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Interdecadal variations of deflection of the vertical,tilt and LOD and axially symmetric motions of the inner core

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Increase of the residual of the latitude observations removed effects of the polar motion correlate with increase of LOD(length of day) in the low latitude zone for the period from 1967 to 1983(Kakuta et al.,1993). We try to extend the period of comparisons. We derive 6 year running mean value of the ILS latitude observations at Mizusawa and Ukiah and the Z term for the period from 1900 to 1978 (Yumi and Yokoyama,1980). We remove a linear trend and large variations near 1915 from both data by assuming a triangular variation whose apexes are 49 mas and 62 mas for the Z term and the residual of the mean latitude with the aid of the Fourier expansion series. The LOD data are derived from Stephenson and Morrison (1984) for the period from 1900 to 1980, and the smoothed derivatives of (TAI - UT2) from the IERS for the period from 1962 to 2000. Both data are joined in 1968. The LOD data are removed a linear trend and the 68 year period oscillation with the amplitude of 1350 micron s.We compare the modified yearly values of the Z term and the residual of the mean latitude with the modified LOD data by applying a 24 year low-pass filter. The amplitudes of the Z term and the mean latitude show nearly the same values and the amplitudes of the Z term and LOD are about 30 mas and 300 micron s respectively. Increases of the residual of latitude observations of Mizusawa correspond to decrease of J2 (Nerem et al.,1993),which shows increase of the mass in the lower latitude zone in 1980s. Variations of the N-down of the NS component of the tilt at the Esashi Earth Tides Station correspond to increase of LOD in the same period. Comparisons of decadal and interdecadal variations shown above indicate that increases of deflection of the vertical northwards and the N-down of the NS component of the tilt relate with increase of LOD due to transfer of the axially symmetric mass towards the equatorial plane, and that the polar moment inertia increases.

We assume that the anisotropy axis of the inner core is not the figure axis of the inner core and that the inner core oscillates symmetrically relative to the center of gravity along the figure axis of the mantle.We consider a cylindrical fluid core of which axis coincides with the figure axis of the mantle. The bottom of the cylindrical fluid core is the spherical inner core. The axial velocity changes as a function of the radius in the fluid core. Coupling motions between axial oscillation of the inner core and the main dipole, a poloidal magnetic field, induce magnetohydrodynamic Alfven waves both in the axial and the radius direction associating with the pressure waves and the redius of the fluid core oscillates along the axis. With numerical values of the amplitude of the inner core oscillation to be 1 m, and the axial magnetic flux density to be 400 micro T, we obtain the travel time from the pole of the inner core to the CMB(the core mantle boundary) is 23 years and the amplitudes of LOD and northward deflection of the vertical are 270 micro s and 220 micro as respectively. The 68 year period oscillation of LOD is attributed to internal fluid motion associating with the geodynamo.