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COSMOSTRUCTURAL MODEL OF THE MALGUZAR MOUNTAINS FOR ORE BEARING DATA PROCESSING ON THE LAIYAGUN MINERALIZED ZONE

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Annotation. *Analysis of geological prospecting, geological surveying, geochemical and other materials of the territory of the Malguzar Mountains allows us to note that here the ore-bearing formations are Silurian formations (sandstones, gravelstones, shales), crumpled into folds, which are complicated by a series of faults of north-west strike, zones of splitting and etc. These structures are rectilinear, their zone is characterized by the presence of small fracture structures, areas of swellings (Liyagun mineralized zone) and splits (Ardakshan area). The reason for these swelling and splitting, where gold mineralization is noted, remains not fully studied. The importance of studying these features of ore-controlling faults is determined by the confinement to their zones of gold mineralization and geochemical halos of the main 5 ore chemical components. Consequently, the identified ring structures of the Malguzar Mountains are signs of deep granitoid magmatism, with which gold ore mineralization is genetically related. In the course of the study, linear structures of northeastern striking were established, which, together with northwestern and sublatitudinal faults, form the block structure of the study area.*

Key words: *Malguzar mountains, Laiyagun mineralized zone, ring structures, mineralization, geochemical aureole, magmatism, granitoids, gold occurrence*

Introduction. Currently, within the ring structures, more than 70% of the world's gold deposits have been identified, including the deposits of Western Uzbekistan, which are genetically related to granitoids. (D. Rundqvist et al.). As is known, the formation of the vast majority of ring structures in the earth's crust is associated with magmatism processes, from its last stage of development, when hot liquid ore-bearing fluids (subcrustal or mantle), rising to the upper horizons of the lithosphere, lose their energy (Planet Earth, Tom Mineralogy) (Planet Earth. Saint Petersburg, Ore deposits of uzbekistan. Tashkent, gidroingeo, 2001) [18]. However, the yield of products of granitoid magmatism on the surface of the Malguzar Mountains is insignificant.

The wide development of folded structures in combination of steeply dipping fault-strike-slip large faults indicate the tectonic activity of the Malguzar Mountains area during the Hercynian tectonic cycle. Geodynamics at that time was characterized by horizontal-vertical movements of the territory of the Malguzar Mountains**.**

Horizontal movements led to the formation of linear (northwestern strike) folded structures with the subsequent complication of their axial parts by rectilinear large steeply dipping faults, in which subsequently vertical movements in the form of a fault were observed. As a result of vertical-horizontal movements, morphological changes in the fault zones occurred with the formation of systems of small fracture structures within the zones, areas of swelling, pinching

and splitting.

In the pre-ore stage, the territory of the Malguzar Mountains was in a tectonic active phase. In contrast to this, magmatic processes manifest their passive activity, as evidenced by the small number of small ring structures and the absence of intrusive massifs. Dike formations (acidic and basic composition), in the opinion of many researchers, are products of recent magmatic processes, and they are indicators of deep magmatic bodies.

The Laiyagun mineralized zone is structurally a strip of close faults of sub latitudinal and western northwestern striking, isoclinal folding with intense silicon-carbon metasomatism in the rocks. Interpretation materials for high-altitude space images and Aero Photos The images indicate the continuation of the strip to the Marjanbulak Upland (Mikhailov-Kiselevsky et al., 1989f). The Laiyagun mineralized zone, considered already at the stage of geological survey as an ore strip (Tabachkov V.A. et al., 1966f), is limited in the north by the North-Zambar uplift, in the south by the Kurpinsky upthrust; a similar structure of deep and long development - Laiyagun reverse fault strike-slip. The ore-controlling importance here is played by feathering and spalling cracks, interstratal delamination, genetically related to folding and renewed, blocked by cutting faults. The strike of the zone in the west is latitudinal, in the central and eastern parts of Malguzar it changes to the north-west, its length from west to east to the border of the Republic is about 85 km, width is from 2 km to 6 km. In the western part of the Laiyagun mineralized zone, there is the Bakhmal silver-gold deposit, in the eastern group of small manifestations of gold mineralization. Ore minerals of the Malguzar mountains are represented by deposits and ore occurrences of gold and mercury, ore occurrences of titanium, copper, molybdenum, vanadium, tungsten, lead, zinc, uranium. The manifestations of ore mineralization of other types, at the achieved level of knowledge, have an indicator value (lithium, fluorine, antimony, bismuth, etc.) (Bakhmal, Etytau). The metallogenic feature of the Malguzar Mountains is determined by noble, non-ferrous, and ferrous metals. Research methods. In order to determine the reasons for the formation of swelling of cleavages and other ore-bearing elements in the zones of large ore-controlling faults, the materials of remote sensing of the earth were involved in the study, the interpretation of which may reveal the reasons for the change in the morphogenetic features of the northwestern ore-controlling faults, which are associated with the formation and spatial distribution of gold mineralization.

