

# → ESA ADVANCED OCEAN SYNERGY TRAINING COURSE 2019

4–8 November 2019 | Center of Mediterranean Architecture | Chania, Greece

## Altimetry: before the grids

V. Rosmorduc

05/11/2019

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# How it works

Orbit

Instrument and Instrumental  
Corrections

Environmental  
Corrections

Sea Surface Height (SSH) (wrt an ellipsoid) = Orbit height – Range

$$\text{SSH} = \text{Orbit} - \text{Range} - \sum \text{Corr}$$

Corrections applied:

instrumental

water in the troposphere

electrons in the ionosphere

atmosphere

atmospheric pressure (inverse barometer)

sea state bias (wave crests and troughs)

tides (ocean, solid Earth, pole)

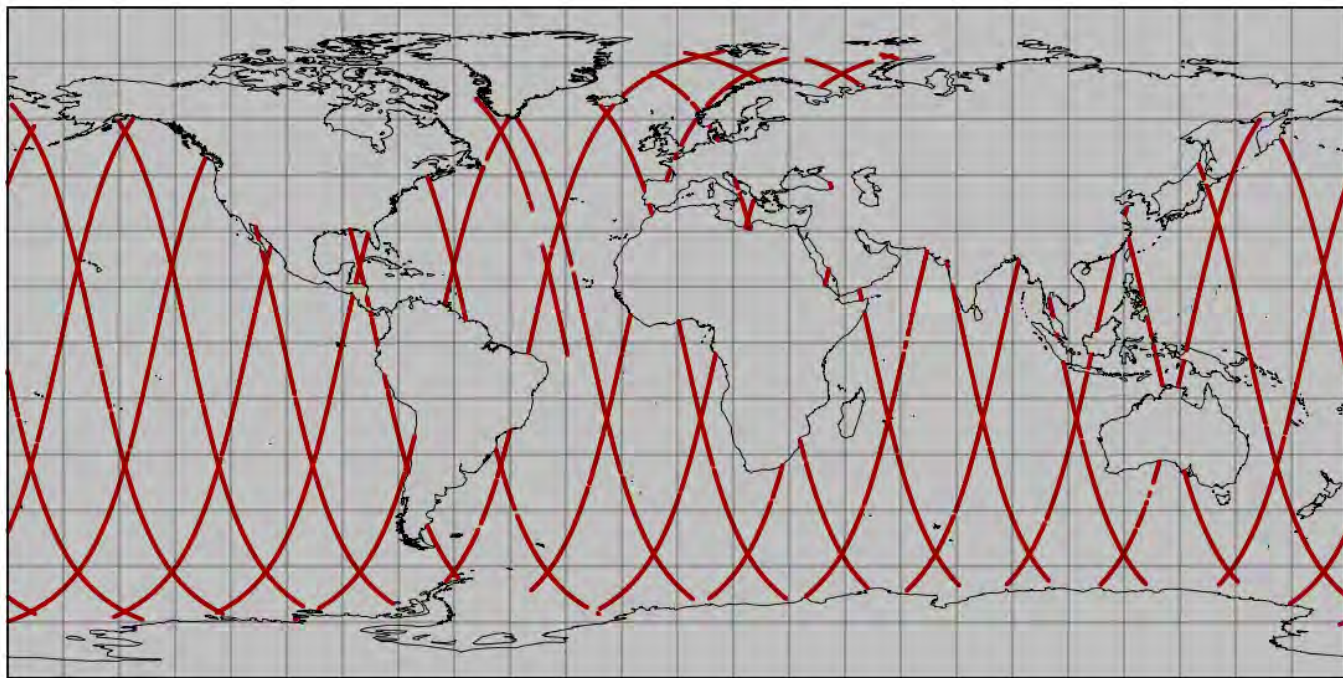
Sea State  
Corrections

Geophysical  
Corrections



# Altimetry is **not** imagery...(for now)

NB. basically altimetry data are “along-track”, i.e. a narrow thread of measurements just beneath the satellite. Don’t expect a 2D-filled plot from Level 2 data (only at “level4”).



