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Excitations of Earth rotation parameters at high frequencies

D. Salstein (1), J. Nastula (2), D. MacMillan (3), K. Quinn (1) and P. Mendes Cerveira (4)

(1) Atmospheric and Environmental Research, Inc. (salstein@aer.com), (2) Space Research Center of the Polish Academy of Sciences, (3) NASA Goddard Space Flight Center, (4) Vienna University of Technology

We have calculated excitations of Earth rotation/polar motion at very high temporal frequencies with hourly resolution. The atmospheric series were based on a data assimilation system that was run at NASA using the GEOS4 meteorological model. In this system excitations from five of the six hours are based on model forecast simulation, and at each six-hour epoch they are based on a mixture of model and observations. This heterogeneous procedure can cause discontinuities at the six-hour mark if the model is not successful. Though some terms have discontinuities, the polar motion excitation terms based on winds, which are known to have a strong diurnal signal due in part to tidal fluctuations, are nevertheless reasonably continuous. However, the phase of the diurnal signal appears to vacillate during this period. The resulting excitation functions agree reasonably well with independent data sets that were based on other 6-hour data assimilations. We chose October 2002 for this study as it encompasses the CONT 2002 special observing period that was held for Earth rotation observations. Time-spectra of these wind-based and pressure-based terms reveal diurnal and semidiurnal signals in the prograde and retrograde senses, with other spectral peaks around 8 hours, though these peaks may have occurred as temporal harmonics. Earth rotation signals for that period were also examined, particularly from the VLBI system run for CONT2002. Though spectra have peaks at the similar frequencies, the power is much smaller in the atmospheric series. We anticipate that newer models will be available from NASA that will mitigate some of the discontinuities found at the six-hour mark in these series, and will perhaps come closer to the power in polar motion excitation.