International Journal of Geology, Earth & Environmental Sciences ISSN: 2277-2081
An Open Access, Online International Journal Available at http://www.cibtech.org/jgee.htm
2019 Vol. 9 (1) January-April, pp. 45-52/Bayramovich et al.
Research Article

STRUCTURAL FEATURES OF THE SOUTH-WESTERN GISSAR REGION ACCORDING TO EARTH REMOTE SENSING DATA

***Goipov Akram Bayramovich, Abdullaeva Mukhayyokhon Akramovna, Hasanov No'monjon Raxmatovich**
Faculty of Geology and Geographic Information Systems, National University of Uzbekistan, Tashkent, Uzbekistan
**Author for Correspondence*

ABSTRACT
The article presents the results of cosmological studies of the south-western spurs of the Gissar Range. A cosmo-structural map of the region was compiled on a scale of 1: 100,000. Cosmic-structure maps featured several predicted local oil and gas promising structures, which are characterized by a high degree of geodynamic activity of the relief and are potentially promising areas of likely hydrocarbon accumulation. Including the article presents the data of space structural features and structurally interpretive signs of the south-western spurs of the Gissar ridge, associated with oil and gas content.

Keywords: *Fluid, Anticlinal Structures, Thrusts, Lineaments, Faults, Ring Structures*

INTRODUCTION
In world practice, the cosmogeological method (the method of remote sensing of the Earth) is one of the priority areas of research and is widely used both to predict and identify structures that are favorable for the accumulation of hydrocarbon deposits and to conduct geological prospecting in order to detect oil and gas deposits.
Remote methods are most effective in studying the structures of a sedimentary cover of a different order, with which oil and gas fields are spatially associated.
The south-western spurs of the Gissar Range (SWSGR) belong to highly promising areas in search of oil and gas.
The study of the tectonic structure and oil and gas potential of this region was carried out by such scientists as Telnov, S.V.Ekshibarov, Tseisler, Tazhetdinov, Umarkhodzhayev, (Madenov, 1973), Kenzin, Mogilevsky, Yuriev, Bekker (Bekker, 1996), (Leonov 2013), and others. Using cosmophotomaterials: Tikhonov, (Glukh *et al.,* 1982, 2006, 2008), (Poletaev *et al.,* 1984) Vnuchkov, Azimov, Sidikkhodjaev, (Amursky *et al.,* 1978), Valiev, (Tevelev *et al.,* 2012), Tadzhiev, Divaev, O.Tadzhitdinov, Eidelant, Kochubey, Bunyak, Klochko and others.
Lastly, on the basis of the interpretation of the CFS materials, the tectonic structure of the region is clarified, interpretation signs for structural-tectonic interpretation have been developed. Ark Tevelev in 2005, along the northern part of the Aktash-Surkhantau anticlinal zone, identified six strip-like tectonic zones, which were shifted in the latitudinal direction. Tevelev (1978-2012) revealed more than ten articles and scientific papers on the disclosure of this issue (on the interpretation of satellite images of the South-Western Gissar (SWG) and the Surkhandarya Depression, on the ratio of different types of faults, Alakutan Transgenic Lineament, comparative tectonics, kinematics of lineament systems, structure, deformation history and petroleum potential).
Half of all deposits are located in a narrow strip of the north-western strike, which intersects successively the South-Western Gissar, the Surkhan-Darya depression and the Tajik Depression (Borisov *et al.,* 1982, Poletaev *et al.,* 1984, Tevelev *et al.,* 2012).
First of all, Tevelev recommends that attention be paid to the Darya lineament, which extends through the entire Southwestern Gissar from the closure of the Tagama anticline to Termez and further, especially since there are signs of oil-bearing in the zone of this lineament, for example, near-surface oil on the Gaurdak anticline (Poletaev *et al.,* 1984, Katz *et al.,* 1986, Tevelev *et al.,* 2012).