Cosmophoto of materials (scale 1: 50000 1: 75000) have undergone visual interpretation, since this method allows obtaining more reliable information on the structural and tectonic structure of the earth's crust surface. It should be noted that the State Enterprises "Institute of Mineral Resources" (Center for Remote Sensing of the Earth) within the framework of Geological Examination of Area-50 2012-2018, carried out cosmogeological studies of the territory of the Malguzar Mountains, while the main research method was the automated interpretation of remote sensing materials. Based on the research results, a cosmostructural model of the southeastern part of the Malguzar mountains was compiled, where the Laiyagun area (mineralized zone) is located. The basis of the cosmostructural model is formed by the north-western to sublatitudinal linear structures. The overwhelming majority of them coincide with the results of our research. In addition to isolating and studying cosmostructures, they carried out work on the revealed halos of sulfide minerals with which gold is associated. These studies were carried out in two promising areas Ardakshan and Kuduk. The materials of their remote sensing made it possible to identify ring, linear cosmostructures. Ring structures are very rare and small (2.5-4.5 km) ring structures. In the destruction of their original ring shape, the main role was played by the north-western ore-controlling to the north-eastern transverse linear structures [9]. The most widespread development was received by linear cosmostructures, northwest, transversely to them northeast directions. The interrelation of northwestern faults with transverse northeastern structures led to the formation of intersection areas with the formation of splitting, swelling and pinching in the zones of ore-controlling faults, which subsequently became a favorable structural position for the manifestation of gold ore mineralization in the ore stage.

On the basis of cosmogeological studies, the cosmostructural models of the Malguzarskie

mountains and the Lyailagunskaya area were constructed. The initial data were various multispectral satellite images (Landsat5_7, QuickBird), spectral libraries available in the ERDAS IMAGINE 9.2 software (Aster, JPL, USGS) and geological and geophysical data. To increase the resolution.

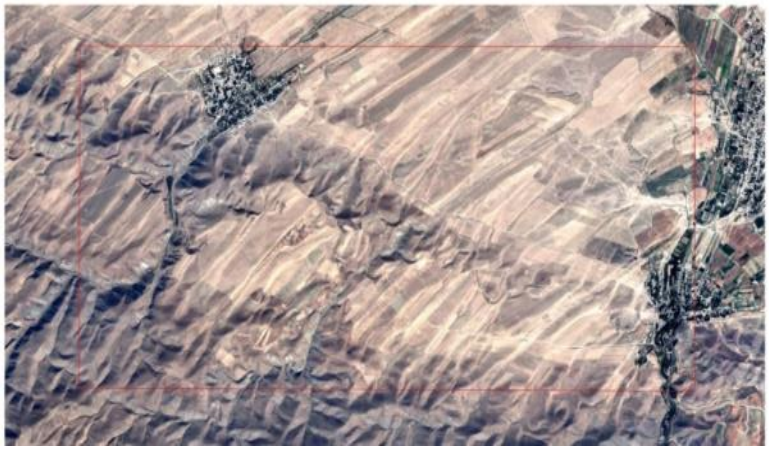

Fig 1. Processed satellite image of Landsat 7 on the territory of the Ardakshan prospective area (Materials of the State Enterprises "Institute of Mineral Resources") Scale 1: 25000

Digital processing of satellite images was carried out by the methods of ACP, ITS, Kirsch and Index IV. As a result, several versions of processed satellite images were prepared (scale 1: 25000).

