COASTALT

NEW COASTAL ALTIMETRY PRODUCTS

In the framework of the COASTALT Project, ESA is paving the way to **one or more new coastal radar altimeter products**. The main objective of COASTALT is to define, test and prototype these new products. Then ESA will apply the resulting knowledge to the routine generation and distribution of such coastal products from Envisat, as well as to the reprocessing of the ERS archives close to the coast.

We need your help to define these new products, which will move coastal altimetry towards an OPERATIONAL status

With this questionnaire we aim to gather a feedback from oceanographers, marine scientists, coastal researchers in order to match the improvements planned for these new products with **your expectations**.

At the end you are also given the option to subscribe to the **Coastal Altimetry Science Working Team** mailing list if you wish.

An introduction to altimetry products is attached as an annex to this questionnaire.

We thank you for contributing to the novel field of coastal altimetry by answering these questions. Please, do not hesitate to contact us if you need any additional information.

Best Regards,

Starlab COASTALT project team.

Cristina.martin@starlab.es
Araceli.pi@starlab.es
Laura.moreno@starlab.es

The COASTALT project coordinator.

Paolo Cipollini, NOCS
cipo@noc.soton.ac.uk

QUESTIONNAIRE

(Please note that several questions allow more than one answer – check all those that apply)

USER PROFILE						
Working institute/enterprise	Operational (Public)	Research (Public)	Operational (Private)	Research (Private)		Other
Specify name: …….						
How do you study the coastal ocean	in situ measurements	remote sensing	numerical modelling	Data assimilation	statistical modelling	Other
Specify data product and model……						
Have you already used altimetry products for your studies	yes	no				
Please specify data product and parameter used: ……						
Problems encountered: ……						
Do you consider your work to be:	Real time	near real time	delayed mode	climate related		
How long are your usual datasets?	day long or shorter	between 1 day and 1 month	between 1 month and 1 year	between 1 year and 10 years	longer than 10 years and as long as possible	
USER SECTOR/APPLICATIONS						
Are you using data from:	Near Shore	Coastal zone	Open Ocean			
To complement the previous question, what distance from the shoreline?	0-50 Km	50-100 Km	100 Km or more	Other		
Purpose of the altimeter products	Modelling/ Validation	Modelling/ Assimilation	Analysis of Ocean Processes	Monitoring	Climate analysis	
Other important specifications: ……						

PARAMETERS USED						
Which physical processes do you STUDY?	Sea Level Anomaly	Absolute Dynamic Topography	Sea Surface height	Waves	Geoid	Wind
Which of the following parameters do you USE? Give a score using 4 (very important to you) to 1 (marginal). Put 0 where you do not use a parameter at all	Wind Speed	Salinity	Temperature	Surface elevation	Significant wave height	Other (specify .....)
Other physical process/ parameter/ contents that could be evaluated with altimetry data: …… …… ……						

PRODUCT CHARACTERIZATION				
Along-track frequency sampling	1Hz	20 Hz	1800 Hz	Other (pls. specify)
Which one do you use currently?				
Preferred/desired for the new product				
Spatial resolution (along-track)	< 15 Km	< 25 Km	Other (pls. specify)	
Which one do you use currently?				
Preferred/desired for the new product				
Data delivery delay vs accuracy	Offline data (most accurate)	Near real time data	Real time data (least accurate)	
Which one do you use currently?				
Preferred/desired for the new product				

ACCURACY REQUIREMENTS				
Accuracy for HEIGHT measurem.	< 3 cm	< 10 cm	< 20 cm	Other (pls. specify)
Current product				
Preferred/desired for the new product				
Accuracy for Signif. Wave Height (SWH)	< 5%	< 10%	< 20%	Other (pls. specify)
Current product				
Preferred/desired for the new product				
Radiometric Accuracy (=on σ_0 measurement)	< 0.2 dB	< 0.5 dB	< 1 dB	Other (pls. specify)
Current product				
Preferred/desired for the new product				

PRECISION REQUIREMENTS				
Precision for HEIGHT measurem.	< 3 cm	< 10 cm	< 20 cm	Other (pls. specify)
Current product				
Preferred/desired for the new product				
Precision for Signif. Wave Height (SWH)	< 5%	> 5%	>10%	Other (pls. specify)
Current product				
Preferred/desired for the new product				
Radiometric precision (=on σ_0 measurement)	<0.2 dB	<0.5 dB	<1 dB	Other (pls. specify)
Current product				
Preferred/desired for the new product				

AUXILIARY DATA					
Supplementary data required for the new product:	Raw data	Quality controlled data	Data with global quality flags	Data with specific quality flags	Other
Specify:……					
Complementary information needed for:	HF fields to correct altimeter data	Applied Atmosph. corrections	Applied Geophysical corrections (tides, etc)	Instrumental corrections	Other
Specify:……					

Need of Mean Dynamic topography (MDT) to reference data?	Yes	No	I don't know		
Which other remote-sensing data products would be synergistic to your applications?	SAR	Optical	Infrared	Other (specify .....)	

For which application/product?
:……..

