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Research Article

ACTIVE EARTH CRACKS AND SEISMODISLOCATION OF CHOTKOL-KURAMA AND NEARBY AREAS

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ABSTRACT
The history of seismic research of the Chotkal-Kurama area is partially covered in the article. Based on the catalog of earthquakes between 07.30.1950 and 07.30.2022, a total of 77 large and powerful earthquakes were analyzed. Earth cracks and Seismic dislocations were reported.

Keywords: *Chotkal-Kurama, Seismodilocation, Earthquake, Active Fault, Meridional And Orthogonal Lineaments*

INTRODUCTION
As the technology of the 21st century develops, solutions to the problems facing humanity are being found. Earthquakes that can cause large losses are predicted in advance, and the damage that can be caused is reduced, as well as seismologically active zones are allocated on the basis of previous earthquakes. For this, various research works are carried out in each region, and new methods are created and put into practice based on new methodological approaches.
Geological and seismological conditions are of great importance in the assessment of seismic risk. Seismic dislocations, which we want to consider, are considered to be products of ancient strong earthquakes and are characterized by their appearance on the surface of the earth. To date, many methods of seismic risk assessment have been developed, the most important of which are tectonophysical (Gzovsky, 1959; etc.), seismotectonic (Gubin, 1966; etc.), quantitative (Petrushevsky, 1959; etc.), geological - geophysical combination (Borisov, Shenkareva, 1972), paleoseismogological (Florensov, 1960; Solonenko, 1962), (Khodjaev, 1985). In 1985, A.K. Khodzhaev studied paleoseismogeology of the Chotkal-Kurama region, and it gained importance with the creation of seismotectonic maps of the region.
One of the signs of focal zones that appear on the surface of the earth with an intensity of more than 7 points is residual deformations of the earth's crust (seismic dislocations) (Khromovsky, 1977). Seismic dislocation is one of the manifestations of the movement of the earth's crust, an indicator of the intensity of endogenous processes. Their study is related to the tasks of engineering-geological research, the problems of seismic zoning and micro-zoning, earthquake sources, the dynamics of their propagation zones, and finally the structure of the earth's crust (Rach 1982). Detailed seismic dislocations of tectonic origin have been discussed as an indicator of the intensity of energy released from depth during earthquakes (Gorshkov, 1977). It is also used to estimate the intensity of earthquakes and serves as the most important element of seismic zoning (Solonenko, 1975; Solonenko, 1962).
The Chotkal-Kurama region is tectonically distinguished by its complexity, tectonic faults and modern tectonics indicate that they are periodically renewed in the relief and at different stages of the development of the crust of the region.
The Chotkal-Kurama mountain system is bordered by Predchimkent and Keless in the northwest, Tashkent in the southwest, Fergana and Nanay depressions in the southeast. It consists of echelon-shaped - parallel - northeastern linear ridges, separated by closed or open intermountain depressions to the southwest in a highland or plateau manner. For the first time in Chotkal-Kurama mountains, A.K. A rhegmatic linament-

crack network based on the interpretation of space photo materials was described by Glux [0], 20 °, 60 ° , 90 °, 310 °, 340 °).

Decoding linear structures or lineaments is used in the analysis and interpretation of space images. It can also be said that for the first time this term was used by the American geomorphologist Hobbs in 1904. Accordingly, at present, a line is understood as any straight-line change in the relief of the earth's surface, landscape and geographical objects.

Also, research and study of the seismicity and seismic dislocation of the Chotkal-Kurama region using the results of the decoding of remote sensing materials will allow to determine the main seismic control directions located in the zone of multidirectional tectonic earth faults in the source zones.

Seismodislocation or seismic dislocation - the release of earth faults to the earth's surface under the influence of an earthquake, the appearance of earth cracks and fissures in loose and solid rocks (seismotectonic dislocations), as well as the collapse of steep rocks associated with the propagation of seismic waves from the center of the earthquake, manifested in the form of landslides (seismogravitational dislocations) .

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In 1956, V.P. Solonenko proposed to estimate the intensity of manifestation of strong earthquakes on the earth's surface by Seismic dislocations affecting layers of different ages. Seismic dislocations are divided into modern (Holocene) and ancient (paleo) ages. Studying them allows us to think about the " complexity of earthquakes " that occurred in ancient times. In seismic microzoning, they allow us to reliably identify dangerous zones, since the information about these earthquakes is not available now, so it is possible to predict their ancient location and impact.

