Technical Achievements, Data and Recommendations from the COASTALT Project

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COASTAL ALTIMETRY - motivations

Satellite altimetry was designed for open ocean BUT **the coastal region** has enormous socio-economic-strategic importance and **19 years of data over the coastal ocean are still unexploited** - normally flagged as 'bad' in the official products

These data can - and should - be recovered!

There are many possible uses, including: **Sea level**, currents, waves (not only long term studies &climatologies, but also specific events), assimilation into **coastal models** and modelling/prediction of **extreme events/surges**

COASTALT - framework & aims

From 2008 to 2011 the European Space Agency (ESA) has been funding a research and development study, **COASTALT**, led by NOC; this started in coordination with CNES which has funded a parallel study in France, named **PISTACH** and led by CLS

COASTALT has defined, specified and prototyped a new coastal altimetry product for Envisat

This has so far been done for a number of selected Envisat passes over three study regions:

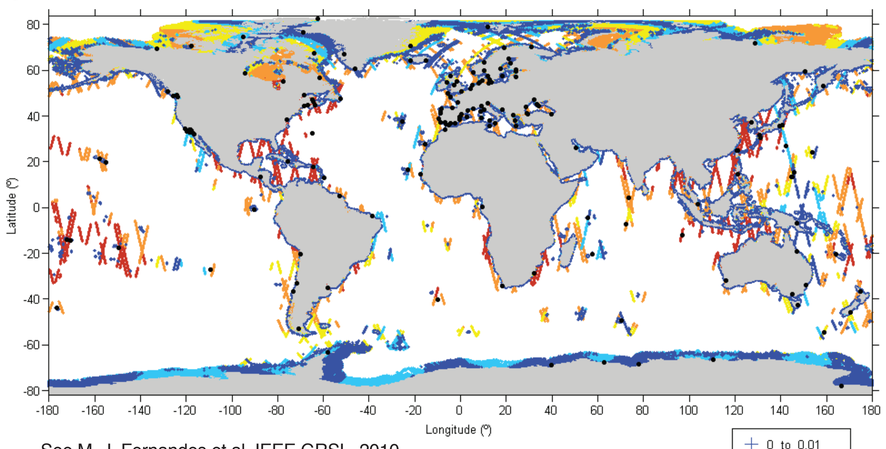
- NW Mediterranean
- West Britain
- Portugal Coast

This poster summarizes the results of the project in terms of **technical improvements and recommendations**

