# MEETING

## The Coastal Zone: A Mission Target for Satellite Altimeters

***Summary of the 7th Coastal Altimetry Workshop; Boulder, Colorado, 7–8 October 2013***

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Synthetic aperture radar (SAR) altimetry is rapidly becoming the most efficient way to measure small-scale changes in elevations of ice, land, and water surfaces as well as sea ice thickness. This new generation altimeter, first launched on board the CryoSat-2 satellite, fires 10 times more radar pulses per second than the previous generation and exploits the motion of the spacecraft to achieve a 20-fold increase in along-track resolution and twofold improvement in its accuracy.

SAR altimetry over the oceans is now reaching maturity thanks to the extensive oceanographic use of CryoSat-2, which goes beyond the primary mission objective of cryospheric measurements (see https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/cryosat).

More than 100 scientists working on development and applications of satellite radar altimetry in the coastal zone met recently in Boulder, Colo., for the seventh workshop in the successful Coastal Altimetry series. In addition to reviewing the technical issues for conventional pulse-limited altimetry, the workshop aimed to explore the coastal capabilities of CryoSat-2 SAR altimetry and of new and forthcoming satellite missions (including HY-2, SARAL/AltiKa, and Sentinel-3). Several applications of coastal altimetry data, alone or in combination with other data and models, were also showcased.

The results presented at the workshop confirmed the continuing improvements in modeling and retracking radar altimetric echoes (waveforms) and in corrections (especially for water vapor path delay) in the coastal zone. These improvements in some cases feed back with beneficial effects onto open ocean altimetry processing.

AltiKa, the new Ka band (~35.8 gigahertz) radar altimeter on board the SARAL mission, features reduced range and significant wave height noise and finer spatial resolution compared with traditional Ku band (~13.5 gigahertz) altimeters and therefore promises a significant refinement of coastal altimetry when matched with improved corrections. The increased sensitivity of the Ka band to rain, which was feared could cause a significant undersampling of the tropical regions and negatively affect climate applications of AltiKa, appears to be much less of a problem than expected, mainly by virtue of the excellent radiometric performance of the instrument.

Reprocessed coastal altimetry data are now available from multiple sources and projects (e.g., the Center for Topographic Studies of the Ocean and Hydrosphere (CTOH), the Prototype Innovant de Système de Traitement pour les Applications Côtières et l'Hydrologie (PISTACH) project, the Prototype for Expertise on AltiKa for Coastal Hydrology and Ice (PEACHI) project, the European Space Agency (ESA) Coastal Altimetry (COASTALT) project, and the Storm Surge (eSurge) project). Many diverse applications benefiting from these data were presented, for instance, the use of altimetry in support of storm surge research and modeling. In an example, the storm surge from Hurricane Sandy was captured on 29 October 2012 by the Chinese HY-2 altimeter, providing an offshore-to-coast profile of the raised water level due to a storm (J. Lillibridge et al., Hurricane Sandy storm surge measured by satellite altimetry, *Oceanography, 26*(2), 8–9, http://dx.doi.org/10.5670/oceanog.2013.18, 2013), which is of great potential value to modelers.

The continuous improvements in the discipline encourage scientists to incorporate coastal altimetry data into their studies, and applications such as those in coastal dynamics and coastal sea level are maturing. The future of coastal altimetry looks even rosier with the prospect of operational SAR altimetry coverage of the entire ocean from Sentinel-3A and Sentinel-3B satellites, built by ESA, due for launch in 2015. This calls also for an extensive intercalibration of the new SAR altimetry data with data from the pulse-limited altimeters in the Ku and Ka bands.

The workshop was supported by ESA, NASA, the U.S. National Oceanic and Atmospheric Administration, and Centre National d'Études Spatiales (the French Space Agency) and was held in conjunction with the Ocean Surface Topography Science Team meeting, where coastal altimetry has been recognized as a mature future altimetry mission objective. The 8th Coastal Altimetry Workshop will be in southern Germany on 23–24 October 2014. More information on the workshop is available at http://www.coastalt.eu/community.

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