DISTANCE RESEARCH METHODS AND DIGITAL MAPPING

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ABSTRACT

In this article, students studying in the field of "Geology, prospecting and exploration of mineral deposits" are trained to develop the skills and abilities to carry out remote mapping and geological research in Geological prospecting with the help of accurate and modern tools. and in order to increase their knowledge, the introduction of the science of "Remote research methods and digital mapping" was considered.

Keywords: remote sensing, geological research, geological field, geological mapping, scanning system, photo image, topolineament, topographic map, cosmolineament, space image.

Today, the widespread use of Earth remote sensing methods in geological research is one of the priorities of non-traditional geological research, and it is widely used in world experience to identify promising areas for minerals and recommend them for further geological research. By the 21st century, due to the progress of science and technology, the improvement and efficiency of new nanotechnologies is being achieved. In this regard, certain progress is being made in remote sensing of the Earth. In particular, as the quality of aerial images has increased to higher wavelengths of the electromagnetic spectrum, the research has increased the possibilities of studying and evaluating the mineral potential of the regions.

In this regard, certain progress is being made in the expansion of the mineral-raw material base of our country, among other things, as a result of the conducted geological research on remote sensing of the earth, it was possible to predict and distinguish many new prospective areas.

Decree of the President of the Republic of Uzbekistan No. PF-4947 dated February 7, 2017 "On the strategy of actions for the further development of the Republic of Uzbekistan" and No. F-5209 dated February 12, 2018 "Space research in the Republic of Uzbekistan and technology development measures" PQ-4401 No. of July 23, 2019 "Further improvement of the geological study of the earth's crust and the implementation of the state program for the development and restoration of the mineral-raw material base in 2020-2021 "On the activities" of the decision, it is envisaged to take measures for the purposeful development and wide implementation of modern methods and technologies of remote sensing of the Earth in the process of studying promising fields and mines. Together with this, the Cabinet of Ministers' decision No. 816 dated October 10, 2018 "On the assignment of higher education institutions with educational literature" and the order of the Minister of Higher and Secondary Special Education dated October 8, 2018 "Remote survey methods and digital mapping in geology" serves to a certain extent in order to fulfill the tasks defined in the regulations and legal documents related to this activity and to create sufficient knowledge and skills for students.

Decisions of the Cabinet of Ministers dated October 10, 2018 No. 816 "On the provision of higher education institutions with educational literature" and the order of the Minister of Higher and Secondary Special Education dated October 8, 2018 and "Remote research methods and digital mapping in geology" was introduced at the National University of Uzbekistan in order to fulfill the tasks defined in other regulatory legal documents related to this activity and to provide students with sufficient knowledge and skills. In addition, the Faculty of Geology and Mining of Karshi Institute of Engineering and Economics emphasizes the need for this subject to be passed as a compulsory subject for students studying in the field of study "Geology, prospecting and exploration of mineral deposits". This science is inextricably linked with geodetic works performed in the field of geology and consists of the following:

Stages of development of aerospace technologies of remote sensing of the Earth. In the 1860s in Europe, the French geologist Eme Sivial took a photo of the Alps from a high peak. Then he separated the boundaries of the geological area in this photo, that is, he used the surface height photo for geological purposes.

As the end of the second stage, the development of the technologies of using aerial photographs in the tasks of geological imaging and, accordingly, methodological guidelines and recommendations was started. The experience of using aerial photography in solving geological problems is summarized.

The use of aerial photography in oil and gas exploration began in the 1950s. The first research on the search for oil and gas fields in the territory of the former union was carried out in our country in the process of searching for oil fields in Southern Ferghana. They mainly reflected the use of photographs to study the geological structure of open areas, and during these times suggested the use of the term "photogeology" (Gridin VI, Dmitrievsky AN, 1994).

The results of the initial stage of research are the introduction of the use of aerospace technologies into the production process to solve geological problems, which are:

- technologies and methods of aerial photography of geological objects;
- technologies of photogrammetric processing of aerial photographs for geological imaging of the earth's surface;
- methods of geological interpretation of aerial photographs;
- predicting areas where oil and gas deposits may accumulate,
- methodical approaches to the use of aerial photographs for search and reconnaissance;
- the use of aerial photography materials in determining the design and construction of main pipelines is explained by a sharp increase in the volume of work in production. At this time, the first main oil and gas pipelines were built.

