Geophysical Research Abstracts
Vol. 13, EGU2011-3878-1, 2011
EGU General Assembly 2011

Improving Real-Time GNSS Satellite Orbit Determination with Data from Low Earth Orbiting Satellites

Hongzheng Cui (1,2), Maorong Ge (2), Chao Han (1), and Jens Wickert (2)

(1) School of Astronautics, Beijing University of Aeronautics and Astronautics, 100191 Beijing, China (h.z.cui@hotmail.com), (2) German Research Center for Geosciences (GFZ Potsdam), Potsdam, Germany

Nowadays, most of the IGS (International GNSS Service) Analysis Centers estimate precise orbits and clocks of GNSS satellites by making use of data from a global ground reference network. Usually, precise orbits of Low Earth Orbiting (LEO) satellites are determined with fixed orbits and clocks of the GNSS satellites. It was demonstrated that the integrated adjustment of LEO and GNSS data provides better orbit results for LEO and GNSS satellites. The improvement is better visible with increasing number of LEO satellites included in the data analysis.

In this study, we investigate the contribution of the GNSS tracking data from Low Earth Orbiting Satellites (LEO) to the improvement of the real-time orbit determination of both GNSS and LEO satellites with simulated LEO data availability. The improvement of the orbit accuracy by introducing LEO data will be a promise for orbit determination with insufficient ground tracking station availability, for example, for the Chinese COMPASS navigation satellite system at the developing phase.

We implemented the LEO orbit determination capability into the newly developed EPOS-RT (Earth Parameter and Orbit determination System in Real-Time) software package which is designed and developed recently at GFZ for real-time applications.

The IGS ground stations and real LEO (CHAMP, GRACE and COSMIC) and additional simulated LEO satellites are used as base for the investigation. Various observing scenarios comprising different number of ground stations and LEOs are selected and corresponding GNSS data are processed with the EPOS-RT software in simulated real-time mode. The results are validated by orbit overlapping and against products from other institutes. The impact of integer ambiguity resolution among ground stations, between spacecrafts, and between ground and space is investigated and the improvement on GNSS and LEO satellite orbits and the relative position between two LEOs in formation flight is evaluated.