

Station Trajectory Models and Terrestrial Reference Frames

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ABSTRACT: The tasks of realizing a terrestrial reference frame (RF) and characterizing the motion of geodetic stations in that RF can be characterized as 'two sides of the same coin'. Modern *station trajectory models* are composed of three sub-models that represent secular trends, annual oscillations, and instantaneous jumps in coordinate time series. Traditionally the trend sub-model invoked constant station velocity. This can be generalized by assuming that position is a polynomial function of time. The trajectory model can also be augmented as needed, by including one or more logarithmic transients in order to account for typical multi-year patterns of post-seismic transient motion. Many geodetic and geophysical research groups are now using modern, rather general classes of trajectory model to characterize their crustal displacement time series, but few if any of them are using these trajectory models to define and realize the terrestrial RFs in which their time series are expressed. At high school we learned that a set of axes allows us to give coordinates to a set of points. But for geodesists it is the giving of coordinates to a set of reference stations that, in effect, defines the axes. So, when a RF is to operate not just at a single epoch, but continuously over an extended period of time, we have to invoke this axis system by specifying the coordinates of the reference stations as functions of time. That is, we must specify the trajectories of these reference stations. If we define a *network trajectory model* as a set of station trajectory models for every station in a network, then in its operational context, a RF is a network trajectory model for a set of reference stations. It follows that if modern station trajectory models are improving our ability to characterize displacement time series expressed in standard RFs, then these improved trajectory models should also allow us devise and realize more consistent (and 'stable') RFs. I will describe my research group's experience with this agenda during the last several years.

Coffee & cookies will be served

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