Seismic dislocations belonging to the tectonic type in terms of occurrence are an indicator of the intensity of energy released from depth during earthquakes. They are used to estimate the intensity of the earthquake and serve as the most important element in seismic zoning. Seismic dislocations are one of the manifestations of the movement of the earth 's crust, an indicator of the intensity of endogenous processes. Their study is related to the tasks of engineering-geological research, the problems of seismic zoning and micro-zoning, the dynamics of earthquake source zones and the structure of the earth's crust. The different types of faults that occur during strong earthquakes serve as indicators of the processes occurring at the source of the earthquakes.

Seismic dislocations should be clearly distinguished from exogenous dislocations, because including exogenous landforms in the category of Seismic dislocations can lead to incorrect paleotectonic generalizations.

One of the effective methods of dividing deformations into seismogenic and exogenous types is the gamma-imaging method.

A detailed description of paleoSeismic dislocations and magnitude calculations that created seismogenic forms A. Khodjaev's monograph "Paleosesmogeology of the Chotkal-Kurama region" (1985)/ I.N. Lemzin's monograph "Geomorphology and Paleogeography of the Chotkal Basin in the Cenozoic Period" (1988) is additional material on paleoSeismic dislocations for this region.

A.M. Korzhenkov's and O.K. The work of Chediy provides information about an unknown unknown region of significant paleoSeismic dislocations in the Karakudjur depression of the Central Tien-Shan, which has long been considered a weak seismic area. Later K.E. Abdrahmatov and I.N. Lemzins found a large number of significant paleoseismic dislocations in the Norin River basin.

O.K. Chedi was engaged in the study of Seismic dislocations of Tien-Shan, in his monograph "Morphostructures and new tectogenesis of Tien-Shan" (1986), information about some Seismic dislocations is given. At the same time, O.K. Chedi *et al.* (1986) Chediy and Korzhenkovs (1997) studied the long-term preservation of geomorphological traces of ancient seismic disasters in the Kemin Basin of Northern Kyrgyzstan . OK Chedia et al. In [20] studies, information about Seismic dislocations in the Chui basin is described. In one of them, the epicentral zone of the 1475 Balasogun earthquake was identified, and in the other, Seismic dislocations were explored by digging deep along the seismically active Issyk-Ota fault.

K.E. Abdrahmatov is one of the scientific researchers who made a great contribution to the study of Seismic dislocations of the Tien-Shan region, and his candidate and doctoral theses [2] are generalizations in this regard. In the first scientific work, a brief description of the Chui geodynamic range is given, and in the second, a brief description of Seismic dislocations of the entire Tien-Shan orogen. Description and analysis of paleo- and Seismic dislocations Abdrahmatova and Surkova (1991, 1992); Abdrakhmatov *et al.* (2002) in many works.

In our opinion, it is important to distinguish Seismic dislocations as lineaments by automated and visual decoding in multispectral and radar space images obtained in the invisible range of electromagnetic radiation. Previously, it was found by researchers that the ground cracks associated with Seismic dislocations are reflected in the radioactive field [5-6].

Research methodology. The catalog of earthquakes that occurred in the region in previous years can be found on earthquake.usgs.gov from 07/30/1950 to 07/30/2022. A total of 77 earthquake catalogs were downloaded for the interval .

