



On the Long-Term “Hesitation Waltz” Between the Earth’s Figure and Rotation Axes

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The principal figure axis of the Earth refers to its axis of maximum inertia. In the absence of external torques, the latter should closely coincide with the rotation pole, when averaged over many years. However, because of tidal and non-tidal mass redistributions within the Earth system, the rotational axis executes a circular motion around the figure axis essentially at seasonal time scales. In between, it is not clear what happens at decadal time spans and how well the two axes are aligned.

The long record of accurate Satellite Laser Ranging (SLR) observations to LAGEOS makes possible to directly measure the long time displacement of the figure axis with respect to the crust, through the determination of the degree 2 order 1 geopotential coefficients for the 34-year period 1983-2017. On the other hand, the pole coordinate time series (mainly from GPS and VLBI data) yield the motion of the rotation pole with even a greater accuracy. This study is focused on the analysis of the long-term behavior of the two time series, as well as the derivation of possible explanations for their discrepancies.