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On causes of the low seismic activity in the Earth's polar latitudes

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The irregularity of distribution of seismic activity in the world was observed at the beginning of the era of instrumental seismology (B. Gutenberg, C. Richter, K. Kasahara). At the same time, the global nature of the symmetry of this effect has been established only in this millennium, with the participation of authors (Levin B.W., Sasorova E.V., 2010). Analysis of the global earthquake catalogs showed that almost all seismic events over the last century occurred within a limited latitudinal band contained between the 65 N and 65 S. The seismic activity in the polar regions of the planet was manifested very weakly. The reasons for such features were found by following the analysis of the characteristics associated with the theory of the figure of the Earth.

In the works of the French mathematician A. Veronne (1912) was the first to introduce the concept of "critical" latitudes ($\varphi 1 = \pm 35^\circ 15' 22''$) wherein the radius of the ellipsoid of revolution is equal to the radius of the sphere of the same volume. Variation of the radius vector of the ellipsoid at this latitude is equal to zero. There is the boundary between the compressed areas of the polar zones and equatorial region, where the rocks of the Earth are dominated by tensile forces.

Analysis of the specific characteristics of the gravity force distribution on the surface of the ellipsoid has shown that there is a distribution of the same character with a singular point at latitude $\varphi 2 = \pm 61^\circ\ 52'\ 12''$. In case of variations in the angular velocity of the planet's rotation the variation of gravity force at the latitude $\varphi 2$ is negligible, compared with variations of gravity force on the equator and pole, which exceed the previous value by 3-4 orders.

Attempted analysis of the model of the ellipsoid of revolution in the theory of axisymmetric elastic shells has allowed to establish that in the elastic shell of the planet must occur meridional and ring forces. The theory shows that when the flatness (or polar compression) is littleness the whole shell must be compressed, in this case there is a singular point at the latitude $\varphi 3 = \pm 55^\circ\ 42'\ 22''$. It should be noted that circular forces in the area between the latitudes $\varphi 3$ with increasing compression force become smaller ring forces of a spherical shell. And outside mentioned area - on the contrary, these forces become more and more. Thus, according to the theory of equilibrium figures of celestial bodies in the higher latitudes (due to variations in rotation velocity and change of the body flatness) should appear specific latitudinal zones where the different characteristics of the body structure and physical parameters undergo the significant changes. The study of such zones can bring us closer to understanding the physics of the emergence of interfaces between areas of high and low seismic activity.