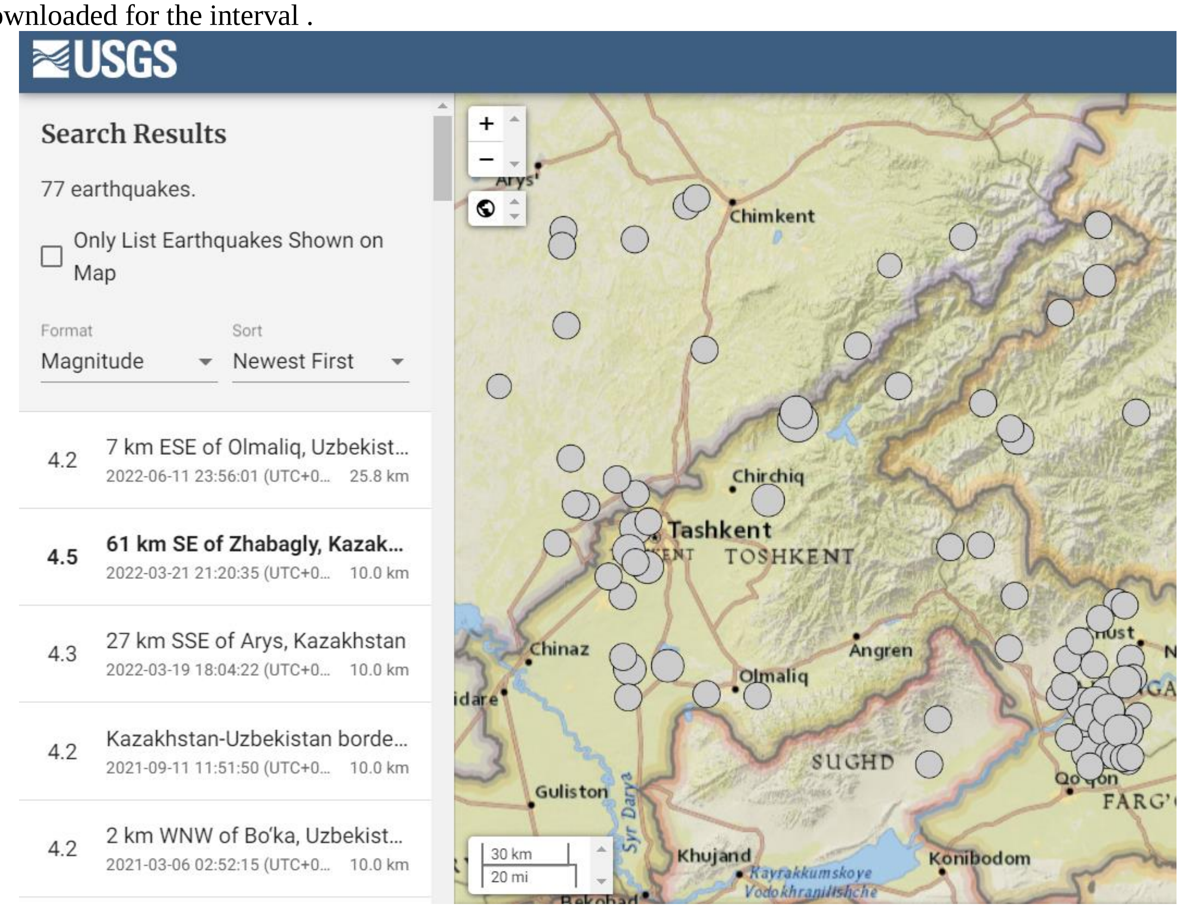

Figure 1. From earthquake.usgs.gov for the analysis of seismic dislocations by research area 07/30/1950-07/30/2022. catalog of earthquakes between

Hidden lineaments can be seen in the metamorphic layers of the basement in the form of blastomylonites. That is, in the process of metamorphism, deep deformation and decomposition, as well as recrystallization and new formations are formed. At the same time, the mylonite structure undergoes a general recrystallization process and eventually transforms into the blastomylonite structure.

Blastomylonites pass into the layers of the upper structural layers, take the form of small fracture zones and appear on the surface of the earth. This type of damage, apparently, develops from the bottom to the top, and can be expressed in the form of flexures, which are repeatedly updated at different stages . This is the basis for distinguishing this type of lineaments as "hidden earth cracks of the foundation".

The second sign of identifying hidden lineaments is characterized by the variety of forms of manifestation at different stages of geological development. Many indicator signs of "hidden earth faults" or lineaments can be described as a system of geological and structural anomalies.

Another characteristic feature of lineaments is their dislocation anomalies. The zone of lineaments is oriented at a sharp angle to the azimuth of the direction of the folds. The linear zones often pass along the bends of the flexure-shaped layers and do not appear in the form of specific zones of dislocations. But it is reflected by a number of partially concave shapes, which show that the cracks are clearly delimited by a linear zone. Zones of cross-fold lineaments often correspond to concave cross-folds of series of parallel fold structures.

The main discontinuity structures of the Chotkal-Kurama area formed during the Hertzian orogeny are: Kumbel, Julaysay, Kenkol, Arashan and Beshtash faults. The Satartav subduction is related to the Alpine orogeny.

The Qumbel fault is one of the largest faults in the region. It has a total length of about 120 km, a bearing of 315° NE, and a vertical or nearly vertical dip.

Both sides of the Kumbel fault have two hornblende wings and exhibit silicified, carbonated zones interspersed in the dark gray marble limestones of Rizaksoy and the granitoids and quartz porphyries of the Kyzil-Nura effusive suite. The thickness of the zones ranges from 5-10 m to 40-50 m.

