ON MONITORING THE COASTAL DYNAMICS THROUGH AN INTEGRATED APPROACH (MARINA PROJECT)


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ABSTRACT:
Atmospheric missions in the last 15 years (TOPEX/Poseidon, ERS-1/2, GFO, Jason-1, and ENVISAT) have resulted in great advance in deep ocean research and operational oceanography. Oceanographic applications using satellite altimeter data become very challenging over regions extending from nearshore to continental shelf and slope (Cipollini et al., 2007). Unlike what happens over the deep ocean, intrinsic difficulties in the corrections (e.g., the high frequency ocean response to tidal and atmospheric loading, the mean sea level, etc.) and issues of land contamination in the radar footprint have so far restrained the systematic flagging and rejection of these data. In the prospect of forthcoming altimeter missions (SASSA/ERIKA, SWOT, Sentinel-3, etc.) which in virtue of their design might be better suited for use in the coastal ocean, a number of studies have dealt with the problem of re-analyzing, improving and possibly exploiting the existing archive to monitor coastal dynamics. The early encouraging results (Vignudelli et al., 2005, Bouffard et al., 2008) support the need of continued research in coastal altimetry, with the opportunity of providing inputs and recommendations to future missions.

The MARINA (Margin Integrated Approach) projects aims at mitigating or removing, where possible, the obstacles to promote coastal altimetry to operational status. Here we propose an integrated approach which consists in (i) building a multi-satellite data set optimised for shelves and coastal studies using regional de-aliasing corrections and regional mean sea surface and/or regional geoid models, (ii) exploiting this data set in the context of regional hydrodynamic modelling of shelves and coastal circulation. We will investigate this integrated approach in two coastal systems with remarkable oceanic dynamics, namely the Northwestern Mediterranean Sea (hereafter NWMED) and the Black Sea. A particular emphasis on monitoring coastal currents using radar altimeter data in collaboration with a US team led by J. Wilkin.

INTRODUCTION
Since many years, the core team of the MARINA project has gained strong experience on the topic of coastal altimetry within several national and international collaborations (e.g. the French-Italian ALIBICOCA project, the EU/INTAS-funded ALTCOAST project, the ESA-funded COASTAL initiative, ...). It is actively involved in monitoring of the NWMED. This international team has brought together for its deep acquaintance with the field of hydrodynamic modelling, remote sensing, in situ data processing and coastal oceanography.

MARINA PROJECT TEAM
The Center for Topographic studies of the Oceans and Hydrosphere (CTOH) is a French national observational and expertise service devoted to satellite altimetry studies. The CTOH produces and distributes regional SLA products computed using the X-TRACK processor (Fig.4). Once validated, these coastal-oriented SLA data sets are made freely available through the CTOH website: www.legos.obs-mip.fr/observatories/ctoh/CTOH

DATA DISTRIBUTION
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X-TRACK PROCESSOR

Fig. 1: snapshot of the X-Tracker software interface

OBJECTIVES AND WORK PLAN
There is an increasing consensus that coastal management requires a holistic view, based on better quality and more integrated geospatial and environmental information on which a scientifically sound policy can be built (as suggested by the OCEANS initiative, instead of a sector by sector approach. In the future, an important, international research effort will be made on coastal zones (GHMES and IMBER initiatives) and will aim at developing operational oceanography at regional and coastal scales. As for deep ocean, coastal operational oceanography will be possible only in an integrated approach, merging process-oriented studies, remote-sensed and in situ observing systems, ocean modelling and data assimilation.

In this framework, our research program is intended to pursue two central objectives:
1) to enhance the satellite altimetry coverage and quality in the marginal ocean by using a multi-satellite approach;
2) to exploit satellite altimetry in the context of regional hydrodynamic modelling of shelves and coastal circulation, with focus on the NWMED.

PRELIMINARY RESULTS
10/20Hz data streams have been added to the X-TRACK processor in the prospect of monitoring Kelvin waves and/or western currents, which is not possible with 1Hz data sets at high latitudes where internal Rossby radius is too large.

For instance, in the framework of the MIC4S (Multi sensor Impact assessment in Coastal and Shelf Seas) project (De Mey et al., 2007), retrieving the 10Hz SLA data set from TOPEX/Poseidon processed with the X-TRACK processor permits to reconstruct along track SLA with a significant improvement of the data coverage (Fig.3b) with 1Hz SLA data coverage (Fig.3a). This improved data set should permit to study the dynamics along the Cantabrian slope (Spain), which was not feasible with former classical data sets. In addition, Fig.3c,d reads interesting perspectives regarding the quality of the 20Hz 2Hz SLA along the Cantabrian slope.

REFERENCES
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