TECHNICAL IMPROVEMENTS

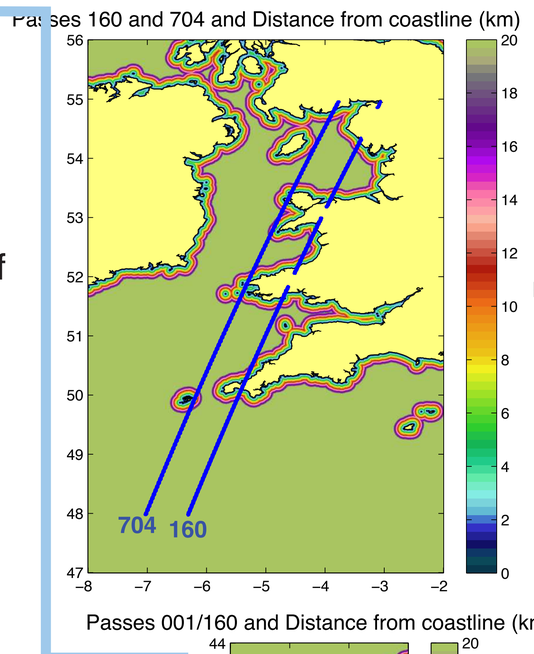
GPD Tropospheric Correction

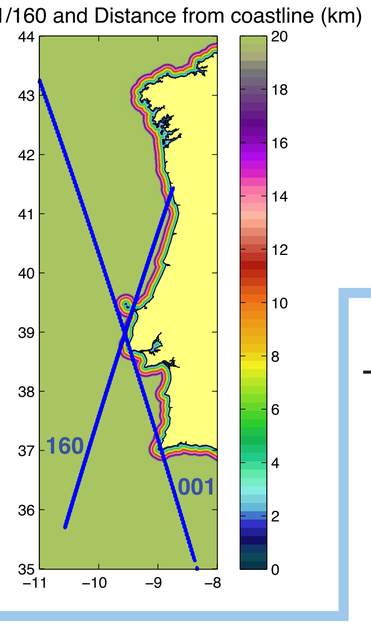
Original contribution to COASTALT by Univ. of Porto. Uses data from GPS stations to provide an estimate of the path delay due to gases ('dry tropo') and water vapour ('wet tropo'). Potentially more accurate than ECMWF model correction and hybrid model/radiometer (DLM) correction, as first results confirm. In COASTALT it has actually been computed for all the Envisat tracks globally, as shown below.

