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The Earth core secular motion to the northern pole and accompanying phenomena in geodesy, geodesy, astrometry, geodynamics and geophysics

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Introduction. In series of my papers the phenomena of inversion changes of the Earth figure, its tension and deformation fields in opposite hemispheres, inversion of gravity in opposite hemispheres, the radial redistribution from one hemisphere to opposite hemisphere, density inverse changes in opposite hemispheres, inversion variations of activity of the planetary processes (seismicity, volcanism, geysir activity) and I've predicted and studied on the base of new geodynamical conception about displacements, wandering turns of the non-spherical Earth shells due to forced gravitational differential influence of external celestial bodies Barkin (1995a-2003b) and others. The inversion phenomena are characterized by definite axis of (radial) changes of the Earth (Barkin, 2001). The orientation of similar axis determines positions of hemispheres exposed to contrast variations of the geophysical and geodynamical properties. The orientation of the axis is changed in the space in different time-scales in definite rhythms.

The slow inversion Earth processes in last 100 years are characterized by the inversion axis oriented to the polar axis or to the Earth rotation axis. In firstly this axis was determined on the base of a semi-empirical model of the Earth mass redistribution (Barkin, 1995b, 2000a, 2001, 2003a,b). We will call this axis as "inversion axis". In accordance with Barkin (2001) this axis is geocentric and directed to the inversion pole 70° N, 116.5° W. In accordance with general geodynamical conception (Barkin, 1995a, 1996a,b, 1999, 2000b,c,d) along this axis the geocenter undergoes slow drift in the southern direction and liquid core undergoes linear trend (in Northern direction). It is only a secular tendency in the composite motion of the geocenter. This motion is generated by the gravitational influence of the Moon and Sun on non-spherical core and mantle of the Earth.

In papers (Barkin, 1995 a,b,c, 1996c, 1997a, b, 1999) the center of mass drift was systematically studied. The analysis of contribution of different factors: variation of the sea level, tectonic processes (plate motion, subduction of the plates and mass accumulation) and others.

Due to lithosphere plate subduction and mass accumulation the center of mass is moving with a velocity of ± 0.042 mm/year in a direction given by geographical coordinates $42^{\circ} \pm 7^{\circ}$ N Lat. and $131^{\circ} \pm 6^{\circ}$ E Long. (the Japan Sea) (Barkin, 1996c, 1997a). An original method (Barkin, 1995b) has let us to evaluate a vector of the centre of mass motion with respect to special reference system in which the coefficient of geopotential is equal zero. It was shown that the mass centre of the Earth moves to the northern pole with velocity of 0.98 cm/year.

Another model determinations of hypothetical geological drift of center of mass were given in paper (Barkin, 2001). Semi-empirical models have let us to determine the orientation of inversion axis of the Earth mass redistribution in the last hundred years as geocentric axis directed to a geographic point 70.0° N Lat., 116.5° W (Barkin, 2001; Barkin, Ferrandiz, 2003). Due to Earth figure change the centre of mass drifts along the Taymyr peninsula with small velocity about 0.242 mm/year (Barkin, 2001). We explain this trend of the centre by a mechanism of the core trend and wandering relatively the centre of mass of the mantle. In the era of inverse variations (in opposite hemispheres of the Earth) of the different geodynamical and geophysical processes accommodate this fundamental planetary process. Some from them are observed in reality and some inversion processes we have predicted for future studies (Barkin, 2001, 2003a; Barkin, Ferrandiz, 2003). Geodynamical studies of the relative oscillations of the core and mantle of the Earth and the mantle deformation induced by the forced core-mantle interaction we have been fulfilled on the base of two layer planetary model with two axisymmetrical shells separated by the viscous-elastic layer (Barkin, 2002; Barkin, Shatin, 2002; Barkin, Ferrandiz, Vilke, 2004). A short description of these studies are given in the paper. The dynamical explanation of observed phenomena is the perturbing gravitational attraction of external celestial bodies (Barkin, 2002a,b). The main consequence of the core displacement is the changes of tension states of the mantle in opposite hemispheres. Of course the shell relative motion will be done a non-trivial behavior of the centre of mass. Deformations of the mantle will lead to the change of the Earth form – to planetary flux formation. One of the consequences of this process is the change of the Earth figure – to planetary flux formation.