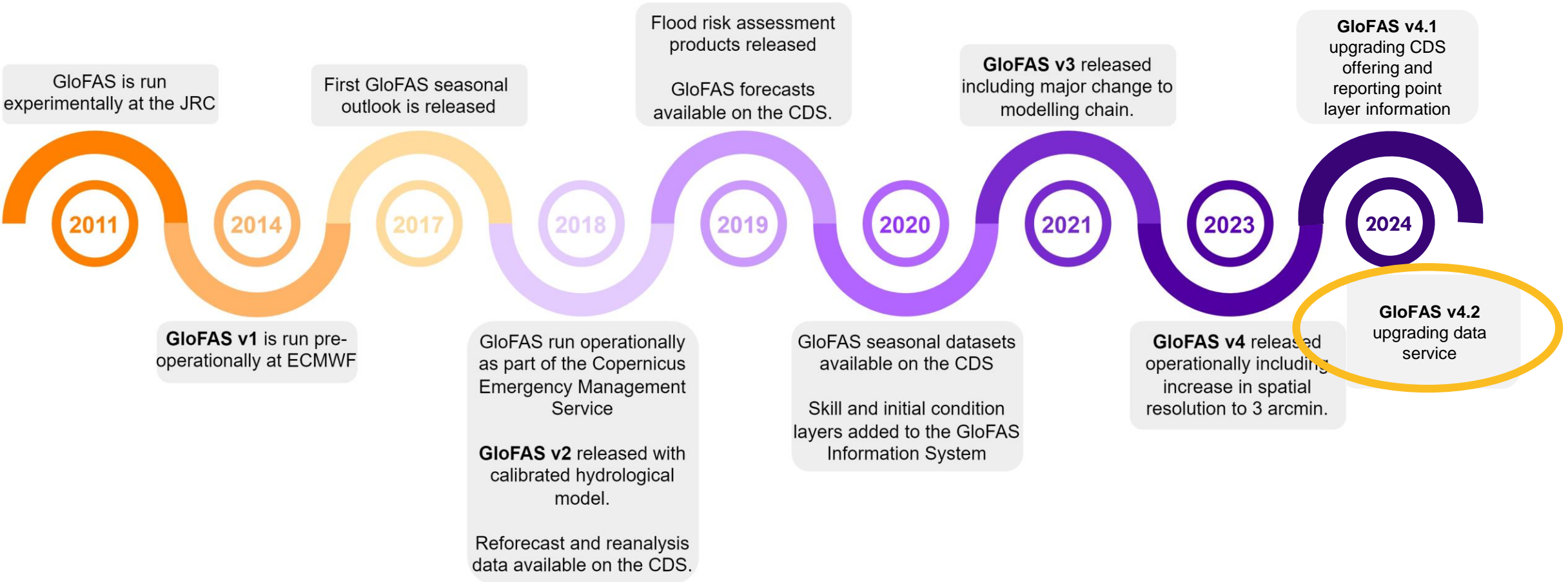
Deadline: 14 March 2024



Have your say through the GloFAS
Survey and talk to us in GatherTown!



GloFAS evolution – what to expect in the future





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GloFAS v4.2- Upgrade data service

- Password-protected access
- Increased user support
- Notification service



Implemented by the European Commission as part of the Copernicus Programme

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christel.prudhomme@ecmwf.int

