Sentinel-3 retracker implementation for coastal zones

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As it is well known, one of the most important issues in coastal altimetry is the effect of land contamination. As the altimeter approaches the coast, radar echoes from the altimeter are likely to impinge on the coastline. In that case, if the land surface scattering is much higher than the one of the ocean, such as in the case of wet and flat terrain, a strong coherent component from these areas can highly distort the ocean-like waveform shape on which retrackers are designed to work. Hence, the combination of the effects of several scatters with different backscattering intensities on the surface can lead to random waveform variations, which inhibits conventional retracking techniques from retrieving accurate geophysical parameters.

In SAR mode altimetry, the shrinking of the radar footprint allows to reduce the land contamination effect, expecting to obtain measurements of SSH, SWH, and WS close to the shore (several hundred meters). Hence, previous studies have already shown the capabilities of a delay-Doppler Altimeter to obtain useful radar echoes at a distance about 300 m from the coast [1].

However, in a delay-Doppler altimeter the resolution improvement occurs only on the along-track direction, while the across-track direction remains pulse-limited. Thus, the DDA’s response in coastal regions depends on the relative orientation between the coastline and the spacecraft orbital plane.

Here, is proposed an algorithm to disregard the range bins of the SAR waveform, which are likely to be affected by land contamination. This is achieved by geo-locating the delay and Doppler pairs of the SAR altimeter stack, obtaining a 2D map of the surface backscattering response. From it, it is possible to identify the SAR waveform range bins that are potentially affected by land contamination, and then a mask is applied above these points. Hence, this algorithm allows to determine which of the range gates of the SAR waveform, can be used reliably in the retracking without land contamination.

Once the contaminated bins have been identified and masked, the multilook is applied to the non-corrupted data, and then the SAR retracking algorithm is applied. Previous work done for Cryosat-2 will be taken into account and adapted to Sentinel-3, where some aspects as the validity of this approach (as the altimeter approaches the coast, more waveform range gates are susceptible to have land contamination, and therefore to be discarded for the later retracking process), will be considered.

Preliminary results obtained, and main advances in this topic will be presented at the conference.

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