

# Seismogenic role of excessive mass of geological environment by examples of natural and technogenic earthquakes in Central Asia

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Kazakhstan National Data Center (KNDC) of the Institute of Geophysical Research, for more than ten years, in the process of current scientific-research works has been using gravimetric data. The analysis of the seismicity of Kazakhstan territory and adjacent regions of Central Asia showed the relation of many epicenters of moderate and large tectonic earthquakes, and accumulation of epicenters of small and very small earthquakes to local anomalies and gravity anomaly zones coinciding with excessive mass of geological environment.

The excess mass of geological environment can be represented by local volumes of high-density rocks at any place, and by rock volumes of different density localized in positive landforms, i.e. in different uplifts and mountainous area. The excess mass of geological environment can be also represented by changing volumes of large reservoirs of big lakes in intermountain areas (Zaysan, Alakol), and large water basins (Kapchagay, Shulba, and other).

When producing hydrocarbons at large oil and gas fields, the mass of oil and gas-bearing geological structures changes. The defect mass of the geological environment occurs, leading to destabilization of the subsoil at great depths in the rocks of the crystalline foundation. Examples of intensive hydrocarbon production facilities in Central Asia that experienced tangible and destructive technogenic earthquakes are the Gazlinskoye field in Uzbekistan and fields in the North Caspian region.

The changing excess mass of geological environment also appears at open-pit mining of hard minerals at large coal mines (Molodyozhniy, Bogatyr, Karazhyra) and at large ore deposits (near Ryudniy town, Zhezkazgan, and other). Here it is connected with the creation of huge volumes of external and internal waste dumps of soft rocks. The seismogenic processes are especially sensitive at quick accumulation of internal rock dumps as it is easier and faster to deliver soft empty rocks into the quarry than to remote external dumps.

This work describes definite examples of known natural and technogenic earthquakes in Central Asia that show gravitational relation of seismicity with the excessive mass of geological environment. And the technogenic earthquakes are often related to the excessive mass of relatively fast or periodically changing geological environment. These all are tectonic a occur at existing nearby faults.