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GPS-derived long time series of Earth rotation parameters with daily and subdaily resolution

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Global GPS observations allow for the continuous and high-precision monitoring of the Earth's rotation. Although satellite techniques are not able to determine UT1 in an absolute sense due to the high correlations with the orbital elements, the time derivative of UT1 (length of day - LOD) is accessible to GPS. Homogeneous Earth rotation parameters (ERPs) with daily and subdaily resolution covering a time interval of almost 12 years have been estimated in a complete reprocessing of a global GPS network conducted by the Universities of Technology in Dresden and Munich. The ERPs with daily resolution will be compared with series from individual analysis centers for different techniques (e.g., GFZ GPS solution, DGFI VLBI solution), intra-technique combined series (e.g., IGS, IVS) as well as inter-technique combined series (e.g., Bulletin A, C04). Furthermore, the influence of different solution strategies (e.g., considering higher-order ionospheric terms or not, different models for the antenna phase center variations) on the ERPs will be demonstrated.

In a special solution of the reprocessing subdaily Earth rotation parameters with a resolution of 2 hours have been estimated. Variations of the Earth rotation in the diurnal and semi-diurnal frequency band are primarily generated by interactions of the oceans with the solid Earth. Smaller effects are related to interactions with the atmosphere. As the frequencies of the ocean tidal constituents are well known their amplitudes can be estimated from the subdaily ERP time series in a least squares adjustment. Comparisons of this estimated ERP ocean tide model with the IERS2003 model show amplitude RMS differences on the level of several microarcseconds for polar motion

and about 0.5 microseconds for UT1. After removing the ocean tidal amplitudes the spectrum of the residual signal still contains several significant peaks. The origin of these peaks will be discussed: possible explanations range from atmospheric signals, artifacts from the orbit modeling to aliasing effects.