GNSS Estimates of Short-period Nutation

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Nutation parameters can only be determined in an absolute sense by the space geodetic techniques Very Long Baseline Interferometry (VLBI) and Lunar Laser Ranging (LLR). Global Navigation Satellite Systems (GNSS) like the Global Positioning System (GPS) do not provide access to absolute nutation parameters due to correlations with the orbital elements. On the other hand, nutation rates can be determined with GNSS as they are linked to the first derivatives of the orbital elements. However, due to systematic errors, these rates can only contribute to the determination of nutation terms with short periods.

Long-time series of GNSS-derived nutation rates provide the basis for the estimation of different nutation models limited to periods up to 16 days. Three different series will be used: (1) the operational solution of the Center for Orbit Determination in Europe (CODE) which is a combined GPS/GLONASS solution since 2003; (2) a reprocessed GPS solution generated by TU München and TU Dresden; and (3) the reprocessed CODE GPS series. Due to the characteristics of these solutions, the impact of different modeling options on the nutation rates can be studied: e.g., operational vs. homogeneously reprocessed, different a priori radiation pressure models and GPS-only vs. combined GPS/GLONASS analysis. A comparison of the different nutation models amongst each other and with the IAU2000A model allows to assess the precision and accuracy of these models. The stability of the estimated nutation amplitudes can be evaluated by comparing nutation models estimated from different sub-intervals of each series. Finally, the GNSS-derived models will be compared with VLBI.