The South-Western Gissar anticlinor has a symmetrical structure and consists of several anticlinal and synclinal zones of northeast strike (Tevelev *et al.*, 2012).
In terms of geomorphology, the South-Western Gissar represent a complex mountain structure, which is due to the intensive mountain-building activity that lasted for a long period up to the Alpine time.
As a result, high elevated mountain ranges exceeding 4000 m above sea level were formed. In addition to the fact that the mountains are heavily cut up, they do not have the same strike in different parts of the area; which significantly complicates the implementation of geological and geophysical works.
The South-Western Gissar oil and gas bearing region is characterized by a satisfactory degree of reproducibility of the interpretation results and the probability of recognition on satellite images of the local and detailed level of generalization of cosmogeological objects of various hierarchical levels of linear and areal character. Many of these objects are the leading elements of structural analysis, predictive constructions and prospecting.

MATERIALS AND METHODS

Based on the interpretation materials, generalized structural-deciphering complexes (SDC) are distinguished. The name and age of the complex is given on the basis of a comparison with a geological map of 1: 200000 scale, according to its dominant part in the complex.
As a matter of fact, distinguished, thanks to the properties of multispectral satellite images, in the cosmostructural map legend, combined by SDC, are tectonically crowded geological bodies of various sizes. This is the difficulty of mapping SDC within the region. The SWSGR, in terms of development within it, SDC is divided into blocks, in each of which, over a predominant area of distribution of rocks of a certain composition and age, specific complexes have been identified.
The main elements of space structural maps and objects of exploratory research are faults (linear structures: planetary, regional, local, and other linear tectonic elements) (Poletaev *et al.*, 1984, Katz *et al.*, 1986, Glukh *et al.*, 2006, 2008, Tevelev *et al.*, 2012, Goipov *et al.*, 2017, 2018) which have a hydrocarbon-localizing value. Along them, horizontal and vertical filtration and movement of fluid flows occur, leading to a regular distribution of hydrocarbon deposits over the area.
There is a known location of deposits on the area to linear tectonic-geological objects, expressed on the surface and in the pictures as extended linear formations (lineaments), zones of fracture.
Currently, geologists under the lineaments understand the linear heterogeneity of the earth's crust and lithosphere of different rank, length, depth and age of occurrence, which are manifested on the earth's surface directly (gaps) or indirectly, geological and landscape anomalies. Such linear anomalies can be caused by hidden faults of the basement, flexural (knee-shaped bending of layers) and fracture zones in the overlying sedimentary deposits of the slab cover (Poletaev *et al.*, 1984, Katz *et al.*, 1986, Tevelev *et al.*, 2012).
As a result of the research, two methods for decoding the Earth remote sensing materials were considered. The first technique is discussed in the texture analysis program and lineaments WinLESSA. Images of the southwestern spurs of Gissar and the adjacent territories were used. It is based on the analysis of surfaces.
The space image of the Territory of the South-Western Spurs of the Gissar Range, obtained from the satellite ASTER Terra on December 10, 2000, was used.
The feature of lineaments, to which particular attention is paid, is defined - the formation of lineament crossing nodes. Such a node may indicate abnormal rock density in this area.
In the SWGR, the formation and accumulation of oil and gas deposits is associated with a geological and tectonic feature, with plicative and disjunctive structures (Tevelev *et al.*, 2005). The second technique was carried out by visual interpretation of satellite images.
In terms of spallation, they (lineaments) may not be clearly expressed in the relief due to the overlap of high power precipitation with a plate. Sometimes lineaments can be manifested by secondary indicators (Goipov *et al.*, 2017).

Structural and geological (direct) signs of faults are well manifested in exposed areas (both for individual fault features and for their combination). Landscape-indicative (geomorphological) signs serve as indicators of faults within areas with a wide development of the Mesozoic-Cenozoic SDC.

The zones of tectonic fracturing of the meridional strike are well expressed on satellite images. These are low-amplitude end-to-end disturbances for the area, representing thickening zones of parallel faults.

They can be organized (on satellite images of different levels of generalization) into zones of different widths. Most of the faults that make up the zones of tectonic fracturing are deaclase cracks with no displacements.

Zones of tectonic fracturing are channels of migration and concentration of fluid flows zones of tectonic fracturing form a regional spatial system along which the horizontal and vertical movement of fluid flows and the regular distribution of hydrocarbon fields occur.

All pre-Kulabu sediments of the South-Western Gissar are stationed more or less uniformly, and in some places the deformations are extremely intense (of Alpine type). On the whole, the SWG is a normally vergent anticlinorium, pulled both onto the inner Surkhandarya depression and onto the outer Beshkent trough of the Turan plate (Tevelev *et al.*, 2012).