The second stage of the second innovative cycle (1970-1985) was the widespread use of aerial and satellite optical-electronic, radar and infrared images and electronic computing machines for solving topographical problems and geological analysis of images, engineering research. 'characterized by teeth.

Due to the sharp increase in the volume of collected aerospace images at this stage, automated systems of their processing and processing began to be implemented. Another important event of this period was the creation of the first basis for automated processing of aerospace, geological, geophysical and geochemical data for conducting systematic surveys for the purpose of searching for oil and gas deposits.

Small- and medium-scale spatial images were used during the research. Based on these materials, a 1:2,500,000-scale cosmotectonic map of the Arol-Caspian region was created in 1978, and a 1:5 map of the former Soviet Union in 1979.

It should be noted that currently the entire territory of Uzbekistan is partially covered with an analog topographic map of the scale up to 1:25,000. Digital topographic maps on a scale of 1:100,000 and geological maps on a scale of 1:500,000, and digital geological maps on a larger scale of 1:100,000 of major geo-economic regions and mining areas are available.

Geologic relevance of thermal infrared aerospace imaging rates.

The use of thermal infrared images in geological research allows solving the following issues:

- Geological mapping (due to different thermal conductivity and heat capacity of rocks):
- Studying areas with active volcanic activity:
- For hydrogeological purposes;
- Search for gas, oil, various mineral deposits;
- River and sea pollution control.

IR sensing is performed using a scanning system and subsequent visualization of the radiation change in the form of a heat map. The last one reflects the temperature contrasts of the earth's surface and the space-time distribution of the structural forms of the lithosphere.

The threshold sensitivity of thermal IR devices is 0.1-1°K, which allows to record even imperceptible temperature differences of geological objects. The accuracy of objects and details in space imaging is from one hundred meters to one kilometer. Thermal IR imaging allows obtaining information with a resolution of up to 1015 m in the spectral range of 8-14 μm with an aircraft carrier (plane or helicopter) at an altitude of no more than 1 km.

Thermal IR-imaging is carried out with scanning radiometers from space. The main principle of using IR images in geological research is that it allows mapping rocks of the same age and lithological composition.

Thermal IR aerial imaging is used to solve various geological problems, including: geological mapping and mineral exploration; in the study of intrusive arrays; identification of ancient volcanic points and dome-shaped uplifts in buried granite massifs; distinguish lithological differences of rocks; identification of discontinuous faults and active fault systems; modern hydrothermal processes can be noted.

Use of thermal IR aerial imaging in hydrogeological and engineering-geological studies: contouring of groundwater outlets; study of thermal sources, swamping and salinization phenomena; allows to identify buried river valleys, manifestations of karst and suffusion processes, ice soils, cryogenic structures, etc.

Geological relevance of aerial photographs. The reliability of geological structures based on remote sensing methods is primarily determined by the geoinformatics of materials used for aerial and space imaging.

The geoinformativeness of remote imaging methods for the purposes of geological deciphering means the ability of aerial or space imagery to convey signs of geological objects as follows: structural elements of the lithosphere, lithological-stratigraphic complexes, derivatives of exogenous processes, etc. Informativeness of remote sensing methods is strongly influenced by the degree of generalization of motions, their accuracy and spectral characteristics.

In the green spectral range (0.5-0.6 μm), it is possible to obtain information about the structural forms and lithological composition of rocks deciphered by geobotanical signs.

Due to the reliable reflection of the relief in the red zone of the spectrum (0.6-0.8 μm) by remote imaging methods, it will be possible to decipher the structural features of the lithosphere observed in geomorphological indicators.

The RL-spectral range records the structural elements of the lithosphere mainly with a set of geomorphological signs.

The following are used for decryption:

1. The composition of minerals reflected in the texture of photographs: the microform of the relief, the feature of the object located in space and its elements.
2. Laying conditions reflected in the structure of photographs: in images with different textures (colors), the configuration of the boundary of the field combines the shape and character of the object.
3. Color and color (performed when studying a single image).
4. Straight-line-earth fault boundary, exchange of structures or textures of photographs, exchange of relief shape and direction.
5. Signs related to the structure of the object, interconnected with the studied object.