The Julaysay fault extends for 20-25 km in the northwest (330°) direction. Along its entire length, especially in the southern part, the earth fault is accompanied by a strong bright zone, brecciation, silicification, pyritization, cracking of rocks in some places, extensive development of dykes of acidic to basic composition. The thickness of the rock zone reaches 120 m.

A large fault is located in the north-east of the Kumbel and Julaysay faults, and has a vertical dip angle of 290 - 310° to the north-west. Its length is 70-75 km. The fault zone on the surface of the earth is manifested by sharp crushing, brecciation, silicification, chloritization and epidotization of the main rocks, varying in thickness from 40-50 m to 100-150 m. The fault zone (including fractured parts) is accompanied by the development of dyke formations, mainly quartz porphyries, and in some places quartz, barite and calcite veins.

The Arashan fault is of regional significance and crosses the Kurama and Chotkal ridges in the north-west (SW - 315°) direction. In these areas, the total length of the fault is about 20-25 km, the angle of lying is vertical. The fault is represented as a belt of brecciated, quartzized, ferruginous, epidotized and chloritized rocks (mainly granodiorites of Karamazar type) with a thickness of 50-100 m.

The Satartau thrust delimits the Satartau ridge, with a dip angle of 30-35° in the southwest direction. The metamorphosed rocks are overlain by Cretaceous and Neogene deposits. Along the direction of the fault, weak rock fissures are visible, and weak quartzization is observed only in the area of Chorvadala village.

Figure 2 presents a catalog of active faults and earthquakes of the last 70 years of Chotkal-Kurama and adjacent areas .