Regional anticlinal chains (Tagam-Amanatinskaya in the north-west and Kelif-Sarykamysh in the southeast), associated syncline depressions (Dekhkanabad and Baysun respectively) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta respectively) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta respectively) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta respectively) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta respectively) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta respectively) and axial anticlinal uplifts (in the north, parallel and single-type Surkhanta and same type and Surkhanta are connected.

Baysuntau and Chakchar, and in the southern part of the Kugitang and Gaurdak-Tubegatan). The southeastern and axial parts of the SW of Gissar have a pronounced southeastern vergence, which is preserved in the folded structures of the adjacent Tajik Depression right up to the Vakhsh Basin, while the north-western marginal folds are inverted in the north-western direction. The analysis of geophysical data shows that almost the entire SWG is an allochthonous structure. The leading mechanism of its deformation is the feat ("limited subduction") of the basement of the Surkhandarya depression in the north-western direction, which controls the formation of the mountain-folding structure and its overall displacement, "rolling" on the Turan platform.

Mountain formation in the SWG is associated with the Late Pliocene - Quaternary tectonic events and again manifested in a strange form - although its geological structure is regionally homogeneous, the region morphologically splits into two sharply different parts bordering on the line crossing the USG along the diagonal: the eastern highland represented by the same the erosional mountain side, as other areas of the Southern Tien Shan, and the western low mountain region, as if immersed in an accumulative plume, demolished from the east. The maximum elevations here exceed 7 km, and the deflection is 5-6 km.

RESULTS AND DISCUSSION

The zone of regional trishinosity of the meridional strike reflects deep structures that have reached the surface in a dispersed form, have a through-to-pass character for the area and are barrier for fluid flows. They control and determine the transverse geomorphological zonality of the foothill structures, are most clearly manifested in the activated blocks and, in this connection, are deciphered by strike from the scenes of fractures that form the zone along the strike. These structures are weakly reflected on geological maps, they are not attached to fluid-concentrating significance, and in most cases they are not searched.

Tectonic disturbances with interpretable signs of horizontal movements (thrusts, reverse faults): The latitudinal thrust is installed in the northern and eastern parts of the mountains and is decoded on satellite images by the arc form of the carbonate KFOR (this is the most common interpretive sign of thrusts). Fall

thrust south. It consists of several thrusts that mate along the strike, each of which cuts a separate carbonate composition of the suite (Glukh *et al.*, 2006).

When studying the role of thrust structures in localizing the accumulation of hydrocarbons, it is recommended to pay attention to the role of sub-thrust and sub-thrust positions within which localization of oil and gas perspective structures is possible.

In addition to linear structures, there are several significant authentic thrust structures based on the results of visual and automated, structural geodynamic and geomorphological interpretation of Earth remote sensing materials. A group of thrust structures can also be called a feature of oil and gas perspective structures. Illustrative examples are the Adamtash, Amanata, Gumbulak, Pachkamar, South Kyzylbairak and others deposits, the Lyalmikarskaya and Pachkomar (Fig. 1.) structures are linear antedic anticlines, etc (Goipov *et al.*, 2018).

