Mantle Heterogeneity and Tidal Deformation

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The current trend in global space geodesy is toward a1 mm accuracy in positioning at the Earth's surface, both in the vertical and horizontal. Solid tide models associated with such highly accurate measurements arc required to now account explicitly for the Earth's rotation, $P_{20}(\cos\theta)$ shape of the Earth and resonances with the free core nutation in the diurnal band *[Gipson, 1994]*. Hopefully, these 3 complexities arc not overshadowed by additional complications such as core n~agncto-hydrodynamic flow *[eg., Wu and Wahr, 1997]* or atmospheric/oceanic torques and loading that arc more difficult to model *[e.g. Dehant et al. 1996]*. The level to which full lateral heterogeniety associated with a convecting mantle must be accounted for is thought to be negligible. However, there arc still ambiguities in how to deal with the nutation series, ab-initio, corrected core mantle boundary which has 500 meters of additional equatorial flattening that cannot be systematically derivable from seismology alone. Additionally, the nature and magnitude of frequency-dcpcndcnt dispersive effects associated with mantle anelasticity may now be better constrained by tidal displacement, UT1 and gravity. We present computations of solid tidal deformations using a complete representation of mantle lateral heterogeneity and comment on the level of these effects on the observed tidal signals.

References

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