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SOME FEATURES OF PROSPECTING WORK IN THE OIL AND GAS REGION OF GANJA

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A b s t r a c t

Extensive exploratory investigations and borehole surveys have confirmed the high prospect of oil and gas potential of the Upper Cretaceous-Maikop deposits in numerous structures in the Ganja oil and gas region. The structures identified in the OGR have a complex structure and are also complicated by multidirectional fractures. Although the regularity of field formation has been clarified, an individual approach to prospecting and exploration operations at each block is necessary. It is necessary to direct prospecting and exploration operations to obtain direct geophysical parameters representing oil and gas potential in other blocks, taking into account the results of recent comprehensive geophysical surveys at the Gazanbulag-Chaily and Naftalan-Godakboz fields. Taking into account the available geophysical data and using appropriate geophysical complexes for predicting of oil and gas potential in anticlinal and non-anticlinal structures, determination of their boundaries and depths, elements of traps and stratigraphic affiliation is an effective way for further exploration of oil and gas.

Keywords:

Seismic survey;
Refracted wave;
Gravity-magnetic survey;
Seismic and gravimetric anomaly;
Trap;
Oil and gas field;
Upper Cretaceous-Maikop.

Ganja Oil and Gas Region is located in the northwestern part of Yevlakh-Agjabadi depression where geological and geophysical exploration has been conducted for more than 90 years at intervals. About 40 local anticlinal uplifts and structural complications have been found in Mesocaynozoic sediments (fig.1).

Sariyaldagh, Aliushaghi, Acidara, Gazanbulag, Borsunlu, Kurakchay, Chaily, North Chaily, North Ziyadkhan and Shadili uplifts are found in the northwestern part of the region between Ganjachay and Godakboz-Tartar fractures. The central part of the oil and gas region from the uplift zone of the same name separated by Naftalan-Godakboz-Duzdagh fracture to the Aghjabadi uplift is a relatively simple structure. Here, the Duzdagh, Gizilhajili, Godakboz, North Naftalan, Naftalan, Tartar, Ayrija, Barda, Shirvanli, Gulluja, and Lambaran uplifts are divided into longitudinal and transverse tectonic blocks. The northeastern flanks of some uplifts have a relatively flat structure. Located in the southern part of the region where complex seismic record zones exist, Aghjabadi, East Agjabadi, Dayirman, Aghgol, South Aghjabadi, Kabirli, Eyvazli, Sovietler, Shiringum, West Shiringum, Godaktala, Gamarli, Jabri, Boluslu, Beylagan, Agrum, Ayri and Sarkhanli uplifts and benches are also divided into blocks with different directions [1, 2].

According to the results of the studies, tectonic uplift processes in Ganja oil and gas region have been formed in the last stages of Cretaceous period, and the repeated tectonic uplift started from the Upper Sarmat period. Subsequently, some of the Paleogenic and Miocene sediments were subjected to erosion processes in the arches of the structures in the area in connection with the formation of the terrestrial area. For example, because of strong tectonic uplift processes in the Eyri structure, the Upper Cretaceous, Eocene, Maikop and Miocene sediments were exposed to erosion processes. As a result, terrigenous sediment flow in the flank sections of the structures formed pinched out reservoir which were restricted by Miocene erosion surface. The eroded areas are covered transgressively by Aghjagil sediments from above. These processes formed numerous lithological and stratigraphic traps in the area.

According to new research, it is better to focus on the study of the geological structure, paleotectonic features of the Upper Cretaceous-Maikop sediments, and the exploration of oil and gas perspective. The geological structure of the Kazanbulag and Naftalan-Godakboz structures was determined by 2D and 3D seismic exploration. The possibility of non-anticlinal traps in Eocene and Paleocene sediments has been