*One day of Sentinel3A- altimetry data over ice-free oceans.*

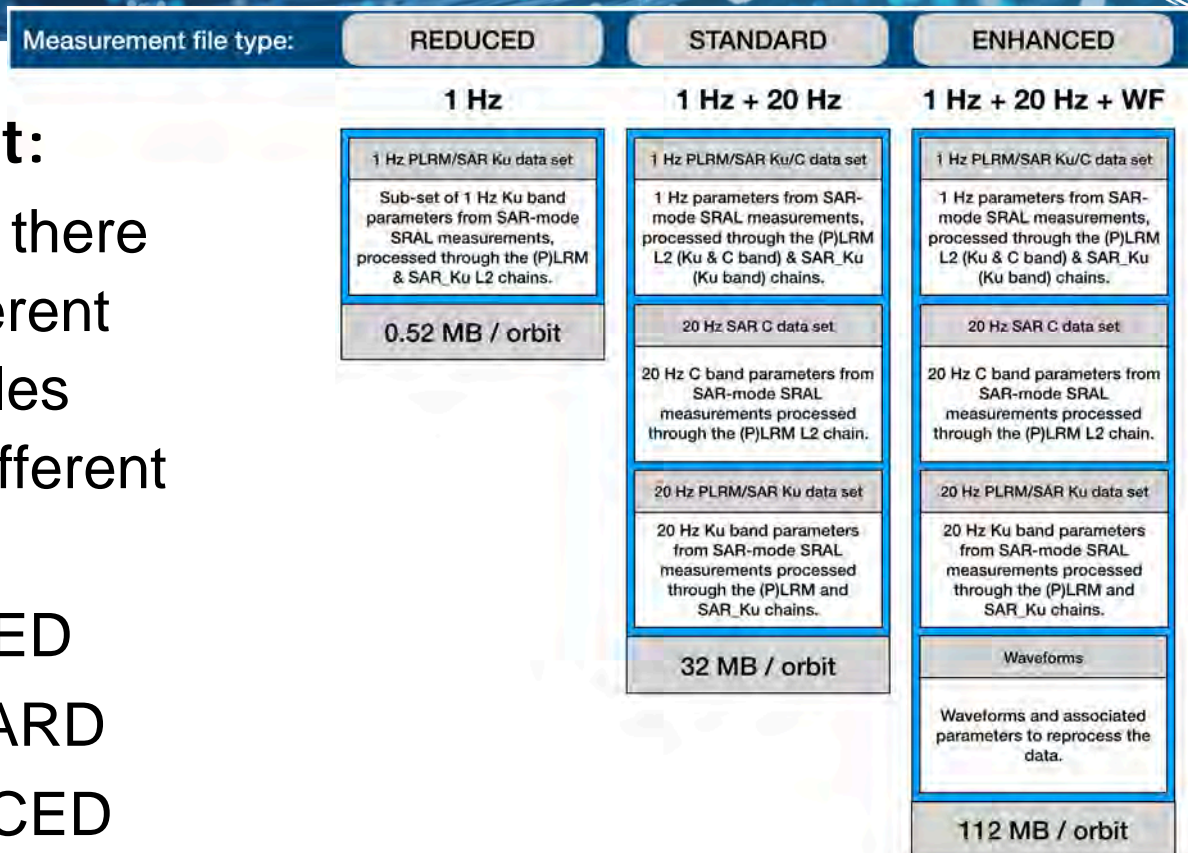
## SAFE Format:

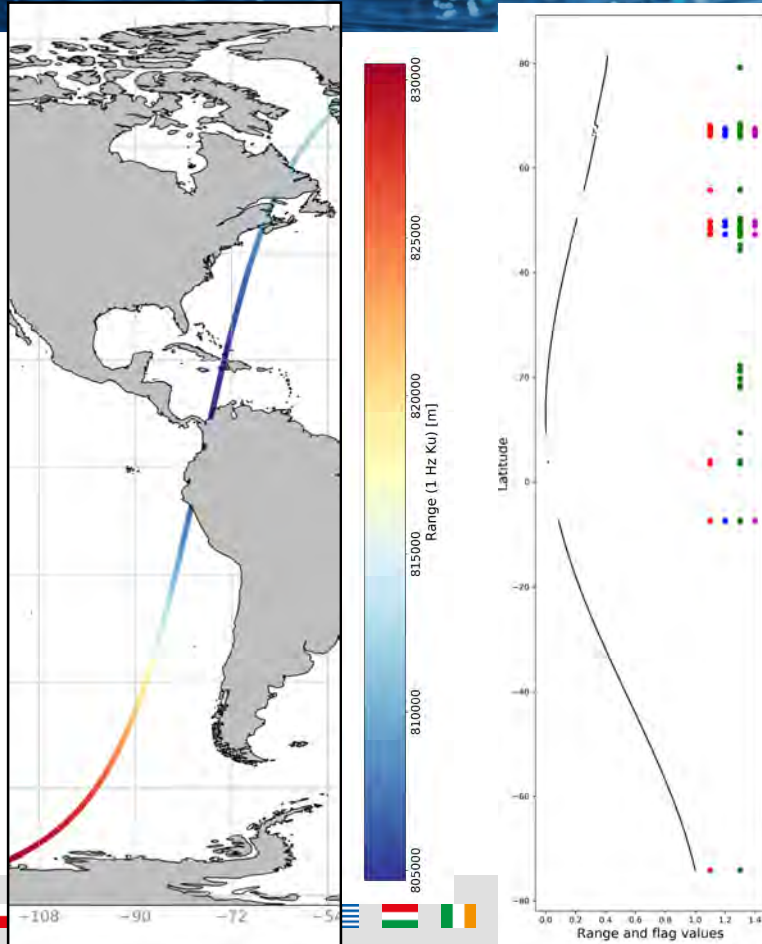
At Level-2, there  
are 3 different  
netCDF files  
contain different  
variables:

REDUCED

STANDARD

ENHANCED

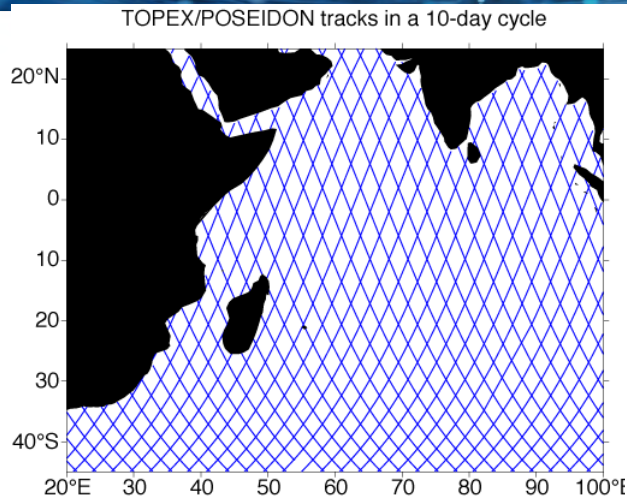




- Level 2 products contain flags for quality values for **range**, **SWH**, **sig0** and **surface classification** at both 1 Hz and 20 Hz.
- Additional flags are available at 1 Hz and 20 Hz for proximity to land, ice presence, rain presence.
- 20 Hz data has yet further flags for identify outliers and 'goodness of fit'.

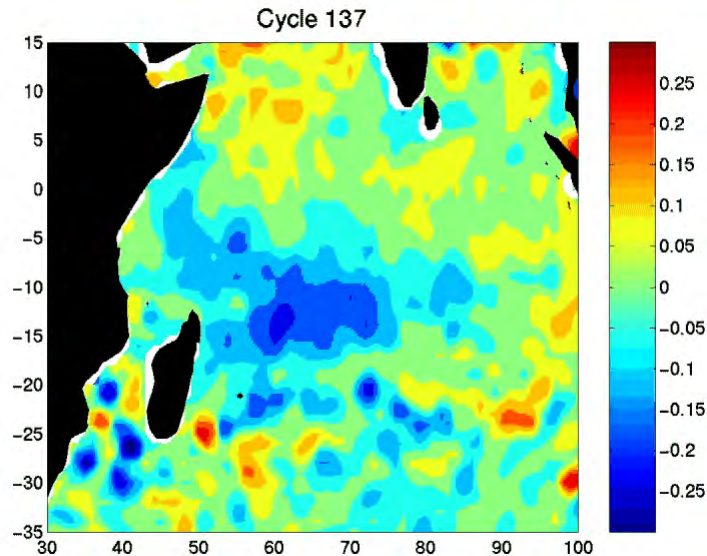


# .and finally from tracks to map



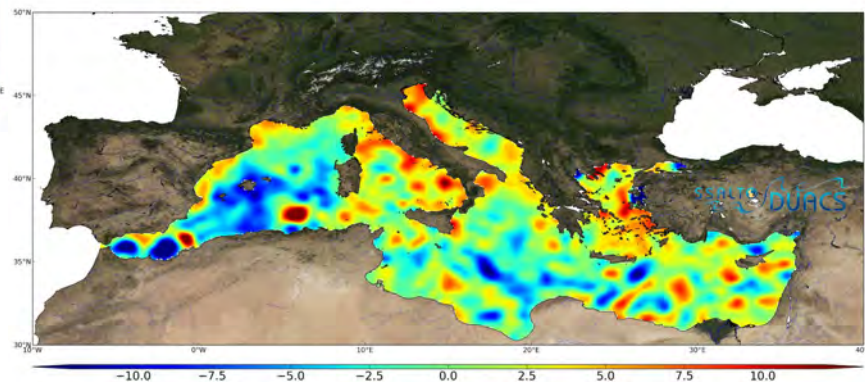
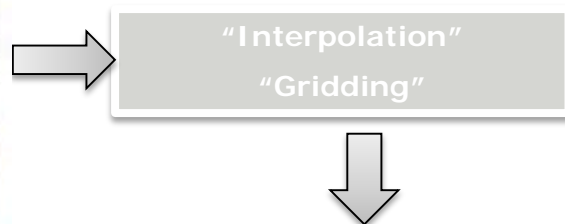
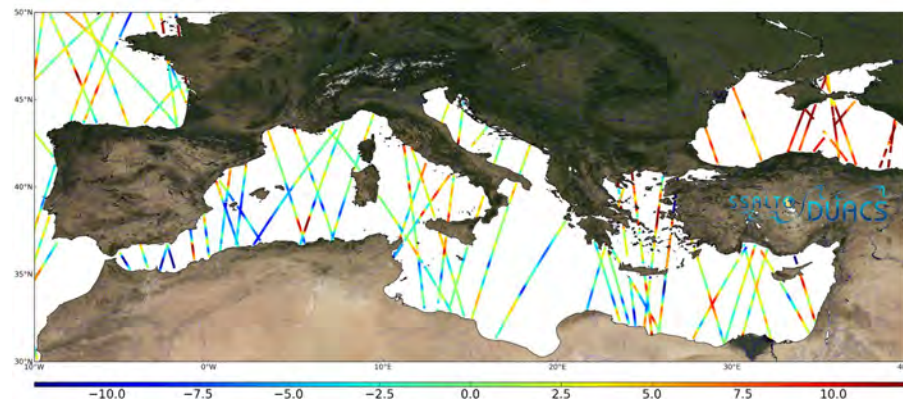
Example of interpolated data  
and data in space and time

