Interdecadal fluid motions on the triaxial ellipsoidal inner core and variations of LOD and the vertical

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Anomalously large values of deflection of the vertical at Ukiah (Kakuta et al.,Joint Meeting,2003) caused in the east edge of the high temperature region of the Pacific, which is located near the major axis of the triaxial ellipsoidal Earth(the major axis of the ellipsoid on the equator is the longitude 15 degrees west). In order to study motions in the fluid core, we assume that the heat flows outward from the inner core in the equatorial region and that the uniform magnetic field is parallel to the rotation axis. Fluid motions in Earth's fluid core are nearly in the perpendicular plane to the axis of Earth's rotation (Taylor-Proudman theorem). Main characteristics of the fluid core having a solid inner core are described with the tangent cylinder, which is parallel to the rotation axis and is touching the inner core boundary on its equator.We assume the horizontal divergence in the perpendicular plane to the rotation axis to be zero, because the fluid motions are enclosed in the rigid mantle. We obtain interdecadal magnetohydrodynamic wave motions along the line of the uniform magnetic field. Fluid motions show different character at the boundary of the tangent cylinder. The zonal flow induces the electromagnetic torque (poloidal torque,Wicht and Jault,1999) on the mantle, which contributes to variations of LOD (length of a day). Fluid motions are equivalent to the spherical harmonic mode Y(2,2), and are induced around the major axis of the triaxial ellipsoidal inner core, because the mean low pressure region is captured on the axis.The motions consist of two modes. One is a rotational mode around the major axis (gradient wind). The other mode is parallel to the axis and transports heat flux to the base of the mantle, which changes thermal stresses there. Finally variations of heat flux induce changes of both the horizontal component of the stresses in the elastic mantle and deflection of the vertical at the top of the mantle. We can estimate deflection of the vertical with the aid of moderately thick plates. Comparison of the observed values of variations of LOD and deflection of the vertical is used to estimate magnitudes of the zonal flow and the non-zonal flow at the boundary of the tangent cylinder with the aid of time variation of the pressure. The result of comparison shows that the non-zonal mode is larger than the zonal mode.