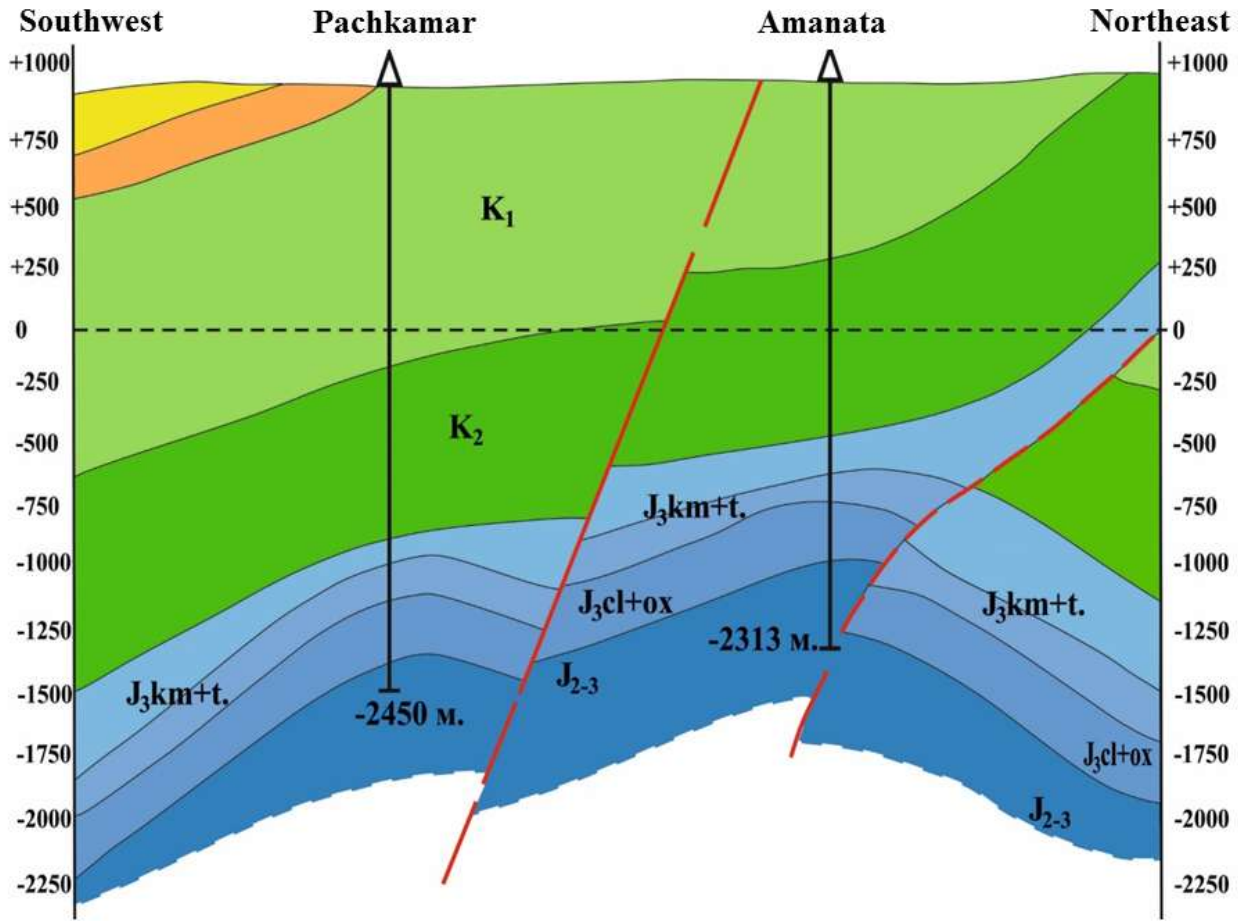

Figure 1. Geological profile of the Pachkmar and Amanat deposits along the line I-I (based on materials of Ch.Sherov)

The Gumbulak gas condensate field at depth is complicated by faults of the thrust-and-thrust type. The plane of the northern (Karailsky) fault, which cuts off the northwestern wing of the fold, falls at angles of 100–400. In the southwesterly direction the displacement amplitude increases from 215 m to 354 m.

The northwestern wing of the South Kyzylbayrak Oil and Gas Condensate Field is complicated by an uphill running parallel to the fold axis, an uplift amplitude of 120-150 m. The plane of the thrower is inclined to the southeast at an angle of 30 degrees. Industrial petroleum potential is associated with Upper Jurassic carbonate sediments (XV + XVa horizons).

