Geophysical Research Abstracts, Vol. 9, 09968, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09968

Local Time Influence in Radio Occultation Climatologies

B. Pirscher, U. Foelsche, B. C. Lackner, G. Kirchengast

Wegener Center for Climate and Global Change (WegCenter) and Institute for Geophysics, Astrophysics, and Meteorology (IGAM), University of Graz, Graz, Austria. (E-mail: barbara.pirscher@uni-graz.at, Fax: +43-316-380 9830)

We investigated the sampling error of Global Positioning System (GPS) radio occultation (RO) temperature climatologies. The sampling error (undersampling) of these climatologies was compared for sun-synchronous and non sun-synchronous single Low Earth Orbit (LEO) satellites as well as for one non sun-synchronous multi-satellite platform. We focused on the sampling error's local time component, which is caused by incomplete sampling of the diurnal cycle of which in particular the diurnal and semi-diurnal harmonics are relevant. The local time influence depends on the geometry of the satellites orbits and on the number of measurements.

Three satellites and one satellite constellation were chosen as representative cases: The sun-synchronous satellites SAC-C (Satelite de Aplicaciones Cientificas C) and MetOp (Europe's Meteorological Operational weather satellite), the non sun-synchronous satellite CHAMP (CHAllenging Minisatellite Payload), and the non sun-synchronous FORMOSAT-3/COSMIC satellite constellation (Constellation Observing System for Meteorology Ionosphere and Climate), respectively.

Since satellites in sun-synchronous orbits are characterized by fixed equator crossing times (twice per day) they are not able to fully resolve the diurnal cycle. The influence of different equator crossing times on the sampling error was investigated by means of SAC-C and MetOp.

The equator crossing times of non sun-synchronous satellites change depending on their rate of nodal precession. CHAMP's monthly local time drift amounts to approximately 3 hours and a full diurnal cycle is sampled within about 130 days. However, the local time drift of the FORMOSAT-3/COSMIC satellites allows one full diurnal

cycle to be sampled within every single month by the constellation.

Depending on the temporal resolution of temperature climatologies (month, season, year) the effects of orbit configurations are slightly different but the overall evidence is that monthly RO climatologies are of high accuracy (sampling error < 0.3 K), with the local time component being of little importance (< 0.1 K).