EGU21-8942, updated on 17 Oct 2021
https://doi.org/10.5194/egusphere-egu21-8942
EGU General Assembly 2021

Improved SAR Altimetry Techniques in Coastal Island Areas

Nikos Flokos and Maria Tsakiri
National Technical University of Athens, Survey Engineering, Geodesy, Athens, Greece (nikflokos@mail.ntua.gr)

Improved SAR Altimetry Techniques in Coastal Island Areas

Synthetic Aperture Radar (SAR) Altimetry has made a remarkable progress over the past years. Advances in data processing, combined with technological progress such as the advent of new Altimetry satellites (Sentinel 3A,3B,6, SWOT etc.) increased the accuracy of the retrieved geophysical parameters (i.e., Sea Level Anomaly, Significant Wave Height and Wind Speed) in coastal zones within several hundred meters from the coastline.

The improvement in the estimation of the geophysical parameters using SAR Altimetry has been reported by many researchers. The improved accuracy is obtained through the development of new SAR Altimetry retracking algorithms in several research and development projects (i.e., SAR Altimetry Mode Studies and Applications-SAMOSA). Similar to Low Resolution Mode (LRM) Altimetry, the requirement of specialized retrackers for SAR waveforms is vital in improving the estimated ocean parameters. The waveform retracking is a postprocessing protocol to convert waveforms into scientific parameters of power amplitude (related to wind speed), range (related to sea level), and slope of leading edge (related to SWH) that characterize the observed scene (Idris et al., 2021).

However, several issues remain open. Close to the coastline, SAR altimeter simultaneously views scattering surfaces of both water and land producing complicated waveform patterns therefore a huge range of waveform shapes is observed. This complexity poses a real challenge to today's approach to retrack waveform.

The combination of different retracking algorithms is essential for dealing with this high diversity of altimetric waveform patterns since there is no single retracker that can retrack all of them. However, this raises two significant issues. The first is regarding to the selection of the optimal retracker under various conditions. The lack of a clear guideline on the selection criteria of the optimal retracker limits the use of this combining method. The second is how to reduce the offset caused by switching retrackers, as it results in relative offsets in altimeter-derived SLAs. This offset is partly caused by the retracking method itself, in which the fitting algorithms are affected by noise in the trailing edge due to the SWHs variability (Idris et al., 2018).

Due to the issues in coastal Altimetry data the focus of this work is:

- 1) To improve the sea measurements from the SAR Altimetry missions by developing a new

retracking algorithm taking advantage artificial intelligence and machine learning technologies.

- 2) To further investigate the assessment of the offset between various retrackers and the use of a neural network for reducing the offset in the retracked SLAs by including information about SWH.

- 3) To validate the altimeter derived SLAs by performing tests and comparisons with data from many island coastal areas worldwide.

Also, this work aims to improve the Sea State Bias corrections (SSB), which is currently one of the range corrections with the largest uncertainty in the coastal zone (Vignudelli et al., 2019), by providing more accurate sea measurements near the coast.