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Reliability of empirical tidal models from GPS observations

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At a time scale of one day and shorter the variations in the Earth rotation are mainly caused by the ocean tides. The recommended IERS model for these variations at diurnal and semidiurnal periods has been computed from an ocean tide model and comprises ∼100 terms in polar motion and ∼70 terms in Universal Time. Empirical tidal models estimated from the observations of different space geodetic techniques can be used to gain a better understanding of tidal and non-tidal influences on the Earth rotation. For this purpose the issue of stability and reliability of the empirical tidal models needs to be considered first.
In this presentation we study the stability of the GPS-derived tidal models using long time series of the GPS-only solutions during the time period 1994 – 2007 and combined GPS/GLONASS solutions during the time period 2002 – 2010. A comparison with VLBI-derived tidal models is used to identify technique-specific biases in the estimated tidal amplitudes. We show that the tidal terms with the periods very close to 24 and 12 hours are not reliably estimated from GPS observations. Therefore, the impact of different processing options on this instability is investigated. We show that most effects affecting the empirical tidal terms come from the modeling of the satellite orbits and demonstrate the influence of the radiation pressure parameters on the estimated tidal amplitudes.