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To explanation of gravity variations at Potsdam and Antarctic Syowa station

Yu. Barkin

Sternberg Astronomical Institute, Moscow, Russia (yuri.barkin@ua.es / Fax: +07 095-9328841)

The mechanism of polar drift and periodic oscillations of superfluous mass of the Earth outer core relatively to the centre of mass of the mantle is one of the basic mechanism of not tidal variations of a gravity. Its nature is connected to external differential gravitational influences on not spherical shells of a planet (Barkin, 2002). Moreover, this mechanism plays the important dynamic role in redistribution of air and oceanic masses of the Earth. It determines and directs the redistribution of planet masses from one hemisphere in opposite. In the given work on the basis of geodynamic model about polar displacements of the core (Barkin, 2005) and known results about an annual mode of inversion deformations of the Earth (Blewitt et al., 2001) the analytical formula for variations of a gravity has been obtained: **dg = [(2.72t+4.52cos (V) +1.02cos (W)] sinQ**. Here the time t is measured in years (from the beginning of year), and arguments are measured in degrees and calculated under formulas **V=360 t-56** and **W = 720 t-207**; amplitudes are given in microgals (mGal), and velocity of drift in mGal/yr. **Q** is the latitude of station of the observations. The formula takes into account direct effect of gravitational influence of displaced superfluous mass of the core, an additional attraction of the mantle deformed by displaced core. The annual deformation of a surface is described by the solution of Blewitt et al. (2001) on which it is estimated also secular inversion component of deformation of the Earth. The core actively participates in a redistribution of masses between northern and southern hemispheres with various cyclicities. Therefore the discussed mechanism is predominating in researched problem. Circulating between hemispheres atmospheric and oceanic masses bring the certain contribution to not tidal variations of a gravity, but they are small for considered stations. They were evaluated on the basis of the elementary model of polar points with variable masses. We plan to investigate these effects, and also spa-

tial character of relative displacements of the centre of mass of the core and mantle in other works. The given theoretical formula for **dg** rather precisely explains main effects in the variations of a gravity observable at station Syowa, in Potsdam and some others. The secular gravity variation at Potsdam is evaluated in 2.1 mGal/yr. During 1976-1986 the similar tendency – gravity trend with velocity 2.6 mGal/yr (absolute measurements) here have been observed. The similar tendency has been determined on measurements on superconducting gravimeters during 1993-1997: 2.3-2.5 mGal/yr (Neumeyer and Dittfeled, 1997). For more extensive period of observation (Neumayer, 2002) the similar result for gravity trend has been obtained. Observable annual variations of a gravity are characterized by amplitude about 3 mGal (on our model it is 3.5 mGal). Observations at Syowa station have been confirmed the developed model. Here it was expected negative gravity trend - decreasing of gravity with velocity -2.54 mGal/yr, that have actually confirmed SG observations during 1995-1998: -2.4 mGal (Sato et al., 2001). Amplitudes of an annual and semi-annual variations approximately make 4.8 mGal and 0.8 mGal (theoretical values: 4.2 mGal and 0.95 mGal). Another's confirmations of the developed theory and geodynamic model are given by the data of SG observations at Medicina, Isashi and Canberra stations.

References

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.

Blewitt G., Lavallee D., Clarke P., Nurutdinov K. (2001) New global mode of Earth deformation: seasonal cycle detected. Science, V. 294. pp. 2342-2345.

Neumeyer J., H.-D. Dittfeled (1997) Results of three year observation with superconducting gravimeter at the GeoForsvhungsZentrum Potsdam. Journal of Geodesy, 71, pp. 97-102.

Neumeyer J. (2002) Curve of the gravity variations at Potsdam. Private communication.

Sato T., Fukuda Y. et al. (2001) On the observed annual gravity variation and the effect of sea surface height variations Physics of the Earth and Planetary Interiors, 123, pp. 45- 63.