The main formations of rocks, differing in their mineralogical composition, have been mapped using the ACP method, the main geological-material complexes have been identified.

By the Kirsch method, the contours of linear lineaments, as well as concentric and arcuate structures of territories (foothill plains) are distinguished. The Index IV method fixed the structural linearities, both in bedrocks and in areas overlain by loose formations

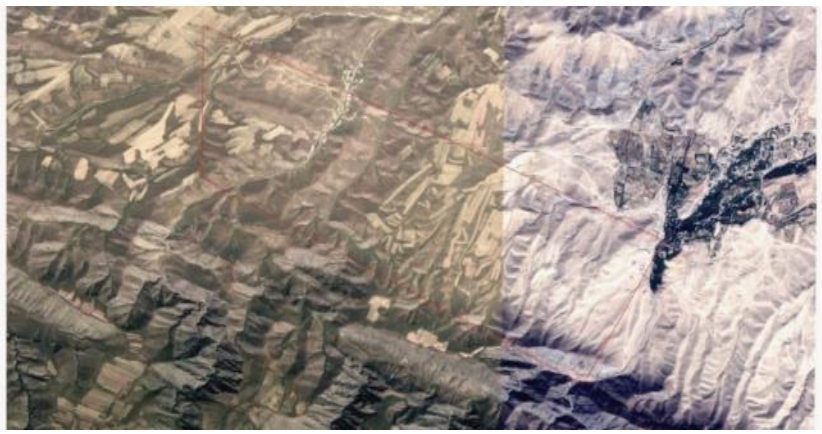

Fig 2. Processed satellite image of Landsat 7 on the territory of the Kudukchy prospective area (Materials of the State Enterprises "Institute of Mineral Resources") Scale 1: 25000

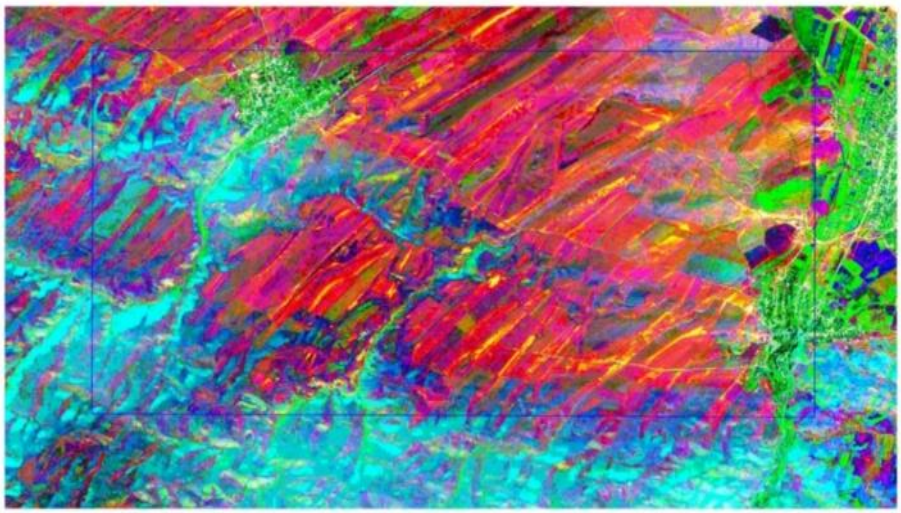

Fig 3. Processed satellite image of Landsat 7 on the territory of the Ardakshan prospective area (Materials of State Enterprises "Institute of Mineral Resources")
Scale 1: 25000

