



On variations of the mean radius of the Northern and Southern Hemispheres of the Earth

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The high-precision space geodetic observations can monitor the variations of the shape of the Northern and Southern Hemispheres. The length variations of latitude circles of the Earth testify an asymmetry of shape variations of the Northern and Southern Hemispheres. The circles are pulled together in the Northern Hemisphere with a lesser degree than stretched in the Southern Hemisphere. Besides in high latitudes of the Northern Hemisphere the opposite tendency - stretching of latitude circles is observed, which is possible to connect with the known phenomenon of postglacial rebound. This asymmetry in rates of compression and expansion of opposite hemispheres can be connected apparently to features of continental lithosphere, located mainly in the Northern Hemisphere. In addition, new distinctions between changes of hemispheres of the Earth (northern and southern) were also found at study of radial deformations (a vertical component). Average linear velocity in the vertical direction for 27 considered sites in the Southern Hemisphere has been estimated as 1.37 mm/yr, which testifies for the benefit of a hypothesis about slow expansion of the Southern Hemisphere. However, for the Northern Hemisphere the similar data have inconsistent characteristics that 66 stations from the discussed list of 151 stations have positive linear vertical velocities, and the other 85 have negative vertical velocities. So their average velocity is estimated at 0.06 mm/yr (Shuanggen Jin, 2005).

Secular change of the Earth hemispheres is very appreciated on the basis of geodynamic model of relative displacement and deformations of the Earth's core and mantle (Barkin, 2002; Barkin and Jin Shuanggen, 2005). On this model the observable drift and oscillations of the geocenter are mainly due to the proportional displacements of superfluous mass of the core. On the other hand, the displacement of the core determines and directs redistribution of water and air masses of the Earth. In particular

they bring the essential contribution to an annual variation of the load moment. Secular drift, under our assumption, also results in secular redistribution of masses between the Northern and Southern Hemispheres. The fluid and air masses increase in the Northern Hemisphere and decrease in the Southern Hemisphere. The maximal uplift velocity of subpolar points in the Southern Hemisphere is 1.8 mm/yr, while in the Northern Hemisphere the tendency is opposite - subsidence with the same velocity. The offered model of deformations has an inverse character. The future specifications of parameters for the discussed deformation model of the Earth hemispheres are an actual problem and will further be checked with new data of observations. We shall note that possible asymmetry in deformation of hemispheres is the certificate on variability of average radius of the Earth. The first evaluation of secular velocity of average Earth's radius is increasing at 0.22-0.23 mm/yr (Shuanggen Jin, 2005). The average radius of the Earth will test also periodic variations with a spectrum of frequencies, characteristic for motion of the geocenter, and in particular with annual and semi-annual periods.

Referenses

Jin Shuanggen (2005) Private E- mail communication from 19 October 2005.

Barkin, Yu.V. and Shuanggen, J. (2006) Kinematics and dynamics of the Earth hemispheres. EGU General Assembly (Vienna, Austria, 2-7 April 2006). Geophysical Research Abstracts, Volume 8, abstract # EGU06-A-01680.

Barkin, Yu.V. (2002) Explanation of endogenous activity of planets and satellites and its cyclicity. Izvestia cekzii nauk o Zemle. Rus. Acad. of Nat. Sciences, Issue 9, December 2002, M.: VINITI, pp. 45-97. In Russian.