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The Impact of the Processing Batch Length in GNSS Data Analysis on the Estimates of Earth Rotation Parameters with Daily and Subdaily Time Resolution

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Microwave observations from GNSS are traditionally analyzed in the post-processing mode using (solar) daily data batches. The 24-hour session length differs by only about four minutes from two revolution periods of a GPS satellite (corresponding to one sidereal day). The deep 2:1 resonance of the GPS revolution period with the length of the sidereal day may cause systematic effects in parameter estimates and spurious periodic signals in the resulting parameter time series. The selection of other (than daily) session lengths may help to identify systematic effects and to study their impact on GNSS-derived products. Such investigations are of great interest in a combined multi-GNSS analysis because of substantial differences in the satellites' revolution periods.

Three years (2008-2010) of data from a global network of about 90 combined GPS/GLONASS receivers have been analyzed. Four different session lengths were used, namely the traditional 24 hours (UTC), two revolutions of a GLONASS satellite (16/17 sidereal days), two revolutions of a GPS satellite (one sidereal day), and a session length of 18/17 sidereal days, which does not correspond to either two GPS or two GLONASS revolution periods. GPS-only, GLONASS-only, and GPS/GLONASS-combined solution are established for each of the session lengths. Special care was taken to keep the GPS and GLONASS solutions fully consistent and comparable in particular where the station selection is concerned.

We generate ERPs with a subdaily time resolution of about 1.4 hours (1/17 sidereal day). Using the session-specific normal equation systems (NEQs) containing the Earth rotation parameters with the 1.4 hours time resolution we derive in addition ERPs with a (sidereal) daily resolution. Note that this step requires the combination of the daily NEQs and a subsequent re-binning of 17 consecutive ERPs with 1/17 day time resolution into one (sidereal) daily parameter. These tests will reveal the impact of the session length on ERP estimates of daily and subdaily time resolution.