

Effect of Long Period Ocean Tides on the Earth's Rotation

R. S. Gross (Jet Propulsion Laboratory, California Institute of Technology, 4800th Oak Grove Drive, Pasadena, CA 91109-8099; tel: 818-354-4010; fax: 818-393-6890; rsg@logos.jpl.nasa.gov)

B. F. Chao (NASA/Goddard Space Flight Center, Code 921, (i re. cnbc. 1C, MD 20-7 1; tel: 301-28661 20; fax: 301-286 1616; chao@denali.gsfc.nasa.gov)

S. Desai (Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109-8099; tel: 818-3545455; fax: 818-393- 6388; sdesai@wansor.jpl.nasa.gov)

The second-degree zonal tide raising potential, which is responsible for tidal changes in the Earth's rotation rate and length-of-day, is symmetric about the polar axis and hence can excite the Earth's polar motion only through its action upon nonaxisymmetric features of the Earth such as the oceans. Ocean tidal excitation of polar motion in the diurnal and semidiurnal tidal bands has been previously detected and extensively examined. Here, the detection of ocean tidal excitation of polar motion in the long-period tidal band, specifically at the Mf' (13.63-day) and Mf (13.66-day) tidal frequencies, is reported. Spectra of the SPACR95 polar motion excitation function exhibit peaks at the prograde and retrograde fortnightly tidal periods. After removing the effects of atmospheric wind and pressure changes, an empirical model for the effect of the fortnightly ocean tides upon polar motion excitation is obtained by least-squares fitting periodic terms at the Mf and Mf' tidal frequencies to the residual polar motion excitation series. SPACR95, a Kalman filter-lmscd combination of space-gcodct ic measurements of the Earth's rotation spanning 1976.8- 1995, was chosen for this purpose since its time span is great enough to resolve the Mf and Mf' tidal frequencies (whose beat period is 18.6 years). The resulting empirical model for the effect of the fortnightly ocean tides upon polar motion excitation is compared with the predictions of hydrodynamic ocean tide models.