“Interpolation”  
“Gridding”



# and finally from tracks to map

Using several satellites:  
Construct a **regular-gridded** data set merging along-track data from different altimetry missions



## Take-home messages

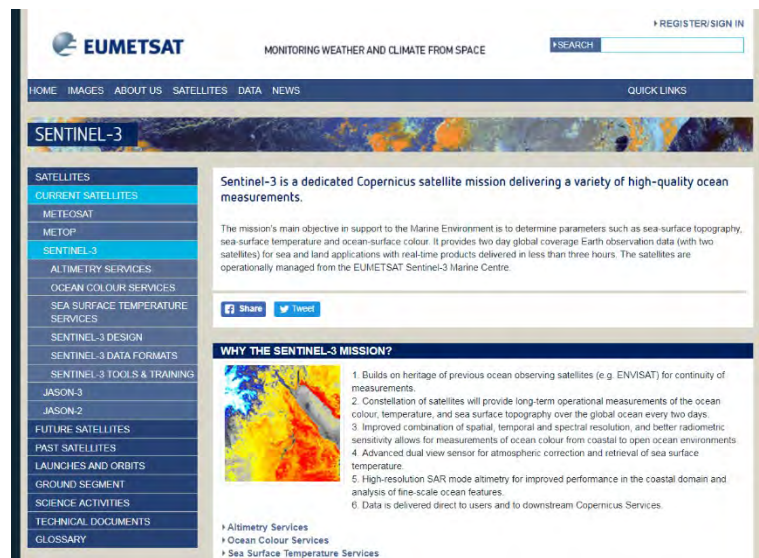


# Getting more information

Detailed information available through the EUMETSAT dedicated Sentinel-3/Jason-3 web pages:

Including:

Product Handbooks  
Algorithm  
Theoretical Basis  
Documents  
Product notices



<https://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Sentinel3/index.html>

<https://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Jason3/index.html>

V. Rosmorduc | CLS for Eumetsat | 5/11/2019 | Slide 9

# How to keep in touch and ask questions



## Training

Attend/send students – <http://training.eumetsat.int>

Collaborate – we want to support other projects.

Contact [Copernicus.Training@eumetsat.int](mailto:Copernicus.Training@eumetsat.int)

## Copernicus Marine User Forum

<http://forums.eumetsat.int/forums/forum/copernicus-marine-calval/>

Questions

Share results/papers/campaigns (case studies)

**Helpdesk** – [ops@eumetsat.int](mailto:ops@eumetsat.int)

**Twitter** – [@eumetsat\\_users](https://twitter.com/eumetsat_users)

## Copernicus Collaborative Exchange:

<https://www.eumetsat.int/website/home/TechnicalBulletins/Training/index.html>

Join the **Sentinel-3 Validation Team** [www.s3vt.org](http://www.s3vt.org)

Lots of information about altimetry at <https://www.aviso.altimetry.fr>

Other altimetry products/contacts in Europe:

CMEMS (<https://marine.copernicus.eu> )

AVISO (<https://www.aviso.altimetry.fr> )

ESA (<http://altimetry.esa.int> )

Radar Altimeter Database (RADS): (<http://rads.tudelft.nl/rads/rads.shtml>)

Ocean Surface Topography Science Team (OSTST)

<https://www.aviso.altimetry.fr/en/user-corner/science-teams/ostst-swt-science-team.html>



# Which level of data should I use?



Questions to ask:

What variable do I need to analyse?

Is standard processing sufficient?

Can I process my own data?

What spatial/temporal scale do I need?

How will merging/averaging/interpolation affect the phenomena I wish to investigate?