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The production of HR Water Masks with Sentinel-1, their verification with Sentinel-2 images and their use in Sentinel-3 Alti-Hydrology

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This work tests and refines some pixel-based water mapping algorithms for Sentinel-1 SAR images. Updated High Resolution water masks are needed to produce a water fraction field as an auxiliary data to Sentinel-3 SRAL products. The objective is to 1. help better characterise Sentinel-3 SAR waveforms, 2. help analyse SAR retrackers performances, 3. help alti-hydrology processing chain in many aspects among which the rejection of spurious signals during the production of water levels over rivers and lakes (low water fraction associated to an outlier measurement).

The Sentinel-1 water extraction algorithms are described. Sensitive aspects like shadowing in mountainous regions are addressed (shadow in radar images could easily be classified as water). To validate the results, the outputs of these algorithms are then compared with a 10m resolution water index derived from Sentinel-2 images. The best water mask is finally used to produce Water Fractions within the Sentinel-3 footprints of collocated and tightly codated Sentinel-3 SRAL acquisitions. The results are illustrated on difficult cases such as those found along the Brahmaputra river.

This work, performed under ESA/SEOM SHAPE contract #4000115205/15/I-BG, not only highlights the great synergy potential of the Sentinel-1, 2 and 3 missions to improve the inland water SAR altimetry processing, but also opens up the door to improvements in SAR alti-hydrology. It could be replicated to LRM altimetry missions and the concomitant imagers as well. Improving Water Level time series will permit assimilation into models such as HYPE to produce improved Water Discharge. This is one of the main objectives of the SHAPE project.