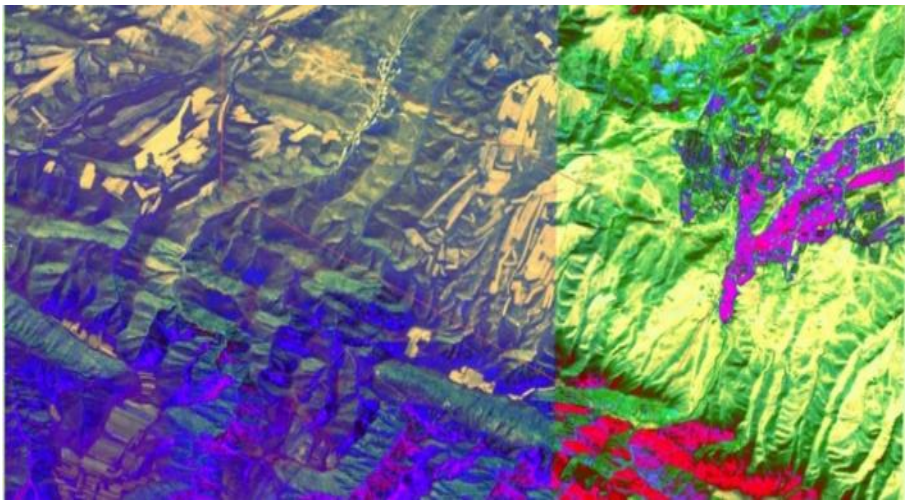

Fig 4 Processed satellite image of Landsat 7 on the territory of the Kudukchinskaya prospective area (Materials of State Enterprises "Institute of Mineral Resources")
Scale 1: 25000

Research results. In the course of interpretation, several small ring structures and a number of systems of linear structures were identified (Fig. 5, 6). In total, six small ring structures with a diameter of 2.5 km to 4.5 km were identified. Only one of the largest ring structures to the north-east of the Malguzar Mountains has retained its rounded shape. The rest of the ring structures are represented by their fragments. The revealed linear structures (faults) of northeastern strike played an important role in changing the initial morphology of the ring structures. The inner part of the ring structures is composed of both Paleozoic and Cenozoic formations.

Deciphering of Earth remote sensing materials made it possible to identify a number of systems of linear structures; northwest; northeastern; sub latitudinal and meridional directions.

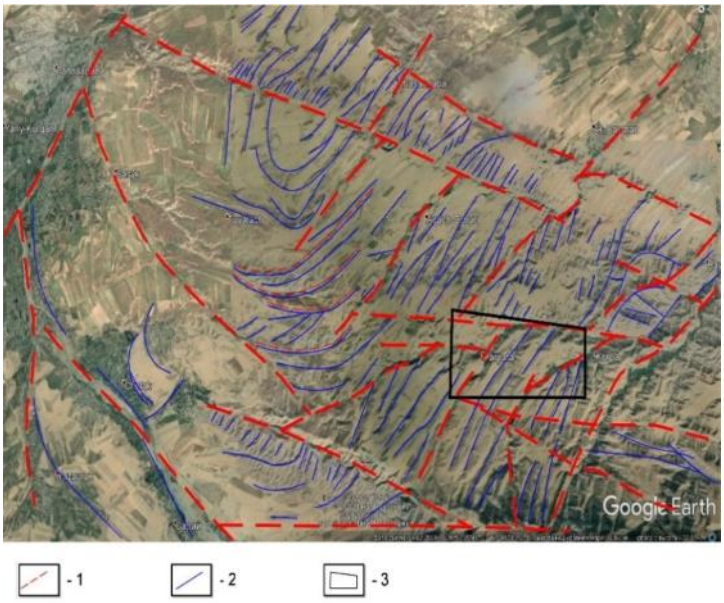

Fig. 5 Space structural model of Malguzar mountains
1 - Supposed faults; 2 - Reliable tectonic faults; 3 - Laiyagun mineralized zone.