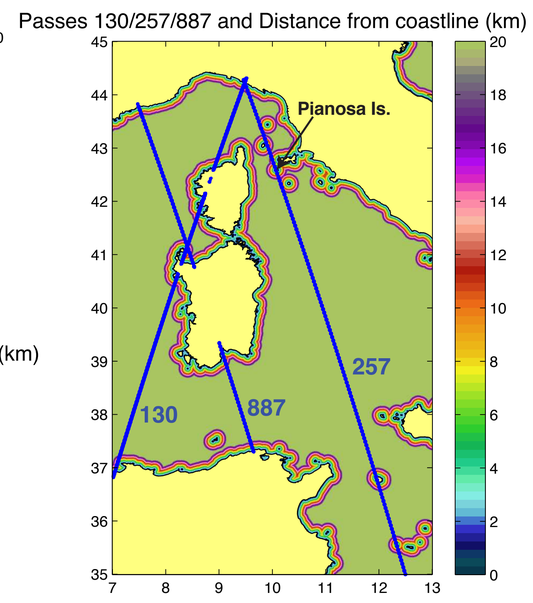


See M. J. Fernandes et al, IEEE GRSL, 2010

GPD correction formal error, in metres, for Envisat cycle 58

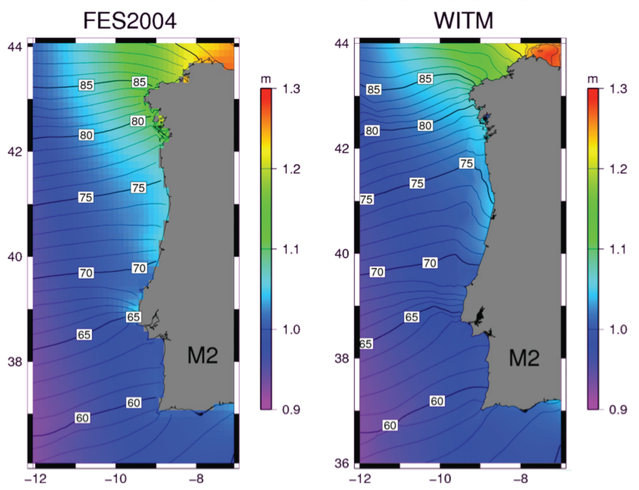


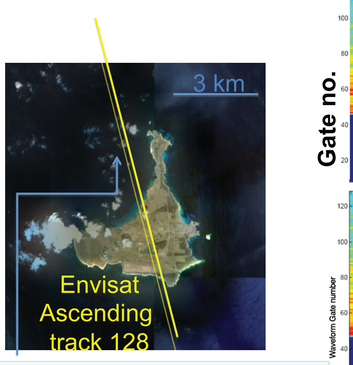




Coastal tidal models

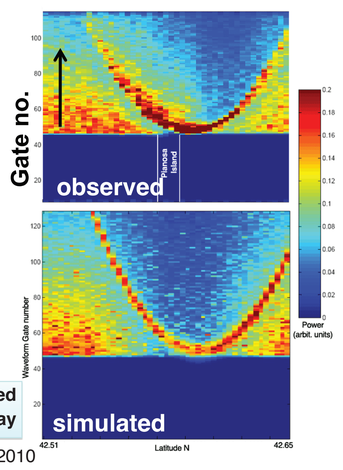
Tides are also a challenge for coastal altimetry, in all those applications where they need to be removed. The figure below shows a comparison of the M2 component in FES2004 vs. the new WITM model developed by CIIMAR and Univ. Porto for COASTALT





In cycle 49, a bright target is observed due to wave sheltering in NW bay

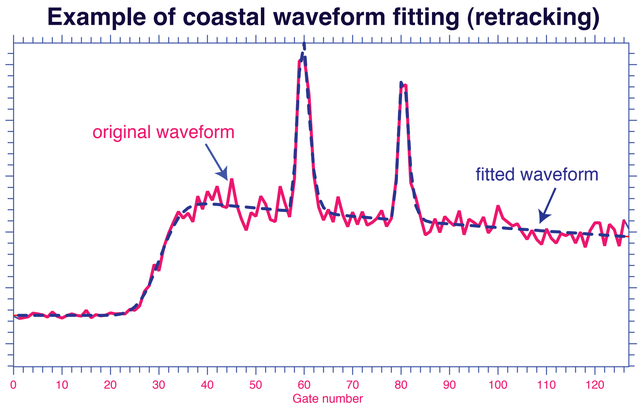
See J. Gómez-Enri et al, IEEE GRSL, 2010



Waveform Retracking

The peculiarities in the radar returns in the coastal zone call for more sophisticated **retracking** (i.e. the fitting of models to the real waveform, which allows the estimation of the altimetric parameters) than the one usually adopted over open ocean and based on the Brown waveform model. On the left, one example of a stack of waveforms (both observed and simulated) around Pianosa Island, and an example of retracking of a waveform with bright echoes from specular targets (like the patch of calm sea causing the hyperbolae in the first example). These techniques are being implemented in the **COASTALT processor** for the generation of improved coastal altimetry data (Coastal Geophysical Data Records or CGDR, in NetCDF format).

Example of coastal waveform fitting (retracking)



RECOMMENDATIONS

1) Further work is needed on the coastal retrackers: improving waveform models, developing new ones, intercalibrating the different existing retrackers.

2) Innovative retrackers (using information from adjacent waveforms) are most promising and need further R&D.

3) Processors must be open, flexible, expandable to facilitate further technical development and uptake of data by users.

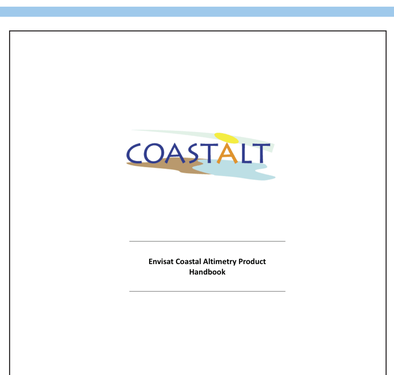
4) Filtering of the various corrections is crucial and needs to be studied further, by investigating correlations scales and data screening techniques.

5) The Sea State Bias (SSB) correction needs a reassessment in the coastal zone.

6) Validation is crucial and should be supported further, by developing consistent validation protocols.

7) The techniques developed should be extended to multiple missions and domains.

8)Applications of coastal altimetry must be supported and encouraged, with easy data access, outreach and demonstration studies.



DATA

The latest reprocessed CGDR data are available from the COASTALT web site.

DOCUMENTATION

COASTALT has also produced a large amount of technical documentation, including a comprehensive handbook on coastal altimetry products, which is available from the COASTALT web site.

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www.coastalt.eu
www.coastalaltimetry.org

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