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Subdaily Earth rotation model and GPS solutions

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In this contribution we study the influence of the subdaily Earth rotation model on the GPS solution including station coordinates, satellite orbits and daily Earth rotation parameters (ERPs).
The approach used is based on the transformation of GPS normal equation systems: free daily normal equations containing ERPs with 1-hour resolution are used as input data, in this case the high-frequency ERPs can be transformed into tidal terms which then can be fixed to new a priori values, thus changing implicitly the underlying subdaily Earth rotation model. To study the influence of individual tidal terms on the solution we successively changed a priori values for one tidal term in polar motion and compared the resulting solutions for GPS orbits, station coordinates and daily ERPs for a time interval of 13 years. The comparison reveals periodic changes in all estimated parameters with periods depending on the periods of the changed tidal terms. The dynamical reference frame realized by the GPS orbits is also affected: the whole satellite constellation shows periodic orientation variations, and each individual satellite shows periodic changes in the position of the orbit origin.
We present a mechanism showing how errors in the subdaily Earth rotation model are propagated into the dynamical reference frame and the estimated parameters. Our model represents a change in one tidal term over one day as the sum of a prograde diurnal wave, a retrograde diurnal wave and an offset and linear drift in x- and y-pole. We demonstrate that this simple model, in conjunction with appropriate constraints, can explain well the observed variations in a one day GPS solution as well as in daily pole rates caused by changes in the subdaily Earth rotation model.