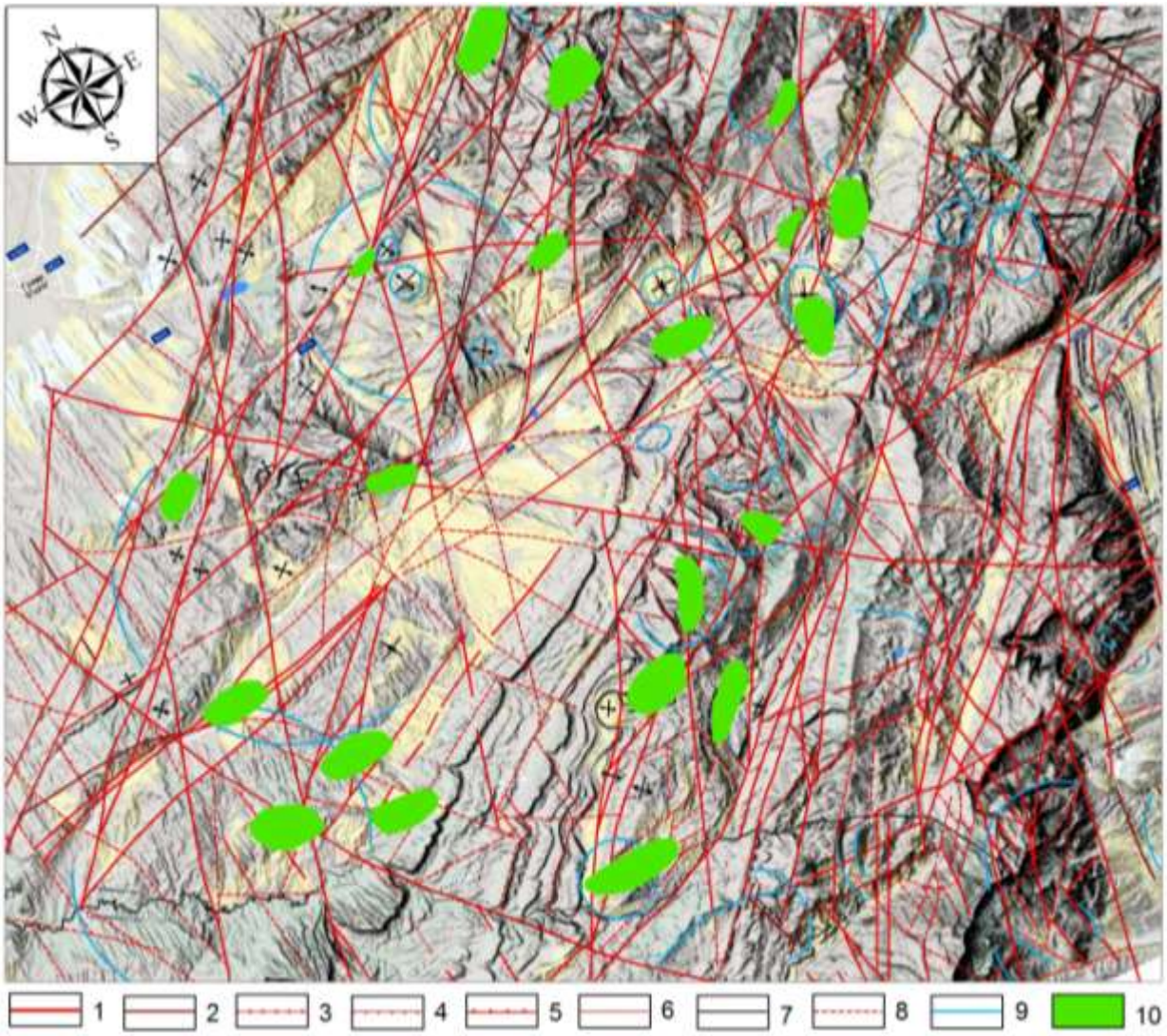

Figure 2. Cosmostructural map of the southwestern spurs of Gissar
1-Regional faults; 2-faults are distinguished according to geological data; 3-stretch zone; 4-shifts; 5 thrusts; 6-zones of regional trechinose; 7-direction of compression; 8-expected faults; 9-ring structures; 10- potential-promising zones of probable accumulation of hydrocarbons based on a comprehensive analysis of cosmogeological results with cosmostructural interpretation of the CS.

The main patterns of development of regional and local discontinuous dislocations:
One of the features of their spatial distribution is the predominance of two main directions: the north-east and north-west. The first direction is the result of the manifestation of Alpine tectogenesis, while the second is more ancient Hercynian, inherited in the later stages of the development of the region. Among them are systems of faults that can be combined into flexural-discontinuous zones, emphasizing the stepped structure of the foundation, as well as vibration of the south-western Gissar along the meso-Cenozoic deposits (Madenov *et al.*, 1978).
In this region, during the Jurassic, Cretaceous and Paleogene (before the Oligocene), faults appeared in a limited number, almost all the existing structures were characterized by undisturbedness. In the Neogene-Quarter, a sharp increase in tectonic activity occurred, which was accompanied by the activation of numerous faults and the complication of the structure of the existing structures. But along with this, new

folds appeared in areas where donogenic deposits were deposited monoclinally, all of which appeared after the completion of migration processes of hydrocarbons and the formation of deposits in the Jurassic carbonate stratum (Nugmanov, 2010).

