Torsional Magnetohydrodynamic Oscillations of the Earth's Liquid Metallic Core

R Hide, D Boggs, J Dickey and D Dong (Space Geodetic Science and Applications Group, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109; tel: 818-354-3235 (e-mail for J Dickey: jod @logos.jpl.nasa.gov)

Owing to Lorentz forces and Coriolis forces, and also to buoyancy forces in "bot[om-heavy" regions, the core can in principle support a wide range of transverse ("shear") oscillations at subseismic frequencies, with periods ranging from less than a day to centuries. These include torsional magnetohydrodynamic oscillations involving only Lorentz forces associated with the non-axial component of' the poloidal part of the magnetic field in the core, the average value of which component is B_P. From determinations (by others) of motions in the outer reaches of the core (obtained from geomagnetic secular variation data under various assumptions) covering **61 epochs** from 1840 to 1980 AD, wc have investigated torsional oscillations by analyzing the time series of fluctuations in the angular momentum of each of 20 imaginary cylindrical annuli co-axial with the Earth's rotation axis. Wc show *inter alia* that mid-latitude core oscillations correlate well with angular momentum exchange between the core and overlying solid mantle, as implied by fluctuations in the length of the day (LOD) on decadal time scales. The dominant oscillation period seen in the data is about 60 years, which can be interpreted tentatively as implying that B_P is about 2 x 10-4T (i.e. 2 gauss, which is less than half the average strength of the total poloidal field over the core-mantle boundary), but there could of course be other explanations of the data.

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3a. Raymond Hide
c/o Dr. J. O. Dickey
MS 238-332
JPL/Caltech
4800 Oak Grove Drive
Pasadena, CA 91109

3b. 818-354-3235 (Office)

3c. 818-393-6890 (FAX)

3d. H-mail: jod@logos.jpl.nasa.gov

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