Geophysical Research Abstracts
Vol. 16, EGU2014-1670, 2014
EGU General Assembly 2014

A New Model for Long-Period Tidal Variations in Length of Day

Richard Ray (1) and Svetlana Erofeeva (2)
(1) NASA GSFC, Greenbelt, United States (richard.ray@nasa.gov), (2) Oregon State University, Corvallis, United States

The standard IERS model for tidal variations in length of day (LOD), covering the band from one week to 18.6 years, stems from a 30-year-old paper by Yoder, Williams, and Parke. Their original table has been updated in the latest adopted standards by modifying only a few constituents: four constituents were adjusted for effects of mantle anelasticity and two constituents for effects of ocean tides. Here a new model of long-period tidal variations in length of day is described. The model comprises eighty spectral lines with periods between 18.6 years and 4.7 days, and it consistently includes effects of mantle anelasticity and dynamic ocean tides for all lines. The anelastic properties follow Wahr and Bergen; experimental confirmation for their results now exists at the fortnightly period, but there remains uncertainty when extrapolating to the longest periods. The ocean modeling builds on recent work with the fortnightly constituent, which suggests that oceanic tidal angular momentum can be reliably predicted at these periods without data assimilation. This is a critical property when modeling most long-period tides for which little observational data exist. Dynamic ocean effects are quite pronounced at shortest periods as out-of-phase rotation components become nearly as large as in-phase components. The model is tested against a 20-year time series of space geodetic measurements of length of day. The current international standard model is shown to leave significant residual tidal energy, and the new model is found to mostly eliminate that energy, with especially large variance reduction for constituents Sa, Ssa, Mf, and Mt.