

Noveltis NPL

# **Fundamental Data Records For Altimetry (FDR4ALT)**



LEGOS

Lancaster Manual University

Reprocessing of ERS-1, ERS-2 and ENVISAT altimeter and radiometer dataset oriented towards dedicated Level 1 and Level 2P products

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# **Overview of the FDR4ALT project**

In the framework of the European Long Term Data Preservation Program (LTDP+) which aims at generating innovative Earth system data records named Fundamental Data Records (basically level 1 altimeter and radiometer data) and Thematic Data Records (basically level 2+ geophysical products), ESA/ESRIN has launched a reprocessing activity of ERS-1, ERS-2 and ENVISAT altimeter and radiometer dataset. A large consortium of thematic experts has been formed to take in charge these activities which are 1) to define new tailored end-user products including the long, harmonized record of uncertainty-quantified observations, 2) to define the most appropriate and state-ofthe-art level 1 and level 2 processing, 3) to reprocess the whole times series according to the upgraded ground processing and, 4) to validate the different products and provide them to a large community of users focused on the observation of the atmosphere, ocean topography, ocean waves, coastal, hydrology, sea ice, ice sheet regions.



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## Dataset

ILMATIETEEN LAITOS METEOROLOGISKA INSTITUTET FINNISH METEOROLOGICAL INSTITUTE

# Project planning



ERS-1, ERS-2 and ENVISAT Altimeter & Radiometer dataset will be reprocessed in NetCDF format, based on the best state-of-the-art algorithms/corrections with definition and provision of innovative level-1 and level-2P products including uncertainty information at both levels.



### **Phase 1 : Processing selection and products** definition (completed)

Completness analysis

**Dedicated Coastal processing** 

for data close to the shoreline

(< 200km)

- Selection of the algorithms for the FDR & TDP products Definition of a validation plan
- Organisation of the reprocessing facilities

#### Phase 2 : Production and Validation (on-going) ✓ Algorithm implementation in the CLS/CNES core system

- ✓ Massive production of the FDR and TDP for the whole dataset (23 years of data) ✓ FDR and TDP validation
- ✓ Uncertainty characterization

## Surfaces

Ocean (Waves & SLA)	Coastal zones	Ice sheets	Inland Water	Sea ice regions	Atmosphere
		AND THE AR			

The objective is to serve the different communities involved in data exploitation of climate dataset over the different Earth surfaces. Level-2P products will be produced and delivered to the users at the end of the project. Products will be user-friendly, in NetCDF format with a main group containing the main variables of interest, and an expert group with additionnal information.

## First results



(averaged PTR much closer to the ideal sinc) Development of the neuralnetwork classification on ERS echoes : class probability is provided along with the main

+ numerous corrections/improvements of the existing L1B products (ERS REAPER and ENVISAT V3.0)

## ALT FDR



**New PTR averaging** allowing

and second most probable class

to apply the **Adaptive** 

retracker on ENVISAT



Uncertainties associated with each measurement will be available for 3 scales (large scale, mesoscale, short scales)

#### **Ocean & Coastal TDP**







Large reduction of SWH noise level wrt MLE3 20Hz Adaptive 20Hz : still too nois Adaptive + HFA: 10km bump visible especially below 50km thanks to the Adaptive retracker In addition, a method derived from Zaron et al 2019 (Tran (Adaptive + HFA) + EMD: bump removed et al. 2021) enables to remove the high frequency errors but HF signal correlated with SLA noise (Adaptive + HFA).

Combined with a flagging and compression method, the project will distribute SWH estimations (L3 CMEMS compatible) with a better resolution (5Hz vs CCI SeaState 1Hz), less noisy and approaching efficiently the coasts wrt CCI (WHALES) and CCI + EMD. It will enable to better characterize the 10hz bump, related to wave groups in the case of large swells (>200m) (Adaptive + HFA) /+ EMD.

## **Ocean Waves TDP**



Land Ice TDP

Sea-Ice TDP

Uncertainty associated with each measurement

New quality flag based on the waveform shape (neural network waveform classification)

+ Useful information concerning the type of surface based on GLWD3 (Global Lakes and Wetlands Database) and the occurrence of water based on GSWE (Global Surface Water Explorer).

**Inland Waters TDP** 

For more details on the impressive improvements on radiometry (FDR MWR and ATM) TDP), see the poster FUNDAMENTAL DATA RECORDS FOR ALTIMETRY: 20 years of ERS and ENVISAT Microwave Radiometer reprocessed data (IPC2022\_004)

Interested in a test dataset and/or more information ? Don't hesitate to contact Fanny Piras (fpiras@groupcls.com) or Pierre Féménias (pierre.femenias@esa.int) or to visit the FDR4ALT website :



Continued, 31 October > 4 November 2022 enhanced ocean altimetry Venice - Italy **EUMETSAT** opernicus cnes and climate monitoring IDS workshop OSTST meeting from space https://ostst-altimetry-2022.com