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ANALYSIS AND GENERALIZATION OF GEOLOGICAL AND GEOPHYSICAL MATERIALS ON AGINSKY BLOCK (EAST AITUZ SQUARE) GEOLOGICAL AND GEOPHYSICAL STUDY

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Annotation

The geological and geophysical study of the Ustyurt Plateau began in the 1950s, focusing on understanding the geological structure of the region and exploring for valuable resources, particularly oil and gas. Geological investigations led to a detailed analysis of Neogene layers and the identification of several anticlinal structures. Geophysical studies were conducted using magnetic, gravimetric, electrical, and seismic methods, providing insights into the area's oil and gas potential. Notably, seismic research employed modern techniques such as Vertical Seismic Profiling (VSP) and Multi-Channel Offset Seismic (MOGT), facilitating in-depth investigations of the structures. As a result, promising areas for oil and gas exploration were identified and prepared for deep drilling operations.

Аннотация

Геологическое и геофизическое исследование плато Устюрт началось в 1950-х годах и сосредоточено на понимании геологической структуры региона и поиске ценных ресурсов, в частности нефти и газа. Геологические исследования привели к детальному анализу неогеновых слоев и выявлению нескольких антиклиналевых структур. Геофизические исследования проводились с использованием магнитных, гравиметрических, электрических и сейсмических методов, что дало представление о нефтегазовом потенциале данной территории. В частности, сейсмические исследования применяли современные методы, такие как вертикальное сейсмическое профилирование (VSP) и многоканальное смещенное сейсмическое исследование (MOGT), что способствовало углубленным исследованиям структур. В результате были выявлены перспективные зоны для поиска нефти и газа и подготовлены для глубоких буровых операций.

주석

우스투르트 고원의 지질 및 지구 물리학적 연구는 1950년대에 시작되어, 이 지역의 지질 구조를 이해하고 특히 석유와 가스와 같은 귀중한 자원을 탐색하는 데 초점을 맞추었습니다. 지질 조사 결과, 신제층에 대한 상세한 분석과 여러 개의 습곡 구조를 식별하게 되었습니다. 지구 물리학적 연구는 자기, 중력, 전기

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및 탄성 방법을 사용하여 수행되었으며, 이 지역의 석유 및 가스 잠재력에 대한 통찰력을 제공했습니다. 특히, 탄성 연구에서는 수직 탄성 프로파일링(VSP)과 다채널 오프셋 탄성(MOGT)과 같은 현대적인 기술을 적용하여 구조에 대한 심층 조사를 용이하게 했습니다. 결과적으로 석유 및 가스 탐사를 위한 유망한 지역이 식별되고 심층 굴착 작업을 위해 준비되었습니다.

Keywords: Ustyurt Plateau, geological studies, geophysical studies, anticlinal structures, oil and gas, magnetic surveying, gravimetric surveying, seismic surveying vertical Seismic Profiling (VSP), Multi-Channel Offset Seismic (MOGT)

Ключевые слова: Устюртское плато, геологические исследования, геофизические исследования, антиклинальные структуры, нефть и газ, магнитная съемка, гравиметрическая съемка, сейсмическая съемка, вертикальное сейсмическое профилирование (VSP), многоканальная смещенная сейсмическая съемка (MOGT)

핵심어: 우스투르트 고원, 지질 조사, 지구 물리학적 조사, 습곡 구조, 석유 및 가스, 자기 탐사, 중력 탐사, 탄성 탐사, 수직 탄성 프로파일링 (VSP), 다채널 오프셋 탄성 (MOGT)

Geological and Geophysical Study

Geological Study

Systematic geological research on the Ustyurt Plateau began in the 1950s with the goal of studying the geological structure and searching for mineral resources. By 1957, the entire Ustyurt area was covered by a state geological survey at a 1:200,000 scale, conducted by the Aral Sea Geological Survey Expedition. As a result, a geological map was created, and the Neogene deposits were studied in detail. From 1964 to 1970, a more detailed geological survey at a 1:500,000 scale was conducted on Eastern Ustyurt by the KGSPE and KK KGPE. This was accompanied by the drilling of numerous mapping wells.

These studies led to the detailed examination of the Neogene sequence, and several anticlinal folds, including Terengkuduk, Kharoisk, Nasambek, and Bashchuak, were delineated along the base of the Sarmatian limestones. Further studies of Ustyurt's geological structure involved drilling profile and structural wells (up to 1200 meters deep), which allowed for an investigation of Neogene, Paleogene, and Upper Cretaceous deposits, determining their thicknesses, identifying oil and gas potential, and preparing structures for deep drilling.

Geophysical Study

Geophysical work on the Ustyurt Plateau has been carried out in various methods such as magnetic surveying, gravimetry, seismology, and electrical prospecting, aimed at addressing both regional and detailed exploratory tasks.

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• **Magnetic Surveying**: Aeromagnetic surveys at a 1:200,000 scale were conducted across the plateau by the Western Geophysical Trust (Y.G. Vorobyev, A.M. Shukevich, 1957). Based on these studies, iso-dynamic and graph maps (ΔT) were created. Later, composite maps of magnetic anomalies in Central Asia were compiled. In 1967, an aeromagnetic survey at the same scale was conducted, which resulted in a map of the magnetic field and quantitative interpretation of anomalies. These results were used for tectonic zoning.