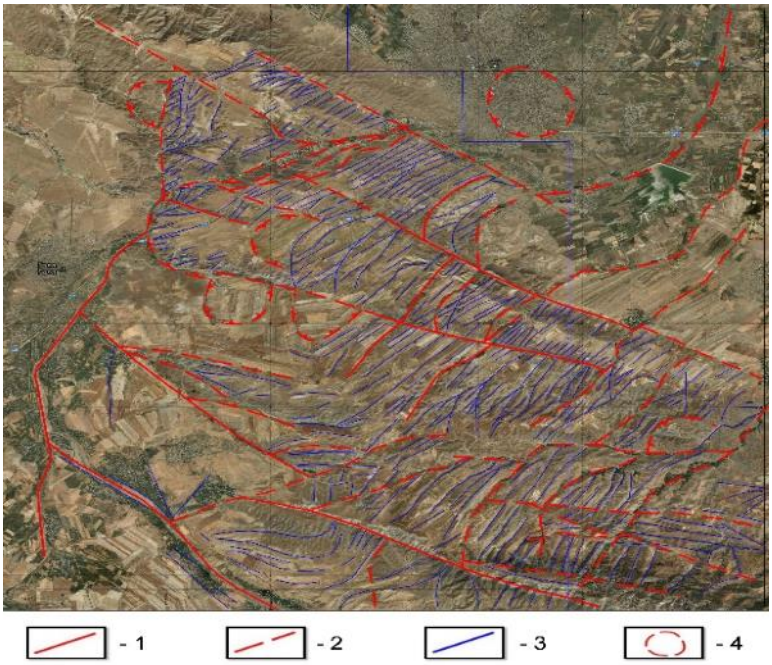

Figure: 6. Cosmostructural model of the Malguzar Mountains
1 - Reliable faults; 2 - Suspected tectonic faults;
3 - Reliable tectonic faults; 4 - Ring structure.

The most widespread development are linear structures of the north-western and northeastern directions, in the linear structures of the north-western and latitudinal directions were revealed earlier in the course of prospecting work and State geological surveys 1960-1973 (M.M. Poskhova, I.G. Toshpulatov, V.A. Tabachkov, A.N. Glukh, I.O. Rapotani and others). Deciphering showed their straightforward morphology [8].

Aerial photographs revealed that linear structures of the north - western direction displace the north - eastern linear structures, complicating them. They are not inferior in length to the linear structures of the northwestern system. Their important feature is the change in morphology; in the northern part of the Malguzar Mountains, they are straight-line displaced and displaced by northwestern ore-controlling faults; in the southern half they are wavy and broken, which

testifies to their deformation. The change in morphology took place in the zone between two large and ore-controlling faults in the northwestern direction. One of which runs north, and the other south of the Laiyagun mineralized zone.

The change in the morphology of northeastern linear structures in the strip between large northwestern and sub latitudinal faults in the southern part of the Malguzar Mountains can be attributed to two reasons:

1. In many cases, in the zones of intersection of northwestern, sub latitudinal and northeastern structures, the latter are displaced by northwestern and sub latitudinal faults, which suggests that the northeastern linear structures are older and displaced by younger northwestern and sub latitudinal faults ... The tectonic activity of northwestern and sub latitudinal linear structures may correspond to the last phases of the formation of folded structures and also to the pre-ore stage of the development of the Malguzar Mountains;

2. The second reason is that the northwestern linear structures have repeatedly become tectonically activated and, regardless of the age of the northeastern linear structures, the geodynamic setting (the period of ore formation or after it) determined the tectonic activity of only northwestern sub latitudinal linear structures, and the north - the eastern ones remained passive in their movements. This was reflected in the relationship between tectonically active and passive structures carved out in the displacement of northeastern (passive) faults by northwestern and sub latitudinal active structures.

The northeastern linear structures revealed during the interpretation, together with the known northwestern and sublatitudinal faults, complicated the structure of the study area, forming blocks. The study of the internal picture of the phototone of each block from space images made it possible to establish that the phototone of the selected blocks differs from each other, if for tectonic blocks in the northern, eastern and southeastern territories of the Malguzar Mountains, straightness is characteristic, and a very weak bend of the dark photon is the central and southwestern parts of Malguzar are plumose branches, a steep bend, a semi-oval morphology of dark phototone, which is a deciphering feature of surface morphology.

