Geophysical Research Abstracts
Vol. 20, EGU2018-12419, 2018
EGU General Assembly 2018


# An inter-agency comparison of non-gravitational force modeling for Sentinel-3A

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One of the main objectives of the Sentinel-3 ESA Earth Observation Mission, jointly operated by ESA and EUMETSAT, is to measure sea surface topography in the frame of the Copernicus ocean and land observation services. It consists of the two satellites Sentinel-3A (launched on February 16, 2016) and -3B (expected launch in April 2018) in sun-synchronous, near-polar orbits at an altitude of around 815 km. Altimetry measurements are conducted with a SAR radar altimeter and require the knowledge of precise and accurate satellite orbits.

The Sentinel-3 precise orbit determination (POD) relies on data tracked by the on-board geodetic-grade dual-frequency GPS receiver and the DORIS instrument. A laser retroreflector array allows the validation of the orbits by means of Satellite Laser Ranging (SLR). Within the Copernicus POD Quality Working Group (QWG) precise orbits from different agencies are routinely compared for validation purposes. All members of the QWG employ a reduced-dynamic POD scheme, involving models for gravitational and non-gravitational forces, as well as empirical and/or pseudo-stochastic orbit parameters to absorb modeling deficiencies.

The great demands on Sentinel-3 orbit accuracy require that empirical and pseudo-stochastic orbit parameters should be used with utmost care as they might degrade the radial orbit leveling, directly affecting the derived altimetry measurements. This implies especially the need for sophisticated and detailed models of non-gravitational forces, including aerodynamic accelerations, solar radiation pressure and Earth radiation pressure. In this presentation the non-gravitational modeling details of different QWG members are compared for Sentinel-3A. Besides a direct comparison of the modeled accelerations, the impact on POD is analyzed by comparing empirical orbit parameters and by means of SLR.