Geophysical Research Abstracts
Vol. 18, EGU2016-14825, 2016
EGU General Assembly 2016

Impact of the ionosphere on GPS-based precise orbit determination of Low Earth Orbiters

Daniel Arnold, Adrian Jäggi, Ulrich Meyer, and Gerhard Beutler
Universität Bern, Astronomisches Institut, Bern, Switzerland (daniel.arnold@aiub.unibe.ch)

GPS-derived kinematic precise Swarm orbits are significantly affected by increased position noise over the geomagnetic poles and spurious signatures along the geomagnetic equator. The latter deficiencies were identified for the first time for the Gravity Field and Steady-State Ocean Circulation Explorer (GOCE) mission and are attributed to the distortion of the GPS carrier signal when propagating through portions of the Earth's ionosphere with a large free electron content. Via the GPS-derived kinematic Swarm positions, the spurious signatures along the geomagnetic equator map directly into the derived gravity fields. This was already the case for GOCE and obviously is also true for Swarm.

To identify the root cause of the problem, the stochastic and deterministic behavior of the ionosphere is characterized by analyzing data collected by the GPS receivers on various LEO satellites. We compare in particular the performance of the Swarm and the GRACE receivers, because no obvious degradations occur in GRACE orbit and gravity field solutions.

Removing GPS data with large ionospheric variations mitigates the ionosphere-induced artifacts in orbits and gravity fields. We illustrate the impact of this measure on the Swarm orbit and gravity field solutions. Making use of the geographically resolved ionosphere characteristics, e.g., to establish better data weighting schemes, results in a better POD performance for LEO satellites.