Towards Operational SAR Imaging Geodesy: An Extended Time Annotation Dataset for Sentinel-1 Image Products

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Abstract

The SAR missions TerraSAR-X and Sentinel-1 are known for their excellent geolocation capabilities at the centimeter level. Several studies have confirmed that sub-pixel SAR image analysis allow the retrieval of range and azimuth coordinates of well-defined point targets down to 1-2 cm when applying a meticulous end-to-end modelling of the SAR system. This modelling requires the usage of precise orbit data, the computation of spatiotemporal corrections for atmospheric path delay and solid Earth tidal deformation, as well as the removal of the residual artefacts stemming from the approximations used in SAR image processing. Therefore, making use of the accurate sub-pixel geolocation ability of SAR is not readily possible for all users.

In order to support the users of Sentinel-1 data in exploiting accurate geolocation for the large amount of imagery acquired by Sentinel-1, ESA has commissioned DLR to develop an operational processing system to generate a dedicated time annotation product for each Sentinel-1 TOPS and stripmap data take. The product will provide gridded slant range and azimuth time corrections for the atmospheric slant path delay and the solid Earth tidal deformations as well as for the systematic effects introduced by the Sentinel-1 SAR processor.

The operational computation of such annotations for each Sentinel-1 acquisition requires robust methods that are globally applicable and allow high computational throughput to keep up with the data flow generated by the Sentinel-1 mission. The presentation will give insight into the methods being currently developed at DLR to meet these demands and show an outlook on what will become possible when applying this new Sentinel-1 Extended Time Annotation Dataset.