



EOP from combined geodetic space techniques

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The ITRS Combination Center at DGFI combined the space geodetic techniques GPS, VLBI, SLR and DORIS in a Least-Squares-Adjustment for the ITRF2008. In this combination the coordinates and the linear velocities of the stations on the Earth and the EOPs are adjusted simultaneously. The advantage of combining the different techniques is that we can use the sensitivity of the techniques on certain EOP for the improvement of the estimated parameters. GPS dominates the estimation of the terrestrial pole coordinates, whereas VLBI provide unique information for UT1 and the celestial pole coordinates. Because of the high short term stability, LOD and nutation rates can be estimated from GPS very well and thus all VLBI EOP will benefit from a combination.

Because of geophysical effects like atmospheric or hydrological mass load changes, but also because of other station related effects like thermal expansion of the monument, the station motion in the Earth-fixed coordinate system is not linear. Because of a large number of causing effects, the modeling of the seasonal variations is very complex. So, in order to consider them we adjust coordinates of the stations at each epoch in a daily (or weekly) solution. That means, that the temporal variations in station positions are considered completely. One of the problems we have to deal with is the reduced number of available local ties because of the small daily observation networks, especially in case of VLBI. So, a careful selection of local ties used for the daily solutions is very important. Furthermore, the relative weighting of the techniques is much more complex than for a multi-year solution. While the GPS network is very homogeneous over time, the VLBI network changes from session to session very strongly. These variations reflect also in the weighting of the VLBI contributions.

For the EOP we choose the daily piece-wise linear parametrization. This type of EOP parameterization has some advantages: we don't have to estimate weak determined EOP rates; if we estimate weekly or monthly solutions continuity and consequently a larger stability of the EOP time series is achieved by combining the EOP at day boundaries, and in addition the number of parameters is reduced.

In order to validate the estimated EOP we compare our solution internally with the single-technique solution and externally with official geodetic products like the IERS 05 C04 time series or the IGS EOP time series.