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COASTALT Project's contribution to the development and dissemination of coastal altimetry

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Satellite altimeters have been monitoring the global ocean for 20 years, with an excellent degree of accuracy; but in the coastal strip data are normally flagged as bad because of a number of technical problems, and therefore rejected. However this situation is rapidly changing: prompted by the tantalizing prospect of recovering 20 years of data over the coastal ocean, and encouraged by the improved suitability for coastal applications of new and future altimeters (like those on Cryosat-2, AltiKa and Sentinel-3), a lively community of researchers in coastal altimetry has coalesced in the last few years, and is developing techniques to recover useful measurements of sea level and significant wave height in the coastal strip, as well as implementing and promoting new applications. The major space agencies are strongly supporting R&D in this new field with initiatives like ESA's COASTALT (for Envisat) and CNES' PISTACH (for Jason-2). The coastal altimetry community holds regular workshops (see http://www.coastalt.eu/community) where the science and techniques of coastal altimetry are reviewed and various applications are showcased and discussed.

The present contribution revisits briefly the many recent technical improvements that are contributing to the steady progress of this new field and in particular focuses on the results of the COASTALT project, which has recently concluded.

COASTALT has been an excellent incubator of ideas and new techniques for the improvement of coastal altimetry: first of all it has contributed to establish user requirements for this new field, and it has defined detailed product specifications for the new coastal altimetry products and produced the relevant documentation. At the same time COASTALT has tackled the two main areas of improvement for coastal altimetry. These are: 1) retracking, i.e. fitting a waveform model to the waveforms to obtain an estimate of the geophysical parameters: and 2) designing and validating improved coastal corrections for the effects of the atmosphere and/or other geophysical phenomena, like tides.

The main results of COASTALT, as far as retracking is concerned, are the innovative techniques to deal with the waveforms in proximity of the coast, where there are often quasi-specular returns due to stretches of calm water which prevent a successful use of the standard (open-ocean) Brown-model retracker. This issue has been investigated in a number of cases around islands, and a hyperbolic pre-tracker has been suggested as a way to precondition the waveform stack prior to conventional retracking. We will show examples of its application.

In terms of coastal-specific corrections, the main contribution by COASTALT has been the implementation of an innovative scheme for the Wet Tropospheric Correction (i.e. the path delay due to water vapour in the troposphere) based on GPS observations and following pioneering research by the University of Porto. These concepts will be presented in some detail.

An important part of the COASTALT mission has been to facilitate the coming together of the international coastal altimetry community of researchers. This has been achieved via the moderation of the coastal altimetry forum, the direct involvement of COASTALT staff in the organization of the Coastal Altimetry Workshop, and the contribution by various COASTALT authors to the new book on "Coastal Altimetry" published in 2011.

We will conclude this talk by drawing the final recommendations by COASTALT and illustrating some of the possible scientific applications that make coastal altimetry an effort well worth the investments currently being made by ESA and by the research community, like the one to storm surge monitoring within the new

eSurge project. It is fair to wrap-up by saying that with COASTALT, ESA has created an asset that firmly places ESA-funded research in this novel sector clearly at the focus of the international scene.

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