• **Gravimetric Surveying**: Gravimetric studies began in 1936-1937 by the Central Geophysical Trust and continued through various institutions until 1956-1958. In 1966-1968, gravimetric surveys at a 1:50,000 scale were performed, resulting in gravity anomaly maps that helped refine the tectonic structure of Ustyurt. A gravimetric map for the entire area was published in 1989. High-precision gravimetric studies were conducted between 2000-2002 on the Samsko-Kosbulak Depression and adjacent areas.

• **Electrical Prospecting**: Electrical surveying started in 1958, with systematic studies beginning in 1962 by the Ustyurt Geophysical Expedition. Various methods were employed to solve regional and exploratory tasks, including studying the Earth's crust and upper mantle's geoelectric characteristics.

• **Seismic Exploration**

• Seismic exploration on the Ustyurt Plateau began in 1956, conducted by the "Specgeophysics" office using the KMPV modification (Common Midpoint Profiling). From 1959, seismic parties of the Bukhara Geophysical Expedition carried out work using the MOW (Multiple Overlap Wave) method. Starting in 1962, the Ustyurt Geophysical Expedition initiated systematic seismic studies employing MOW, KMPV, VSP (Vertical Seismic Profiling), and OGT methods on specific sections of the MPV (Middle Point Seismic Profiling). The correlation method of refracted waves was used on Ustyurt to address regional issues related to studying the general geological structure.

• Based on KMPV results, a structural map of the basement at a 1:500,000 scale was created by V.I. Korablina and others, which outlined the region's overall structure and identified tectonic elements of the 1st and 2nd orders. A tectonic scheme was compiled by T.L. Babadzhanov in 1971.

• **Vertical Seismic Profiling (VSP)** was conducted in deep and structural wells to study the velocity characteristics of the geological sequence, wave fields, and stratigraphic ties of reflecting and refracting horizons. In the planned project area, VSP was carried out in the Agyin-1 well, as well as in several other wells in adjacent areas. These studies revealed patterns in the variation of layer and average velocities within the sequence, depending on the thickness of the overlying deposits (Neogene, Paleogene, and Senonian).

• From 1993 to 1995, exploratory seismic work was performed on the Eastern Aytuz area by seismic party 01/93-95 at a 1:50,000 scale. These studies identified the Eastern Aytuz structure. From 2001 to 2004, Churtai seismic party No. 02/2001-2004 conducted further exploration work using MOGT (Multi-Channel Offset Seismic) at

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the same scale, leading to the delineation of the Eastern Aytuz structure. From 2003 to 2006, seismic party No. 2/2000-2003 conducted more MOGT work at a 1:50,000 scale, which resulted in the detailed mapping and preparation of the Eastern Aytuz structure for deep drilling.

• In total, 544 linear kilometers of seismic profiles were completed within the planned project area. This includes 126 linear kilometers by seismic party 1/93-96, 282 kilometers by seismic party 2/2000-2003, and 136 kilometers by seismic party No. 2/2001-2004. The profile network density was 1.2 linear kilometers per square kilometer.

• **Summary**

The geological and geophysical study of the Ustyurt Plateau began in the 1950s with the aim of exploring for valuable resources such as oil and gas. Geological surveys led to a detailed study of the Neogene layers, the discovery of several anticlinal structures, and the creation of a geological map of the region.

• Geophysical studies, including magnetic, gravimetric, electrical, and seismic surveys, provided a deep understanding of the plateau's geological structure and helped plan oil and gas exploration. Seismic research, in particular, clarified the region's geological framework, with extensive seismic profiling and modern techniques like Vertical Seismic Profiling (VSP) and Multi-Channel Offset Seismic (MOGT) employed.

• As a result, the area's oil and gas potential was identified, and key structures were prepared for deep drilling, with anticlinal folds thoroughly mapped and examined.

Study of the Area by Deep Drilling

In the Ustyurt region, more than 250 wells have been drilled. Over 15 fields have been discovered, with the closest being Kuanysh, Akchalak, Karachalak, and Kokchalak, which have deposits in the Jurassic and Paleozoic formations. Drilling of reference, parametric, and exploratory wells in Ustyurt has allowed the determination of the thickness of the Meso-Cenozoic deposits, the characteristics of the geological structure, and the depths of the Permian-Triassic and Paleozoic deposits. Despite the large volume of work done, the degree of geological exploration varies in different geotectonic regions of Ustyurt. The most studied area is the Kuanysh-Koskaly uplift. The Barsakelmes depression, which includes the East Aytuz area, has been poorly studied. In the section, the Jurassic complex is the most studied. Deep drilling has not been conducted directly in the East Aytuz area. The nearest structures where deep drilling has taken place are: Agyin (2 wells), Bakush (1 well), and Tuley (1 well).

Geographically, the Agyin area is located 13 km to the east-southeast of the East Aytuz area, Bakush is 12 km to the southeast, and Tuley is 50 km to the southeast. The areas have a similar section to the projected area, and in the future, when preparing the project for the East Aytuz area, these wells will be used as primary sources of information about the studied section, composition, properties of target horizons, their FES, etc. All four wells have been decommissioned under Category I, having fulfilled their geological objectives.

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Based on the test results from the cased well No. 1 Agyin, No. 1 Tuley, and the open well No. 1 Bakush, the following conclusions can be made:

- The deposits of chalk, Paleogene, and Neogene are unpromising for oil and gas in the studied area.
- The Jurassic deposits are characterized by high gas content (304-1680 l/l) in the formation waters.
- The Paleozoic deposits have not been studied for oil and gas prospects. In the area of projected work, the prospects for oil and gas are mainly associated with the Jurassic deposits, where the formation waters in adjacent areas are characterized by abnormally high gas factors.

Foydalanilgan adabiyotlar:

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