

Interdecadal variations of deflection of the vertical, tilt and LOD and motions near the CMB

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6 year running mean values of the ILS latitude observations at Mizusawa and Ukiah (236 DEG 47MIN E, 39 DEG 08 MIN N) and the Z term of the ILS homogeneous system for the period from 1899.9 to 1979.0 (Yumi and Yokoyama, 1980) and LOD (length of day) variations (Stephenson and Morrison, 1984) show a 24 year variation (Kakuta et al., 2002). Gross and Vondrak (1999) showed that the newly smoothed Hipparcos polar motion series for 1900.0 to 1992.0 span (Vondrak and coworkers, 1995-2000) gives nearly the same polar motion as that estimated in previous studies using the homogeneous ILS polar motion series. Vondrak (1999) showed that the observed latitude at Ukiah after 1960 displays an abnormal growth and discarded this part from the adjustment.

We consider that variations of the observed latitude at Ukiah may relate with earthquakes between two plates, the Pacific and the North America and study deflection of the vertical and LOD from the point of view of motions near the core-mantle boundary (CMB). Numbers of earthquakes occurred in California and Mexico over M 6.0 shows a variation of 20 year period. The stress due to those earthquakes can be supplied from heat flux flowing into the D" layer from the outer core caused by magnetohydrodynamic motions. Also heat flow into the D" layer contributes to variations of the zonal thermal pressure, the polar moment of inertia (deflection of the vertical) and LOD. We use a simple cylindrical core model with diffusionless fluid motion and a uniform magnetic field parallel to the rotation axis of the outer core. We take into account for variations of the thermal conductivity in the D" layer due to partial melt at the CMB (Wiedemann-Franz-Lorenz law). LOD variations show the minimum value in 1989. However, residuals of the latitude variation at Mizusawa, the N-down value of the N-S component of the tilt at Esashi, -J2 and the Pacific decadal oscillation index, defined by (Alaska, North America Pacific coast sea surface temperature) minus (the central Pacific sea surface temperature), show the minimum value in 1990. This fact suggests that LOD variations are the results of direct exchange of the angular momentum between the inner core and the mantle, and that changes of the figure of the Earth are derived from delayed heat flow at the CMB.