



ITRF origin: Diagnosis of Current Realization

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By definition, the origin of ITRF is at the center of mass (CM) of the entire Earth, including the oceans and atmosphere. The current ITRF is represented through a set of station coordinates and velocities, of which the stations are on the deformable Earth's crust. Such a set of station coordinates and velocities are obtained by combining the solutions of multiple space geodetic techniques over multiple years. Due to the deficiency of the representation model and the solution weakness (poor geographic distribution, data processing strategy changes, and other systematic errors) of the space geodetic techniques, the realized ITRF origin does not always coincide with the defined CM origin. In particular, recent ITRF2005 origin shows about 5 mm offset and 1.8 mm/year drift comparing with the ITRF2000 origin (Altamimi, 2006), indicating that the systematic datum inconsistency is not negligible and should be further investigated and improved.

The deficiency of the origin representation model mainly comes from the lack of proper modeling of the non-linear movement of the geo-center. On the seasonal and short periods, the realized ITRF origin displays several mm to 1 cm variations relative to CM. We will discuss the potential options to remedy the ITRF origin weakness on seasonal and short periods. We also explore the potential causes of systematic inconsistency between ITRF2005 and ITRF2000 origins, in particular the coupling between estimated origin and other estimated network parameters.

Reference: Altamimi, ITRF2005 Origin and Scale Definition, Usage and Consequences, AGU Fall Meeting, G33-C-05, 2006