UNIVERSITÄT BERN

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Bachelor Thesis

Optimum Field of View Settings for Sentinel-3A GPS Tracking

MOTIVATION

The Sentinel-3A satellite, ESA's third satellite of a fleet of Earth observation satellites belonging to Europe's Copernicus programme, was launched on February 17, 2016 into a sun-synchronous orbit. It is equipped with an 8-channel, dual-frequency Global Positioning System (GPS) receiver used for precise orbit determination (POD) and geolocation of the radar instrument to measure the sea surface as well as the thickness of sea ice. These measurements will be used to, e.g., monitor changes in the sea level. Sentinel-3A precise orbit solutions are computed by the Astronomical Institute of the University of Bern (AIUB) during the entire mission in the frame of ESA's Sentinel POD Quality Working Group (QWG). Sentinel-3A POD has to be performed with highest accuracy demands since any orbital errors directly propagate into the measured sea surface heights. In the frame of ESA's Sentinel POD Quality Working group it is currently discussed whether the performance of the POD could be improved by either enlarging or reducing the field of view settings of the Sentinel-3A GPS antenna.

BESCHREIBUNG

- In this Bachelor thesis a closed-loop simulation shall be performed to simulate GPS data of the Sentinal-3A antenna and to perform reduced-dynamic and kinematic POD of the Sentinel-3A satellite. Use can be made of existing programs of the Bernese GNSS Software for both simulation and POD of low Earth orbiting (LEO) satellites.
- A larger field of view, i.e. the adoption of a lower elevation cut-off angle for the GPS measurements, results in general in more GPS data on the one hand. On the other hand the availability of only 8 channels tends to cause that raising GPS satellites are started being tracked by the on-board receiver at relatively high elevations only, yielding an inhomogeneous distribution of the GPS satellites in the sky. Based on real GPS tracking data of the Sentinel-3A and the Swarm satellites (both having implemented different field of view settings), realistic simulation scenarios shall be developed to assess different settings on the performance of Sentinel-3A reduced-dynamic and kinematic POD and to find the optimum values for this mission.

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