Ring structures are important fluid-concentrating elements of space structural maps. In the area of the work, the ring structures of magmatic genesis are recorded, whose position and size are reflected on the space structural maps (Glukh, 2008). Fluid-concentrating importance is attached, as noted above, to faults formed on the arches of the ring structures and, especially, to the nodes of their intersection with the zones of regional fracturing of the meridional strike. An important role is also played by faults, which create a skeleton of ring structures (especially sublatitudinal, diametrical).

Results

As a result of the performed scientific works, 12 local prospective objects were identified within the South-Western spurs of the Gissar Range, which are favorable for the accumulation of hydrocarbon deposits. The estimated depth of possible hydrocarbon deposits at selected sites, by analogy with the reference, may be 1,200- 3,500 m.

Discussion

So, on cosmostructural maps, new elements have been identified that were not previously distinguished in traditional geological studies, namely: ring structures, wedge-shaped blocks, rift-like structures (grabens), Regional fracture zone of a cross-cutting character (Figure 2). All of them, together with faults and ring structures, have migration channels and fluid flow concentrations important in studying the patterns of location of known hydrocarbon fields and forecasting local oil and gas perspective structures and prospecting within the region.

Decoding established the most actively updated faults within individual structures and traced their continuation within neighboring structures and establish the general patterns of localization of known oil and gas deposits in fracture and supra fracture structures, substantiating the methodology for studying them. It is shown with specific examples of the effect on the strike of oil and gas structures. The zone of regional fracturing, emphasizing the fracturing nature of the formation of structures, ring structures — these cosmogeological criteria previously not used in petroleum geology (Glukh *et al.*, 2006).

The main elements of the cosmostructural maps compiled within the studied area on a scale of 1: 100,000 are faults, along which the horizontal and vertical movement of fluid flows takes place, leading to the distribution of mineral manifestations over the area. The degree of interpretation of faults within the region, in its individual blocks, structurally interpretable complexes is different. The picture of their location, reflected on the fundamentals, significantly complements the one reflected on geological maps, which contributes to the exploration and geological exploration of the area. The near-fault (supra-fracture) nature of the formation of oil and gas bearing structures and their northeast orientation was established in the equated part of the region.

According to the processing of the results of the interpretation of satellite images of faults by the sliding window method and the ArcGIS program, a tectonic disturbance density map is constructed and the zoning of the studied area is carried out on its basis, making it possible to establish that the oil and gas fields are located mostly within the low and slightly elevated tectonic disturbance field values allowed to recommend the constructed zoning map in petroleum geology.

It is characteristic that the strike of oil and gas bearing structures located on a large depth (in the deposits of the Cretaceous and Jurassic) and in the surface (in the Neogene sediments) known in the area is consistent with the strike of the northeastern faults. The migration of the arches of the buried structures by their uprising (from the basement to the subsalt salt Jurassic and to the sediments of a young age) has been established, which is linked to the uplift of the CS, which is an important direction in forecasting prospective oil and gas structures.

Thus, cosmogeological objects of various (linear, areal) types are distinguished on cosmostructural maps at a scale of 1:100 000: regional fracture zones , faults, including thrusts, shifts; ring structures, color anomalies that are not on geological maps. The spatial position of zones of tectonic disturbances has been recorded, which, by changing the strike of faults and the formation of ajar faces, or at the intersection of faults, mark signs indicating unsteady geodynamic conditions, possible unloading and localization of hydrothermal fluids within the mentioned areas.

The work performed allows us to purposefully approach the development of the methodology and practice of exploration, forecasting, geological and economic assessment of the area, including adjacent to the developed fields and covered with a platform cover and aeolian formations. In addition, the analysis of the deep structure of the buried basement was carried out on the basis of a study of complex geophysical data and drilled wells. The work in general terms reflects the first stage of using the capabilities of high-tech technologies, using the example of a territory that has been well studied by traditional methods, and has made it possible to evaluate the role of individual, including new, methods of cosmogeological research in complex works. Algorithms of digital maps and interpretive features of geological formations of various composition, age and tectonic structures established during the interpretation of tectonic structures have been developed.