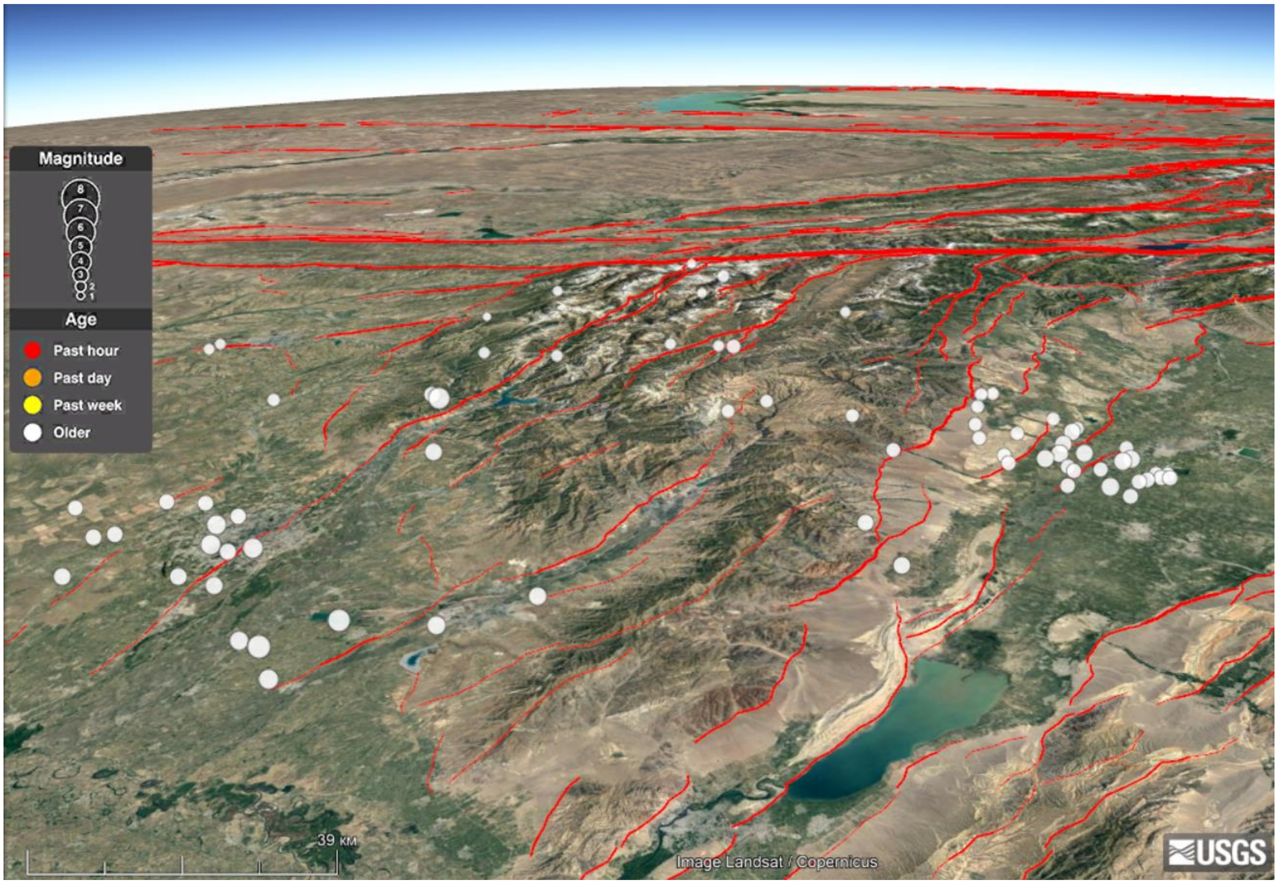

Figure 2. Catalog of active earth faults and earthquakes in the three-dimensional relief model of the Chotkal-Kurama area (active earth faults in red, earthquake catalog is circular in white, size is reflected by magnitude).

The formation time of the superstructure corresponds to the Alpine orogeny.
In addition to the regional ground faults described above, a number of smaller discontinuous faults are observed in the area. The length of this zone of cracks in the form of small cracks is from several hundred meters to several kilometers. They are represented by zones of brecciation, quartzization, chlorination and sericitization of surrounding rocks

RESULTS AND DISCUSSION

Based on the generalization of the above, we can say that the land for the region is a sign of the division of the fault zone, and it is a secondary change of the rocks. For this purpose, it is important to carry out lineament analysis taking into account the catalog of active earth faults and earthquakes in the determination of Seismic dislocations formed throughout the region.
The research area has complex folds and cracks, and structural tectonic analysis, taking into account the mechanisms of formation of the earthquake center and the directions of the vector of stresses, allows to separate Seismic dislocations associated with earthquakes in the area.

