OCEAN TIDAL EFFECTS ON EARTH ROTATION

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ABSTRACT.

The second-degree zonal tide raising potential, which is responsible for tidal changes in the Earths rotation rate and length-of-day, is symmetric about the polar axis and hence can excite the Earths polar motion only through its action upon nonaxisymmetric features of the Earth like the oceans. Ocean tides excite polar motion in the diurnal, semidiurnal, and long-period tidal bands. Here, ocean tidal excitation of polar motion in the long-period tidal band, specifically at the Mm (monthly), Mf (fortnightly), and Mt (9-day) tidal frequencies, is studied. Spectra of observed polar motion excitation functions exhibit peaks at the prograde and retrograde fortnightly tidal frequencies. In fact, except at seasonal and longer periods, these are the largest peaks in the observed spectra after atmospheric and nontidal oceanic effects are removed from the observations. An empirical model for the effect of the monthly, fortnightly, and 9-day ocean tides upon polar motion excitation is obtained by least-squares fitting periodic terms at these tidal frequencies to observed polar motion excitation from which atmospheric and nontidal oceanic effects have been removed. The resulting empirical model is compared with predictions from hydrodynamic ocean tide models.