The studied area is dissected by disturbances of rock continuity — faults of various directions and zones of regional fracturing, which are the result of various dynamic situations that change many times over the geological history of the area. Tectonic structures are deciphered on satellite images by direct and indirect interpretation features. The faults of the latitudinal, meridional, northeast, less frequently northwest strike are most widely manifested on the cosmostructural map (Fig. 2).

Conclusion

In the course of the study, cosmological and geological criteria were developed for identifying regional and local fracture zones and polygonal zones for changing the physical properties of the objects under study.

The cosmostructural map compiled ensured that the principle of successive approximation in the study of the subsoil, which is characteristic of cosmogeological methods, made it possible to identify regional cosmological features of the territory and the structures shown on it from the general to the particular. On the cosmostructural map, several predicted local oil and gas perspective structures are distinguished, which are characterized by a high degree of probability of pattern recognition (mathematical analysis) and are potentially promising areas of hydrocarbon accumulation based on a comprehensive analysis (Goipov *et al.,* 2018), cosmological results with previous geological survey and geophysical studies and also according to structurally interpretive signs of the south-western spurs of the Gissar Range.

The created space structural map complements the data on the geology of the region, helps to identify elements that are not distinguished, or cannot be established by other methods, and are successfully used in further geological and geophysical studies.

REFERENCES

Amursky GI and Tevelev AV (1978). Methodological issues of interpretation of satellite images of the South-Western Gissar and the Surkhandarya Depression. *Proceedings of higher educational institutions. Geology and exploration, publishing house Ros. state exploration University (M)* **10** 17-21

Bekker YaA (1996). Tectonics of the Afghan-Tajik basin. *Geotectonics,* **1** 76-82.

Borisov OM and Glukh AK (1982). Ring structures and lineaments of Central Asia Tashkent. *"FAN" Uzbekistan SSR* in **54**, **83, 91** 126.

Goipov AB, Atabaev DKh and Nurkhodzhaev AK (2018). Integrating cosmological and geophysical data in forecasting oil and gas bearing structures using the example of southern Uzbekistan. *Journal . Geology and Mineral Resources Tashkent.* IMR. 5 **33** 30-35.

Goipov AB, Nurkhodzhaev AK and Atabaev DKh (2018). Structural interpretation of space imagery materials when searching for mineral deposits. *Bulletin National University of Uzbekistan* **3**(1) 341-346.
Goipov AB, Atabaev DKh, **Radzhabov ShS, and Nurkhodzhaev AK (2017)**. Integration of cosmological and geophysical data in the analysis of lineament tectonics and their relationship with petroleum potential. *Bulletin National University of Uzbekistan* **3**(2). **262, 265** 261-267.
Glukh AK, Avazov AR and Habibullaev SS (2006). Distant bases in petroleum geology. // Journal. Geology and mineral resources. Tashkent. IMR. **5** 36-39.
Glukh AK (2008). Baisun ring structure. *Journal. Geology and Mineral Resources*. Tashkent. IMR. **6**(4) 3-5.
Katz YaG, Poletaev AI and Rumyantseva EF (1986). Fundamentals of linear tectonics. Moscow: Nedra, 134.
Leonov MG (2013). Intermountain depressions of the Gissar-Alay mountain region (Tien Shan): structure and history of formation. *Lithosphere* **6(**3) 3-24.
Nugmanov AKh (2010). Patterns of formation of traps and deposits of oil and gas and oil and gas potential of the northern side of the Amudarya syneclise. *Abstract Theses for the degree of Doctor of Geological and Mineralogical Sciences Tashkent*. **24** 46.
Poletaev AI, Rumyantseva EF and Tevelev AV (1984). Lineamental tectonics of the south of Central Asia and adjacent territories. *Bull. MOIP Separate Geol*ogy *Tashkent* **59**(1) 126-127.
Tevelev Ark V and Georgievsky BV (2012). Deformation history and petroleum potential of the South-West Gissar (South Uzbekistan). *Bulletin of Moscow University. Series 4: Geology* Mosk. University (M.), **6** 20-34.