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About low-frequency amplitude modulation of chandler wobble of the Earth polar motion

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The current models of excitation of the free nutation of the Earth (chandler wobble - CW) do not give acceptable explanations of considerable amplitude and phase variability of CW during the 20th century. The energy of CW oscillations in 1910-1950 had changed nearly in 25 times, and the phase after almost complete attenuation of CW oscillations in 1925-1930 had changed on 180 degrees. At the same time interval (1910-1940) the synchronous oscillations of the Earth rotation (length of day - LOD) had been observed. The model restorations of atmospheric (Rosen, Salstein, 2000) and oceanic (mainly ENSO) excitation processes on this time interval do not provide excitation of so serious variations of above mentioned parameters of the Earth rotation.

In this paper the observations of Earth rotation parameters during the 20th century (http: // hpiers.obspm.fr/eop-pc/) were used to discuss the guess of possible variability of viscous friction (dynamic viscosity) in the wide layer between crust and mantle on the decadal time spans. The change of this single parameter can lead to changes as quality factor Q of the oscillation system as well as its moments of inertia due to local changes of lithosphere and mantle cohesion. These cohesion variations of more slowly rotating exterior shells of the Earth (crust and lithosphere) in comparison with upper mantle can lead to almost synchronous variations of CW amplitude and LOD. This guess is the alternative explanation (and more simple qualitatively) of decadal LOD and CW amplitude variations in comparison with developed hypotheses about core-mantle coupling. In the latter case it is necessary to make serious and not always convincing assumptions about the electroconductivity of the mantle, core flattening, velocity and tilt of the core rotation axis and many others.

The fluid geodynamics developed now in a number of geophysical investigations (for

example, Letnikov, 1988) could be geophysical backgrounds of the given assumption. The models developed in the fluid geodynamics represent the upper shell of the Earth ($\sim$ 100 - 200 km) as a series of rigid slabs (with h $\sim$10-30 km and L $\sim$100-1000 km), separated by layers, characterized by the slowed seismic velocities, high electroconductivity and viscosity near 10^{19} pa s. The horizontal motions in this model are represented by relative motions of these slabs and by currents of fluid between them. Process of infiltration of a fluid material goes mainly along the planes of these slabs and in many times surpasses its transport on vertical fissuring zones, that, in our opinion, can explain distinction of the "vertical" viscosity determined on a postglacial rebound, and "horizontal" one for plate motion. Thus, in view of horizontal cross motions of these slabs, local streams of endogenous heat can vary and, hence, viscosity could changes in these stratums.

References:

Rosen R., D. Salstein, 2000, *Multidecadal signals in the interannual variability of atmospheric angular momentum.,* Climate Dynamics, 16, 693-700.

Letnikov F., 1988, *The fluid model of lithosphere formation*. (in russian), In *The petrology and fluid mode of continental lithosphere*. Nauka, Novosibirsk, p. 6-18.