The geomorphological peculiarity of tectonic blocks suggests that their tectonics and geodynamics were changeable in space. This could not affect the manifestation of various geological phenomena, including ore ones. The analysis shows that most of the zones, areas, points of occurrence of gold mineralization are located in the central southern parts of the Malguzar Mountains, confirming the scientific results obtained by decoding the remote sensing materials of the Malguzar Mountains. The position of the Laiyagun mineralized zone in the cosmostructures of the Malguzar Mountains is determined by its confinement to the strip between two large linear structures of sublatitudinal strike, complicated by a series of northwestern and northeastern faults. Deciphering space images of the Laiyagun area on a larger scale (1: 25000) made it possible to build its detailed cosmostructural model (Fig. 7).

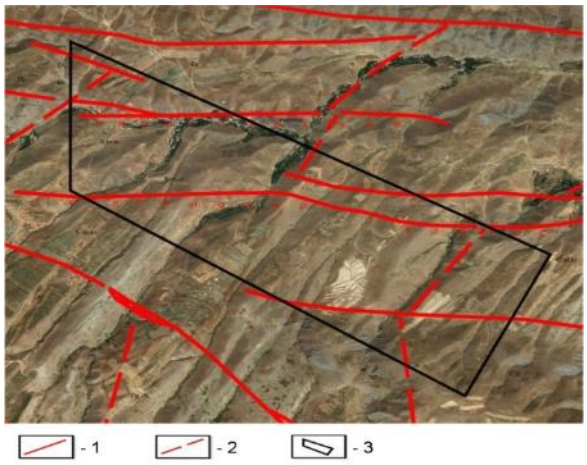

Fig. 7. Scheme of the cosmostructural model of the South-Eastern part of the Malguzarskie

mountains Laiyagun area
1 - Major tectonic faults; 2 - Minor tectonic faults; 3 - Laiyagun site.

There are no ring structures in this area. The most widely developed linear cosmostructures of northwestern strike. These are rectilinear faults of various lengths, in places interrupting branched ones. Their discontinuity and ramification in many cases is associated with the influence of northeastern structures. Crossing the north - western faults, they displace and branch, which leads to an increase in their thickness and a change in morphology

Figure: 8. Scheme of the cosmostructural model of the South-Eastern part of the Malguzar mountains Ardakshan area
1 - Major tectonic faults; 2 - Minor tectonic faults; 3 - Ardakshan area.

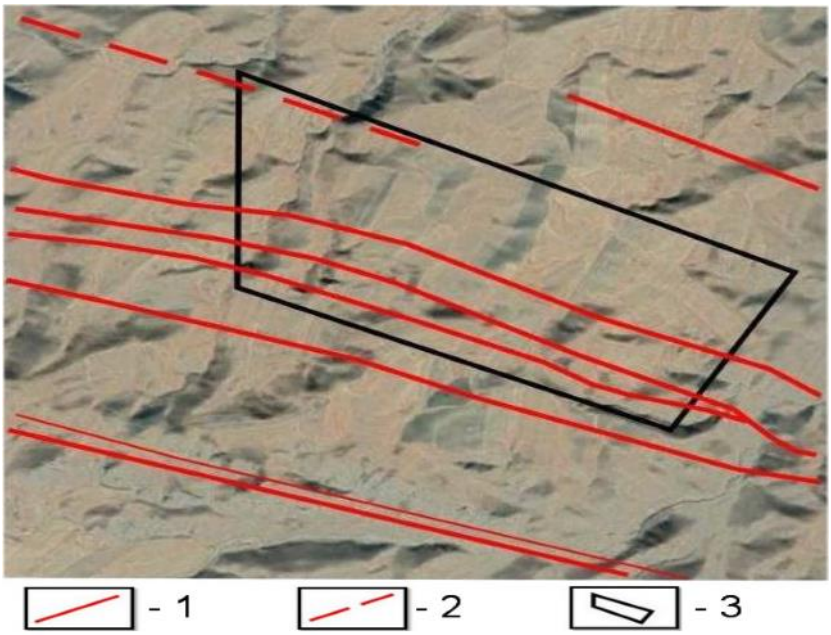

Figure: 9. Scheme of the cosmostructural model of the South-Eastern part of the Malguzar mountains Kuduk area
1 - Major tectonic faults; 2 - Minor tectonic faults; 3 - Kuduk section.