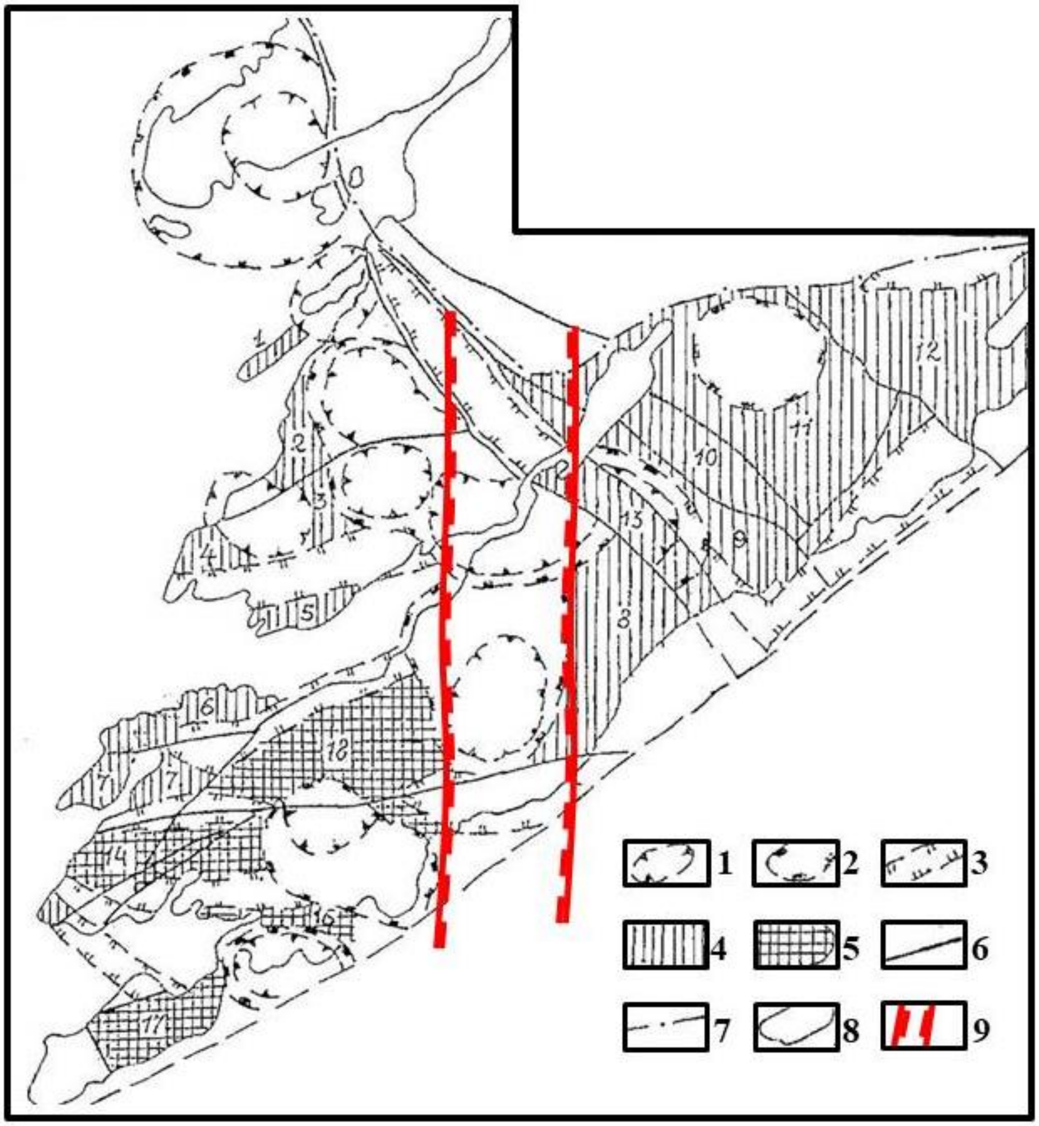

Figure 3. Block structure scheme of the Kurama zone (according to V.A. Arapov, 1996y). *Conditional signs: 1- calderas; 2- annular depressions; 3 - grabens and depressions in front of the earth's fault; 4– elevations; 5- horst - anticlines; 6- earth cracks; 7- Border of Kurama and Chotkal zones; 8 - Paleozoic openings; 9-The zone of permeable cracks in the meridional direction isolated by the author. Ascents (numbers in the picture): 1 - Surenota, 2 - Soqok-Zarkent, 3 - Aqcha-Shavaz, 4- Kaynar, 5 - Talbuloq, b - Northern Almalik, 7- Kalqonata, 8- Gudas, 9- Chadak; 10- Kandagan, 11- Govasay, 12- Kassan; 13- Oktepa. Gorst - anticlines: 14- Central Karamozor; 15-Southern Karamozor; 16- Okurtov; 17– Mogultov; 18- North Karalazor.*

The spatial distribution of the catalog of earthquakes in the analyzed area indicates that there is a rift zone crossing the Ugam-Kumbel structural formation subzone in the meridional direction, directed at an acute angle to the Talos-Fergana fault (Fig. 3).

Perhaps, this zone may be related to the zone of conductive orthogonal lineaments [16] separated by Peretrutov (1985) for the Chotkal-Kurama area.

