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Paleoseismological studies of the Jumgal depression

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Using paleoseismological methods, in particular trench work, morphometric analysis of the relief and remote sensing data, it was possible to detect and parameterize several objects marking strong earthquakes in the geographically densely populated Zhumgalsky district.

The Jumgal depression is located in the Naryn region, which is located in the central part of the Kyrgyz Republic, in the Inner Tien Shan, which consists of a system of ridges separated by inland valleys.

The geological structure of the territory of the Naryn region is due to the variety of rock structures and bedrock, which in turn consist of igneous, metamorphic and sedimentary complexes combined into rocky and semi–rock groups, in which dangerous exogenous processes are developed - landslides, rockfalls, scree, karsts. Intermountain depressions are filled with loose Mesozoic-Cenozoic rocks. Numerous dislocations in the form of landslides, gully erosion, mudflows, solifluction, planar flushing and other exogenous processes and phenomena are common in them [1].

In the newest stress field, there is a partial activation of ancient seams and movements along them. Large depressions (Naryn, Kurai, Chui) are associated with the zones of the Kurai-Chui, Sayano-Tuva, Chingiz-Naryn faults. The sides of the depressions are raised relative to the bottoms of the depressions by 1000 m or more. The depressions are drawn into the uplift of adjacent territories, their marginal parts are partially deformed, and the associated uplifts are pushed over the deposits of the depressions [2].

A characteristic manifestation of tectonic movements of the Quaternary period can be found in the central part of the Jumgal depression to the north of the administrative center of the Jumgal district, Naryn region, the city of Chaek. The depression is an asymmetric syncline approximately 70 km long and up to 35 km wide with a rather gentle southern edge and a complex fractured and folded northern boundary.

The system of plateaued hills with a width varying from 1 to 3.0 km stretches along the axis of the syncline for more than 25 km. The largest site is located in the central part of the depression to the north of the city of Chaek [3].

On average, the total displacements along the terraces range from 6 m to 40 m. Considering that in strong earthquakes, vertical movements range from 1 m to 2 m per event, it can be assumed that 15 to 25 paleoseismic events with a magnitude of M = 7-8 occurred during the formation of this landscape.

A fault located in the structure of one of the quarry hills made it possible to study in detail one of these fault zones, at the place of their practical access to the surface.

Using paleoseismological methods, in particular trench work, morphometric analysis of the relief and remote sensing data, it was possible to detect and parameterize several objects marking strong earthquakes in the geographically densely populated Jumgal depression. Vertical movements along the fault running along the Jumgal River were revealed and the ramp structure of the Jumgal depression was noted.

The data obtained indicate the need for a detailed study of the region and clarification of the seismic hazard of densely populated areas, often located along seismic generating structures.

References:

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