Gravitational relation of seismicity with the excess masses of geological environment on the territory of Central Asia

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The report provides facts and examples of the seismicity relation with excess mountain masses of the earth's crust, located both on the surface in the form of various elevations, and under the surface in the form of localized volumes of rocks with high density. These relations are shown both globally and regionally in Central Asia using gravimetric and geodetic data in the form of detailed maps of free-air gravity anomalies and digital elevation models derived from high-precision satellite imagery.

The overwhelming numbers of earthquake epicenters are located in the highlands. The higher the relative height and steepness of the mountains, the more pronounced the seismicity of the territory, expressed in a greater number and strength of earthquakes. And the more massive is the size of rock formations, the greater is the depth of earthquake foci.

The comparison of the map of the global gravity field of the Earth (of the map of free-air gravity anomalies) and a global map of the distribution of seismicity with the location of the epicenters of the tangible earthquakes around the world show almost complete coincidence of the zones of gravity anomalies with zones of seismicity. And this coincidence is observed both on land and in the ocean depths, including the zone of island arcs and mid-ocean ridges. On the global map of the seismicity distribution also shows that the zone of seismicity coincides with the most elevated landforms of the earth's surface and the ocean floor. In general, it can be noted that localized volumes of denser rocks under the day surface, and mountain ranges of less dense rocks on the surface, coinciding with free-air gravity anomalies and with elevated landforms, are gravitationally disturbing excess masses of the geological environment, generating seismicity. It should be understood that gravitational disturbations of localized excess masses of the geological environment are caused mainly by the action of lunar-solar tidal forces.

In the process of graphical and spatial analysis of seismicity data and detailed satellite maps of gravitational anomalies and digital elevation models for the territory of Central Asia, a significant relation of seismicity with the excess masses of the geological environment is shown not only in seismic mountainous areas, but also in other, less elevated and flat aseismic territories. The intensity of seismicity on the number and strength of earthquakes depends on the intensity of high-altitude and gravimetric gradients in the zones of rapid increase in the values of height and gravimetric field, as well as on the size of these zones on the periphery of the areas occupied by localized volumes of excess masses. The periods of seasonal activation of seismicity for all significant earthquakes associated with the periods of acceleration (March-April-May) and deceleration (September-October-November) of the earth's rotation during its annual movement in the solar orbit were determined.