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Impact of orbit modelling and the reference frame on subdaily variations in Earth rotation

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Mass redistributions in the system Earth cause changes in Earth rotation, i.e. in the position of the rotation axis (polar motion) and in the Earth's angle and rate of rotation (UT1 and length of the day). On the time scale of one day and shorter the variations in the Earth rotation are mainly caused by the ocean tides. The detailed model (recommended by the IERS) for these variations at diurnal and semidiurnal periods has been computed from an ocean tide model and comprises $\sim$100 terms in polar motion and $\sim$70 terms in Universal Time.
In the study to be presented here, we computed an empirical model of the variations in Earth rotation on tidal frequencies using long time series of Earth rotation parameters (ERPs) with a 1-hour resolution obtained from homogeneously re-processed GPS observations from 1994 to 2007. In order to take into account all the variance and covariance information for the parameters of the global GPS solutions, amplitudes of tidal variations in the ERPs were set up as additional parameters in daily normal equations. The comparison between the estimated variations and the IERS model reveals differences, which can be caused by other geophysical phenomena influencing the same ocean tide frequencies (e.g. atmospheric tides or libration) or may be artifacts due to the processing strategy applied for the daily GPS solutions. In this contribution we will discuss in detail the influence of the orbit modelling, the arc length and the underlying reference frame on the estimated variations in the ERPs and the derived tidal amplitudes. Since some geophysical phenomena (e.g., oceanic and atmospheric normal modes) happen at frequencies that differ from those of the ocean tides, we will show in the second part of the presentation which periodic components can be seen in the estimated time series of the ERPs after extracting the tidal variations.