Need of altimeter data over.	Coastal ocean	Open ocean	Both	
Do you need altimetry data in several coastal locations?	Yes	No, just one		

Comments/ suggestions:
……
……
……

DATA FORMAT AND DISTRIBUTION						
What data format do you use?	NetCDF	ASCII	Binary	HDF	Other	Other
Current						
Preferred/desired for the new product						
What delivery mode is easier for you?	Upload data directly into your program from remote servers	DVD	FTP	OPeNDAP	Other	Other
Current						
Preferred/desired for the new product						
How often do you need the altimeter dataset to be updated?	daily	weekly	monthly	2 to 4 times per year	following mission cycles	Other
Current						
Preferred/desired for the new product						

REMARKS

Other comments and suggestions:……..……..……..……
……..……
…..……..……..……
……..……..……..……
……..……..……..……
…..……..……..……
……..……..……..……
……..……..……..……
……..……..……..……
……..……..……

THE COASTAL ALTIMETRY SCIENCE WORKING TEAM (COASTALT SWT)

As part of COASTALT, we intend to establish a **Coastal Altimetry Science Working Team (COASTALT SWT)**. The SWT will initially take the form of a simple mailing list but we envisage that we will hold meetings (preferably to coincide with related events such as the Ocean Surface Topography Science Team meetings).

If you are interested in joining the COASTALT SWT please indicate so below:

Your name .....

e-mail .....

Do you want to be added to the COASTALT SWT mailing list?	**YES**	**NO**

Annex: Altimeter products

Parameters that can be measured with altimetry

An altimeter on board a satellite measures the distance (range) between the reflecting surface and the satellite by processing the time delay between emission of the radar pulse and reception of its echo (waveform). The measurements are taken along the ground track, i.e. the projection of the altimeter orbit on the Earth's surface.

When the surface is water, (usually) the derived elevation of the surface is called **Sea Surface Height** (SSH). It is referenced to an ellipsoid and can be deduced from the range measurement by using a positioning system and knowing the orbit of the satellite. SSH is composed of two parts: a variable oceanic part, the Absolute Dynamic Topography (ADT), and a geophysical constant, the Geoid.

The measure of the Geoid at small scale is not known with enough accuracy; therefore the separation of SSH into ADT+ Geoid cannot be done. The SSH is instead decomposed into a mean (time-invariant) component, the Mean Sea Surface (MSS) and a Sea Level Anomaly SLA which takes into account the variation of height around the MSS due to the variability of the ocean dynamics (eddies, fronts, mean sea level change, tides, …).

$$SSH = MSS + SLA = Geoid + ADT$$

The MSS contains then both the Geoid and the permanent part of the ADT called the Mean Dynamic Topography MDT, which is due to the stationary part of the ocean currents. Its knowledge permits to bypass the Geoid to study the ADT of the ocean

$$ADT = MDT + SLA$$

which can then be used to compute absolute geostrophic currents.
Other parameters that can be estimated from the altimeter waveforms are the **significant wave height (SWH),** derived from the slope of the leading edge of the echo waveform, and the normalized radar cross-section **sigma0 (σ^0), which can be directly related to wind speed.**

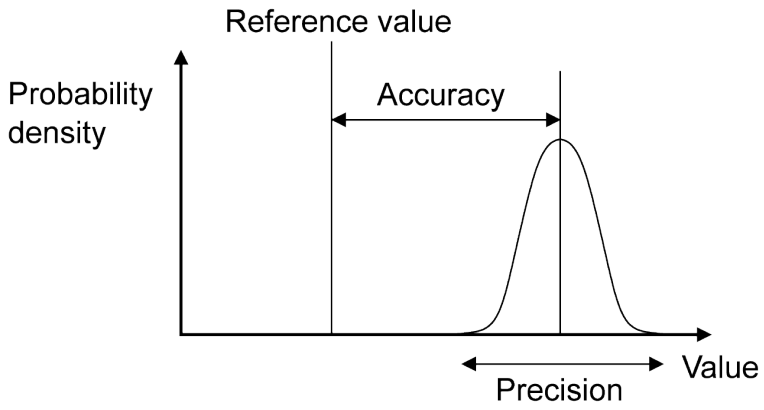
Product levels

Altimeter product levels range from Level 0 to Level 4 data depending on their processing stage:

- Level 0 corresponds to raw data received without any extra processing.
- Level 1 corresponds to positioned and timed raw data.
- Level 2 applies some corrections to level 1 data to rise above the instrumental and geophysical measurement errors (atmospheric perturbations, tides etc...). Level 2 data are given along-track separately for each mission. They are also called Geophysical Data Records (GDR).
- Level 3 data come from a data processing chain including multi-mission calibration and validation (SLA, SSH, ADT).
- Level 4 data refer to gridded products (as opposed to along-track), multi-mission intercalibrated.

A note on *accuracy* and *precision* of altimetric measurements

We assume that the altimeter's measurements are sample values from probabilistic distributions. Then *accuracy* is the relationship between the mean of measurement distribution and its "true" value, whereas *precision*, also called reproducibility or repeatability, refers to the width of the distribution with respect to the mean. The following figure illustrates these concepts graphically:



Different applications may have different requirements in terms of accuracy and/or precision. For instance, the estimation of the rate of global sea level rise from altimetry requires accuracy, but not necessarily precision given the huge numbers of measurements available to compute the mean rate. Instead, studies of El Niño require *both* accuracy (to discriminate the anomalous raised or lowered SSH value with respect to the mean) *and* precision, while the detection of fronts or bathymetric features requires only precision.