

Swarm GPS Receiver Performance under the Influence of Ionospheric Scintillation

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The Swarm mission launched on 22 November 2013 is ESA's first constellation of satellites to study the dynamics of the Earth's magnetic field and its interaction with the Earth system. This mission consists of three identical satellites in near-polar orbits, two flying almost side-by-side at an initial altitude of 460 km, the third flying in a higher orbit of about 530 km. Each satellite is equipped with a high precision 8-channels dual-frequency receiver for the precise orbit determination, which is also the essential fundament in order to take full advantage of the data information provided by this constellation, e.g. for the recovery of gravity field. The quality of the final orbit determination depends on the observation data from the receivers.

In this contribution, we will analyze the performance of the Swarm on-board receivers, especially under the influence of ionospheric scintillation caused by ionospheric irregularities. This is a prerequisite for high quality satellite positioning as well as a sound study of the ionosphere. Ionospheric scintillation can lead to the phase disturbances, cycle slips or even loss of signal tracking. The RINEX observation data from Swarm Level 1b products are used to analyze the Swarm receiver performance. We will demonstrate the signal strength, code and phase noise, different linear combinations (geometry free, ionosphere free), as well as GDOP values for the 3 Swarm satellites. The first results show that the observation data are severely disturbed and the signals could be lost around the geomagnetic equator and geomagnetic poles where the ionosphere is active. The results also show that the receivers are more stable in those areas after the update in October 2015.