Subject *

Select an option

Content *

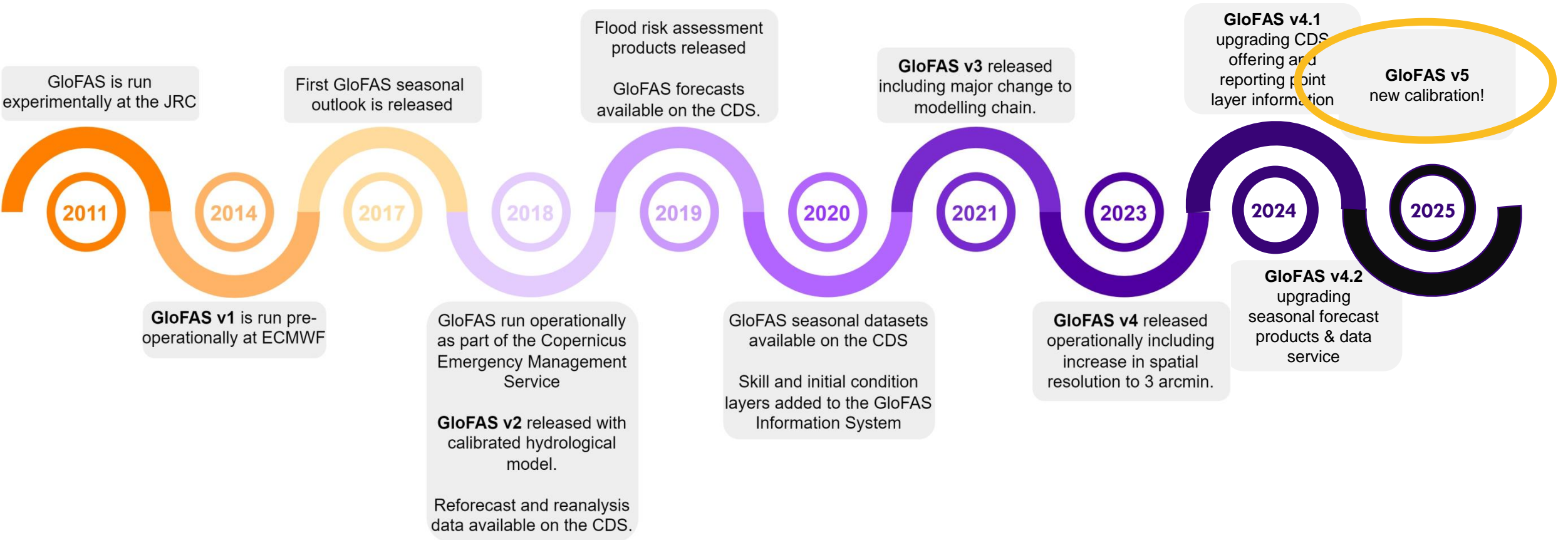
Text



Contact us if you wish to continue
receiving our data service!



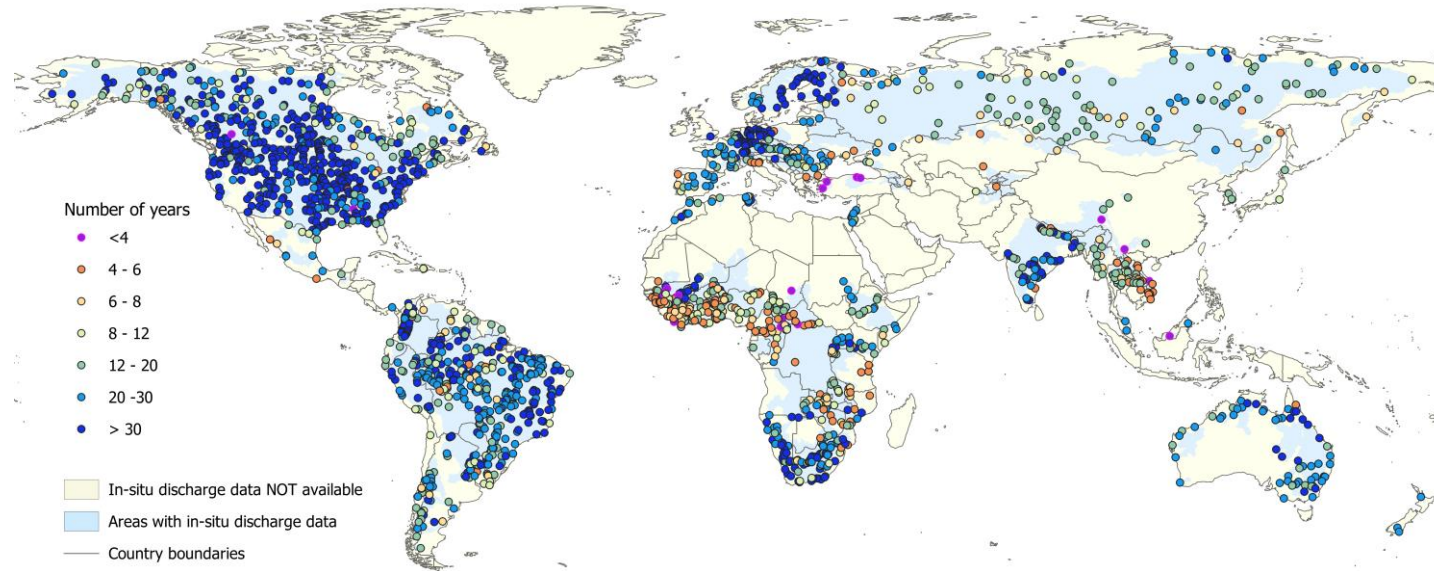
GloFAS evolution – what to expect in the future





GloFAS v5.0 – New calibration

- Improved physical property maps
- Improved LISFLOOD-OS
- Opportunity for more calibrated basins
- Opportunity for longer calibration time series
- Data collection campaign starting now!



Length of the observation time series in years used in GloFAS v4. The points in purple were included to increase the spatial coverage of the calibration

**Want your region to be calibrated?
Visit us in GatherTown!**



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Thank you



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