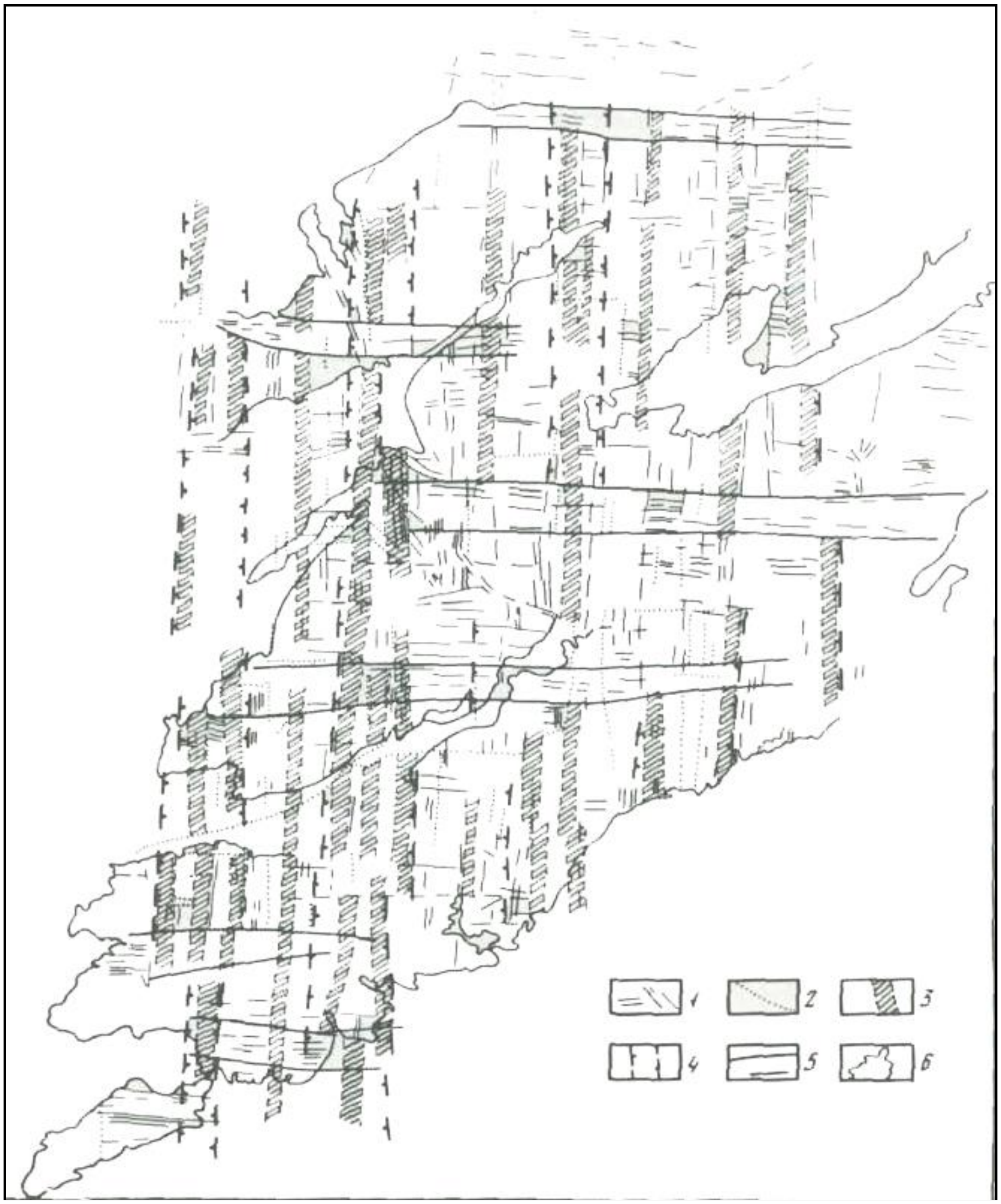

Figure 4. System of orthogonal lineaments of the Chotkal-Kurama area (according to A.V. Peretrutov, 1985). *1- ground faults detected by interpretation of high-altitude images; 3- high fracture zones according to morphostructural data; 4-Outline of conductive zones; 5- high crack width zones; 6- Paleozoic rocks.*

Lineament analysis allows Seismic dislocations or other types of particularly seismically active lineaments to be separated by complex features. Lineaments can sometimes have meridional, submeridional, or orthogonal orientation with different orientation properties . The zone of lineaments extending or oriented in this particular direction exactly coincides with the seismically active zones.

In 2017, A.K. Nurkhodjavev and others conducted a cosmogeological survey on a scale of 1:500,000 for the entire territory of Uzbekistan and separated lineaments associated with Seismic dislocations for the Chotkal-Kurama region.
The complex analysis of the materials of decoding of multi-zone space images with geological, geophysical, and morphostructural data by earlier researchers in the area made it possible to distinguish a number of fractured permeable regional fault zones (lineaments) of different orders of meridional and latitudinal directions in the Chotkal-Kurama region (Fig. 4). .
Lineaments parallel to the general direction of folding may be encountered along with a series of compact linear folds with deeply eroded cores, which are evident in relatively old deposits in the surrounding area. Such folds are often located as an echelon, separated by weak dislocations, appearing as broad and oblique folds or monoclinals, linear zones accompanied by a relatively narrow lineament compressed lineament development zone. Folds also differ in significantly smaller transverse dimensions.

SUMMARY
The analysis of the distribution of the catalog of earthquakes in the region of 1950-2022 shows that the repetition of the catalog of earthquakes along the linear direction zone in the transition from the northern side of the Fergana depression to the southeastern part of the Kurama mountain range is conditioned by the influence of the Northern Fergana fault zone. Similarly, in the Chotkal and Kurama mountain ranges, it is observed that the catalog of relatively strong earthquakes is controlled by the zone of strong active earth faults.

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