Challenges and Opportunities for Coastal Altimetry

10th Coastal Altimetry Workshop; Florence, Italy, 21–24 February 2017

Farmers harvest seaweed on the Zanzibar coast of Tanzania. Coastal altimetry can supply information on sea level and tides that is useful to seaweed farmers and others who rely on coastal resources, complementing other observing systems, especially along stretches of the world's coast that are poorly instrumented. Credit: imke.stahlmann, CC BY-SA 2.0

By Stefano Vignudelli, Jérôme Benveniste, and Paolo Cipollini 6 July 2017

Satellite altimetry—long established as an essential tool for open-ocean oceanography and sea level studies—is now also supporting diverse applications in the coastal zone. These applications include monitoring storm surges and mapping coastal dynamics, wind, and waves, information that can be assimilated in coastal models.

Advances in data processing, combined with technological progress such as the advent of synthetic aperture radar (SAR (http://esaconferencebureau.com/2017-events/17c07/sar-altimetry-training-presentations)) altimetry from CryoSat-2 (https://eos.org/articles/arctic-sea-ice-extent-may-shrink-below-2012-record-low) and Sentinel-3 (https://eos.org/profiles/sentinel-satellites-initiate-new-era-earth-observation), have yielded more-accurate retrievals of sea level, wave height, and wind speed in the coastal zone. This improved accuracy showcases the importance of satellite SAR altimetry.

The 10th edition of the Coastal Altimetry Workshop (http://www.coastalaltimetry.org) series was organized by the European Space Agency (ESA) with additional support from 10 other institutions. This workshop brought together nearly 120 scientists from 28 countries. A SAR altimetry training course (http://esaconferencebureau.com/2017-events/17c07/sar-altimetry-training-presentations) for students and young researchers (also organized by ESA) took place in parallel in Florence.

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Topics discussed at the workshop involved the ongoing technical developments in coastal altimetry. Speakers highlighted improvements in processing radar waveforms, which are complemented by advances in corrections for atmospheric and geophysical effects. In addition, several dedicated coastal altimetry data sets (http://www.coastalt.eu/community) are now being produced. Workshop participants agreed that their use leads to a better understanding of the coastal ocean dynamics, including coastal sea level variations and coastal currents (https://eos.org/project-updates/coastal-observations-from-a-new-vantage-point).

Integrating (https://eos.org/features/global-risks-and-research-priorities-for-coastal-subsidence) coastal altimetry with in situ observations and models was a central topic at the workshop, and it remains crucial (https://eos.org/opinions/why-we-must-tie-satellite-positioning-to-tide-gauge-data) for the foreseeable future. Participants found especially interesting how new scenarios for remote, cloud-based computing—where customized on-demand processing is spread across nodes in a way that is transparent to the user—could help with this integration. Talks highlighted new projects that provide users with environments to merge different data sets (https://eos.org/project-updates/a-weather-eye-on-coastal-winds), to develop and validate new applications, and to share these applications (https://eos.org/features/sargassum-watch-warns-of-incoming-seaweed) with other users.

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Several recommendations arose from the workshop. In particular, attendees called for high-resolution along-track or gridded products to be made more accessible to nonexperts, with well-documented manuals in user-oriented formats. Further research is needed to quantify the improvements in knowledge of the mean sea surface (http://www.altimetry.info/radar-altimetry-tutorial/data-flow/data-processing/reference-surfaces/mean-sea-surface/) shape, of mean dynamic topography, (http://www.space.dtu.dk/english/Research/Scientific_data_and_models/Global_Mean_Dynamic_topography) and of scales of variability smaller than 100 kilometers. All of these factors are now seen in great detail by the new coastal altimetry data sets, even over the open ocean.

Participants also identified another knowledge gap: High-resolution (1-kilometer scale) local tide and storm surge models need bathymetry at the same level of resolution. This relates back to the accuracy of the coastal altimetry data if the model outputs are used as corrections for the sea level measurement. Finally, participants identified user-friendly data access and relevant user formation as being central to further developing robust data sets for coastal altimetry.

A comprehensive workshop report and all of the presentations and posters from the Coastal Altimetry series are available online (http://www.coastalt.eu/community).

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Citation: Vignudelli, S., J. Benveniste, and P. Cipollini (2017), Challenges and opportunities for coastal altimetry, *Eos, 98,* https://doi.org/10.1029/2017EO076805. Published on 06 July 2017.