The most promising identification of gold mineralization is the Ardakshan area controlled by the

Zargar system of faults by Devonian limestones. According to the results of the conducted cosmogeological studies within the Laiyagun mineralized zones, numerous ore points and halos of the development of sulfide minerals have been revealed. By the totality of the established direct and indirect cosmogeological signs of gold mineralization, by the conditions of the spatial, cosmostructural features of their localization

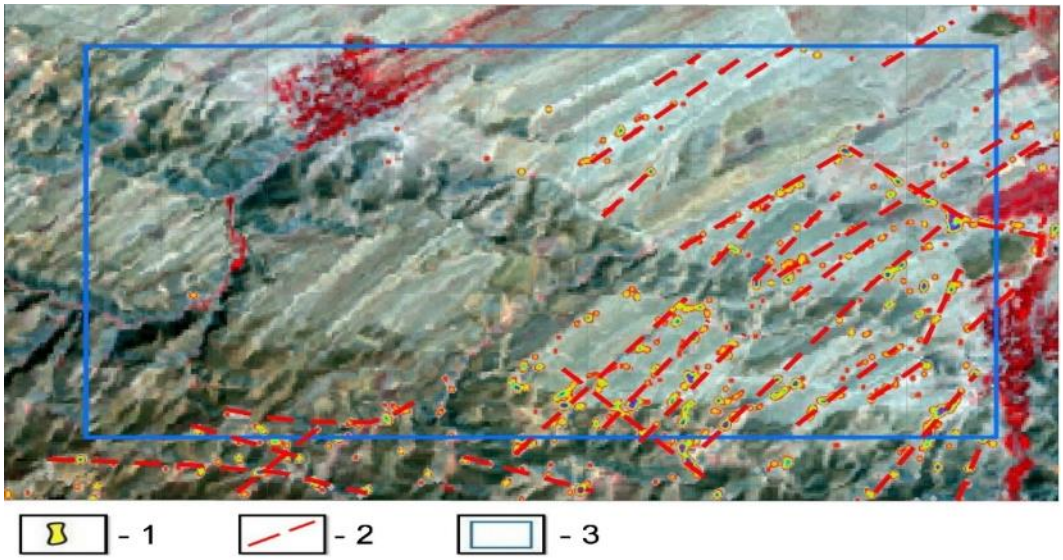

Fig 10. Mineral halos of sulfides of the Ardakshan site according to cosmogeological data: 1 - Halos of sulfide mineralization; 2 - Tectonic faults (faults); 3 - Contour of the Ardakashan area.

