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## Improved Retrieval Methods for Sentinel-3 SAR Altimetry over Coastal and Open Ocean and recommendations for implementation: ESA SCOOP Project Results

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SCOOP (SAR Altimetry Coastal & Open Ocean Performance) is a project funded under the ESA SEOM (Scientific Exploitation of Operational Missions) Programme Element, to characterise the expected performance of Sentinel-3 SRAL SAR mode altimeter products, and then to develop and evaluate enhancements to the baseline processing scheme in terms of improvements to ocean measurements. Another objective is to develop and evaluate an improved Wet Troposphere correction for Sentinel-3.

The SCOOP studies are based on two 2-year test data sets derived from CryoSat-2 FBR data, produced for 10 regions. The first Test Data Set was processed with algorithms equivalent to the Sentinel-3 baseline, and the second with algorithms expected to provide an improved performance.

We present results from the SCOOP project that demonstrate the excellent performance of SRAL at the coast in terms of measurement precision, with noise in Sea Surface Height 20Hz measurements of less than 5cm to within 5km of the coast.

We then report the development and testing of new processing approaches designed to improve performance, including, for L1B to L2:

- Application of zero-padding
- Application of intra-burst Hamming windowing
- Exact beam forming in the azimuthal direction
- Restriction of stack processing to within a specified range of look angles.
- Along-track antenna compensation

And for L1B to L2

- Application of alternative re-trackers for SAR and RDSAR.

Based on the results of this assessment, a second test data set was generated and we present an assessment of the performance of this second Test Data Set generated, and compare it to that of the original Test Data Set.

Regarding the WTC for Sentinel-3A, the correction from the on-board MWR has been assessed by means of comparison with independent data sets such as the GPM Microwave Imager (GMI), Jason-2, Jason-3 and Global Navigation Satellite Systems (GNSS) derived WTC at coastal stations. GNSS-derived path Delay Plus (GPD+) corrections have been derived for S3A. Results indicate good overall performance of S3A MWR and GPD+ WTC improvements over MWR-derived WTC, particularly in coastal and polar regions.

Based on the outcomes of this study we provide recommendations for improving SAR mode altimeter processing and priorities for future research.