

## Decadal variations of the Earth rotation

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The Earth's axial rotation rate shows decadal variation, corresponding to the length of day (LOD) of about 1 ms. The cause of the decadal variations remains unknown. Changes in the degree-2, order-0 spherical harmonic mass load coefficient on the mantle may not accurately enough to explain the LOD values (Gross et al. 2004). Gross et al. (2004) pointed out difficulties in estimation of the effects of the winds. The purpose of this report is to study unknown causes that are screened by motions of the outer core and the inner core. Recently the motion of the outer core is expressed by tangent cylinder which is tangent to the inner core equator and parallel to the Earth's rotation axis. The tangent cylinder is close to the polar vortex which is defined as sources for anomalous rotation of the inner core. There is decadal-scale variability of the atmospheric sea level pressure over the Arctic Ocean that is associated with the larger scale Arctic Oscillation reflecting the strength of polar vortex. The Alfvén waves propagate through the outer core along the main dipole field in about 20 years in the fluid core. We consider following cases: (1) whether excitations on the surface of the Earth can couple with the fluid core motion and can induce variations of the LOD or not, (2) whether magnetohydrodynamic motion can excite variations of the LOD in the fluid core or not. Results are as follows. The excitations mentioned in (1) are small to explain observed values. In case (2), the outer core is assumed to be the tangent cylinder. It is found that the magnetohydrodynamic wave can be excited in the rotating and the thermal tangent cylinder with a period of about 20 years. But the amplitude of the zonal flow is estimated to be the same order of magnitude of the secular velocity of the polar vortex (0.13 mm/s) denoted by Olson and Aurnou (1999) in order to explain the observed values of the LOD.