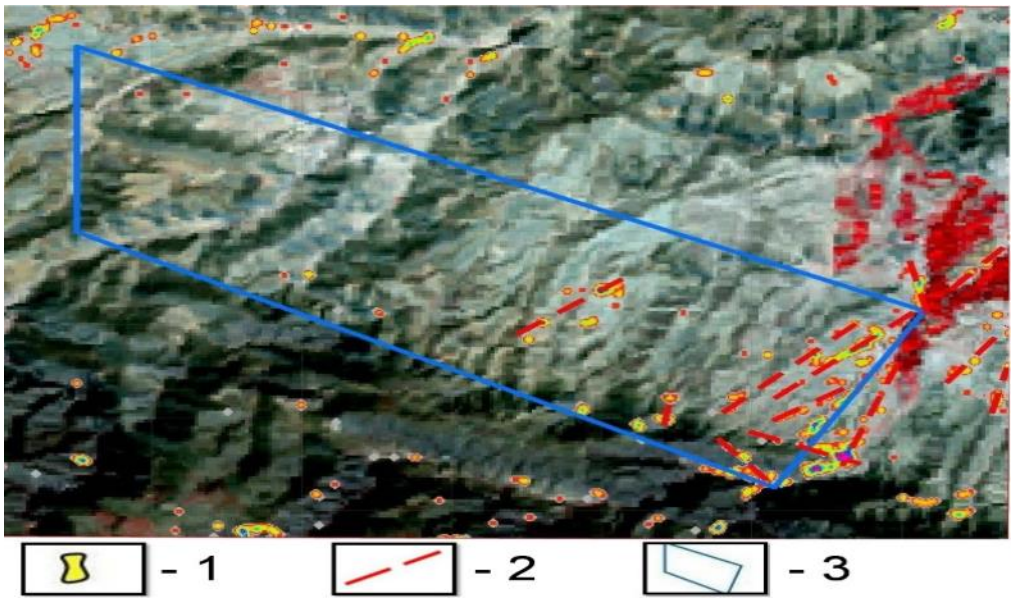

Fig 11. Mineral aureoles of sulfides of the Kuduk site according to cosmogeological data:1 - Halos of sulfide mineralization; 2 - Prospective tectonic faults (faults); 3 - Contour of the Kuduk area.

Conclusions. Cosmogeological studies of the territory of the Malguzar Mountains and the Laiyagun area on the basis of a cosmogeological study made it possible to establish that the halos of sulfide mineralization are located mainly strictly along the line of the north-east direction. On the Ardakshan section - along two lines: north-east and north-west directions. The reason for this spatial distribution of halos is in the presence of linear structures (faults) of

northeastern striking, which controlled the formation and placement of halos of sulfide mineralization. The placement of sulfide mineralization halos along the northwestern direction is out of the question, since prospecting and geological surveys have revealed a system of northwestern faults that control the occurrence of gold mineralization in the Malguzar Mountains. However, halos of sulfide mineralization are located strictly along the line of the northeastern direction and, in all likelihood, their formation and placement are controlled (?) By a system of linear structures of the northeastern direction. This corresponds to the results of our cosmogeological studies, where the main element is the identification of systems of northeastern linear cosmostructures in space images, which played a certain role in the location of the gold mineralization of the Malguzar Mountains [14].

According to prospecting and survey data (M.M. Poskhova, V.A. Tabachkov, M.P. Pulatov, Yu.G. Spirin, and others), the study of the patterns of formation and distribution of gold mineralization in the Malguzar Mountains showed that gold ore mineralization is associated with zones of expansion and swelling of north-western ore-controlling faults. However, deciphering of cosmosinimki shows that the revealed cosmostructures of the northeastern direction play an important role in the formation of these ore-bearing elements of the northwestern fault. This is one of the important cosmostructural signs of gold mineralization in the Malguzar Mountains and it is recommended to use it as a criterion for forecasting and prospecting gold ore occurrences in the Malguzar Mountains. In addition, the results obtained can be effectively used in areas with a low thickness of the sedimentary cover when prospecting for deposits, for which the structural factor of mineralization control plays a significant role.

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RESEARCH AND CALCULATION OF THE STABILITY OF ADJACENT ROCK MASS USING THE “USTOI” PROGRAMM

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Abstract: *One of the main challenges facing deep quarries today is ensuring the stability of the quarry board. The article considers the influence of natural and man-made factors of mining operations on the stability state of the quarry sides. To maintain the quarry side stability, the efficiency of mining operations and security work, the results have been presented using the program. When determining the results, the "VNIMI" method is used, which uses the algebraic sum of forces, as well as the "master" program with the addition of additional factors. The research was carried out on four characteristic profiles in the sides of the quarry using the VNIMI methodology and the multifunctional computer program "Ustoi", as well as the procedure for calculating the stability margin coefficient. The calculation results calculations show that with increasing the General angle of the side, the margin coefficient decreases, but the width of the collapse prism increases. Summing up, we can say that when calculating the stagnation of the Board, using the "master" program, the change in the stagnation reserve coefficient is given and it is recommended to adhere to it for quarry boards with a height of 500 meters and higher.*

Key words: *fracturing, quarry, ledge, side, board, drilling and blasting, massif, impulse, development system, stability, drilling of over.*

Currently, the development of mineral deposits is accompanied by an intensive increase in the depth of quarries, which is associated with the risk of deformations of the near-contour rock mass due to unfavorable geological and engineering conditions, changes in the stress-strain state of the rock mass and the impact of seismic waves of natural and man-made origin [1,2].