The parameters of the general geological order for the object are evident in the image (the speed and the method of logical interpretation of the images are determined by their association with the panchromatic and colored images).

1. High value of mineral components.
2. Connection with minerals.
3. The determined composition of the genus, its genesis is related to its structural form.
4. Relation with relief form.
5. Determination of the relief form and the process shown to be related to the geological object (a method of logical interpretation is established).

Image texture is the location of a landscape component, defined in geologically based significant interrelationships. As the scale changes, the imaging features change: as the scale decreases, all signs and regularities are clearly invisible, as the scale increases, the first-order image texture is reflected.

The main result of remote sensing in geology is the Remote Base (DO) map, that is, it is a digital information product.

Remote sensing methods, their formalized transformations, decoding and interpretation results used in the compilation of geological and other maps included in Davlatgeolharita-1000/3 and Davlatgeolharita-200/2 collections. The remote base map is available in digital form, including a printable format, including 1:500,000 or 1:100,000 color composites in the visible and infrared spectral ranges, respectively.

Formation of the concept of lineament tectonics. Lineaments can be separated in geological environments and maps according to the object and purpose of the research. As a result of the processing of the remote sensing images in the infrared range, the hidden lineaments are distinguished, which are also important in the boundaries of the reflected color inhomogeneities. Ya.G.Kas and others divided the lineament into lineaments that can be reflected in different environments.

According to it, the following lineaments in the geographical environment are distinguished:

- topolineaments, on a topographic map;

- bathylineaments - according to the bathymetric map;
- photolineaments - on aerial photography;
- cosmolineaments - according to the cosmic image.

Lineaments in geological structure:
- geolineaments, according to the geological map;
- tectonolineaments - according to the tectonic map;
- metallolineaments - according to the metallogenic map;
- hydrolineaments - according to the hydrogeological map.

Ineaments reflected in geophysical fields:
- magnetolineaments - on the anomalous magnetic field map;
- gravilineaments - on the gravity field map;
- seismolineaments - on the map of the epicenter of earthquakes;
- thermolineaments - separated by processing heat flow maps or remotely sensed aerial images in the thermal infrared channel.

In the practice of geology, lineaments can represent the channels through which various fluids and solutions move, that is, they can serve as direct markers in the prediction and exploration of mineral deposits.

Comparison of results of interpretation of aerospace data with geophysical data. Depending on the geological development and structure of the studied region, the use of size markers for predicting prospective structures has certain limitations. The dimensions of the structures and their geometries on the surface of the earth can be different. In this case, the formation of the structures can be different due to the specific features of the tectonic movement regime during the formation of the relief during the stage of formation and modern activity, under the influence of denudation processes.

CONCLUSION

In conclusion, it can be said that, based on the above information, we have considered how important the role of "Remote survey methods and digital mapping in geology" is in the field of geology. In addition, we can see that it consists of the following main tasks: the concept of remote sensing of the earth and the history of its development, the stages of development of aerospace technologies of remote sensing of the earth, the development of aerospace geology in Uzbekistan, the earth's orbit navigation satellites, the physics of remote sensing of the earth fundamentals and methods of aerial imaging, low-medium and high-indicator spacecraft of remote sensing of the earth, signs and principles of interpretation of aerial images, stages of data processing of remote sensing of the earth, geological structures reflected in space images, the concept of lineament tectonics and its geological importance, annular structures, application of remote sensing techniques in mineral exploration, spectral library of rocks and minerals, application of aerospace data in oil and gas geology, hydrogeological and engineering geologist It is aimed to provide detailed information to students about the use of aerospace data in research, the use of aerospace data in solving environmental and geoecological tasks, the lineaments recorded in space photographs in the monitoring of seismically dangerous areas, and the software for processing aerospace images. Introduction of this subject as a basic subject to the students of "Geology, prospecting and exploration of mineral deposits" is aimed at increasing the level of knowledge of students and teaching them to apply them in practical processes and to ensure that they have sufficient qualifications.

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