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Trend and periodic variations of lengths of latitudinal circles of the Earth

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For the first time the possible inversion in change of forms of southern and northern hemispheres of the Earth has been discussed after a prediction of the phenomenon of drift of the Earth centre of mass in the direction to the North Pole with velocity 1-1.5 cm / yr (Barkin, 1995). In the same years the idea about functioning the shell-dynamic mechanism has been stated (Barkin, 1996; 2002). To explain such significant displacement of the centre of mass it is possible only with the help of the mechanism of the forced displacements of the centres of mass of the outer core and elastic mantle of the Earth. Its action inevitably should result in opposite tendencies in change of forms of southern and northern hemispheres and to new phenomena of transportation of atmospheric and oceanic masses between hemispheres of the Earth (new tides) (Barkin, 2002). Later on the basis of given satellite and other precision observations secular tendencies in compression of northern and expansion of southern hemispheres for the first time have been discovered (Shuanggen, Zhu, 2002). Definite dynamic interpretation of this problem has been undertaken on the basis of a model problem about deformations of the elastic mantle at small radial displacement of the core (Barkin, Shatina, 2005). In particular it was shown, that at polar drift of the core with velocity about 50-60 mm / yr the observable inversion changes of lengths of latitudinal circles of the Earth obtain clear dynamical explanation. The possible contribution from other processes of redistribution of masses of the Earth (oceanic and atmospheric masses) thus was not taken into account; therefore the obtained evaluations of lengthening of latitudinal circles appeared overestimated. In report the specification of mentioned results is given and the trends of lengths of latitudinal circles are explained. Using the experimental results of work (Blewitt et al., 2001) about a seasonal mode of deformation of the Earth, we accept, that on a share of the mechanism of displacement of

the Earth core it is necessary about 60 % of observable effect. The drift of superfluous mass of the outer core results to slow transportation of oceanic and atmospheric masses from the southern hemisphere to northern hemisphere. By our evaluation it will lead to secular inversion deformation of the Earth according to which subpolar points move downward in northern hemisphere with velocity 1.8 mm / yr. In southern hemisphere opposite tendency is observed. Considering the core trend, its annual and semi-annual oscillations, for variation of length of latitudinal circle with latitude **Ô** we obtain the following model expression: **dL =-[8.5t+14.1cos (V) +3.2cos (W)] sin (2Ô)**, where amplitudes are given in millimeters (mm), trend in mm/yr, the time t is measured in years (from the beginning of year), and arguments **V** and **W** are measured in degrees and calculated under formulas **V=360t-56** and **W = 720t-207**. The extreme values of lengthening of latitudinal circles are reached at latitudes of 45 degrees. The maximal annual shortening in northern hemisphere takes place at latitude 45 N in March (14.1 mm), and in a southern hemisphere (at latitude 45 S) in August - September. Another's cyclic displacements of the core (their polar components) result in additional variations of length **dL**. On our evaluations the following periodic variations of length of latitudinal circle 45 S can be observed: with amplitude of 23.6 mm (the period about 2.1-2.3 yr); 22.3 mm (period 3.6-3.8 yr); 32.9 mm (the period of 7.5-8.0 yr); 22.3 mm (471 days); 20.7 mm (1.6 yr); 15.9 mm (the period 6.9 days).

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