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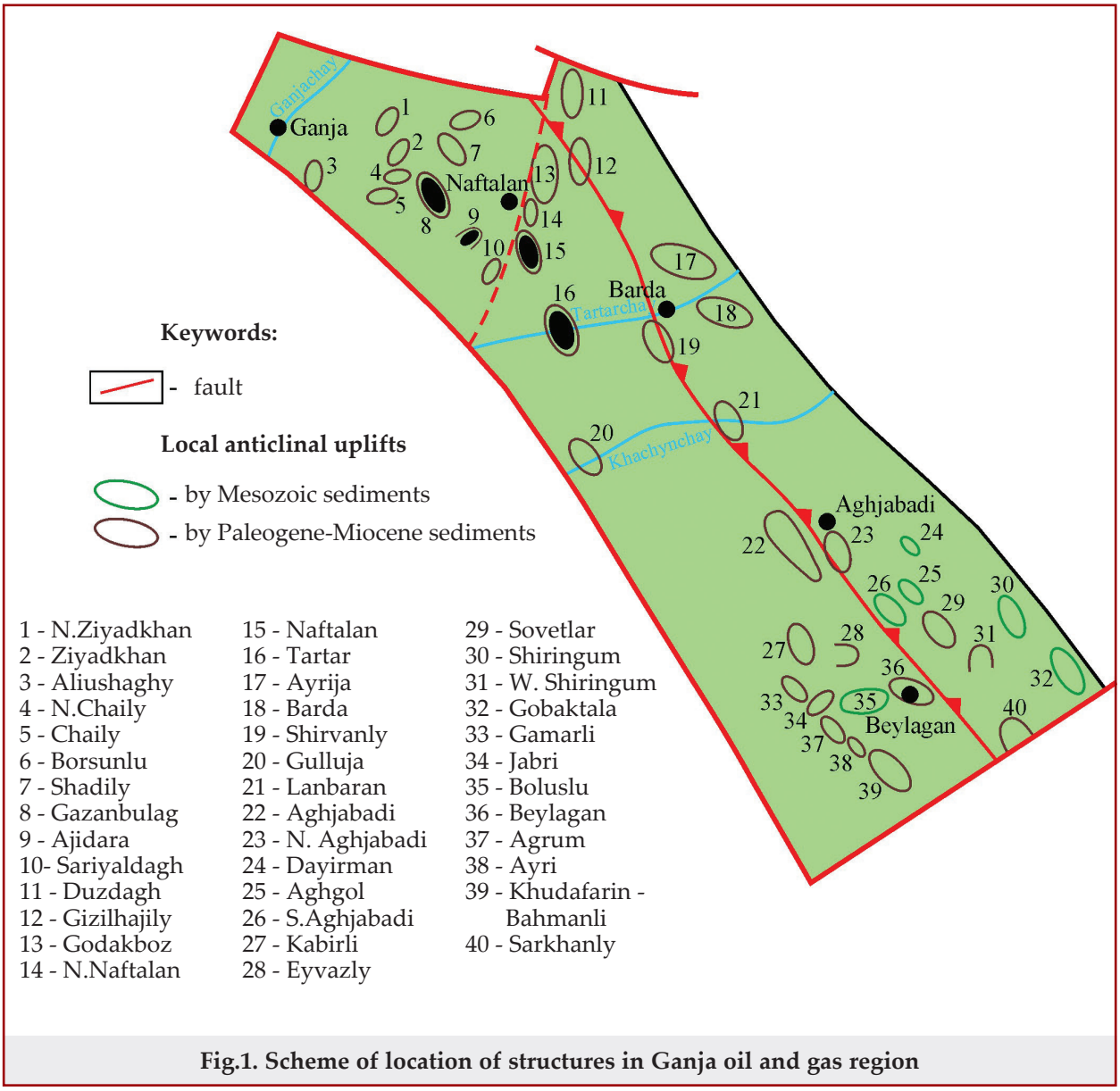

Fig.1. Scheme of location of structures in Ganja oil and gas region

shown, and the oil and gas reserves of geological section have been estimated [3-5].

It should be noted that the structures found in the oil and gas region have a complex structure and are further complicated by fractures of various direction. According to gravimetric studies, the peculiarities of the distribution of gravity anomalies in the field also confirm this [6]. According to gravimetric studies, the distribution of gravity anomalies on the area also confirms this [6].

Despite the fact that in many structures located in the north-north-east of the Ganja oil-gas bearing area, the subsidence depth of the carbonate part of the Cretaceous deposits(up to 1000 m) is favorable for exploration(up to 4000 m), the geological structure and prospects of these deposits are not fully studied yet. Gazanbulaq, Ziyadkhan structures are located at a depth of 1000 m on the surface of the Cretaceous. To the left of Duzdagh-Naftalan regional fracture in the meridional direction is Duzdagh synclinal at a depth of 4500-5500 m, and Duzdagh-Godakboz-Naftalan fold at the right, locked by 3000-4000 m isohypse and buried towards the north. It continues in the form of a narrow strip to Barda and Ayrija areas up to 8000 meters, by the deepening of the Cretaceous.

Longitudinal fractures in the north-west and south-east direction complicated the geological structure of the region. Heredity is observed in the structure of Cretaceous and paleogenous sediments. Lots of them are small brachyanticline structures.

According to the well data of the Ganja OGR of Naftalan-Godakboz area, the upper part of the Upper Cretaceous sediments consist of carbonate, mid-volcanogenic sediments and bottom volcanogenic rocks. Paleogene-Dat sediments have marl and sand-stone interbedded layers, and Eocene sediments are represented by clay, sandstone, marl and limestone, as well as Maikop by alternation of clay, sand and sandstones. II-VII sand horizons of different thicknesses are distinguished in the area. Aghjagil floor consists of gray clays with thin dry layers, and Absheron floor consists of clay and poorly sorted sand and gravelstone [7].

Industrial oil bearing capacity on the south-west of the Ganja OGR is mainly associated with Maikop suite sandy, Eocene sandy-clayey-marl and upper Cretaceous carbonate-bearing reservoirs. The oil deposits discovered here were formed as a result of accumulation of hydrocarbons, produced from the central part of the Yevlakh-Aghjabadi depression, in the southwest, by migrating laterally and vertically, in anticlinal, lithological and tectonic screened traps. Poor reserves of the wells connected with Maikop sandy horizons were determined. Oil was detected in several wells drilled in Gazanbulag, Ajidara and Sariyildagh areas, from the Eocene sediments and oil and gas show or weak oil, gas and water flows were detected at Sovetlar, Tartar, Akdar, Naftalan and Godakboz areas. Upper Cretaceous carbonate-fractured reservoirs are characterized by high water content. Oil flows and intense oil and gas showsare recorded in the wells Tartar 152, Naftalan 58, Gulluja 3, Beylagan 7, 9. Oil was produced at 3919 m in the well No. 2 in the Sovetlar area, during drilling [1].

Exploration drilling has been carried out in a number of structures, and the others are on the list of potential areas. The results of studies conducted to improve the efficiency of exploration works investigated comprehensively. As a result, the feasibility of each used method was estimated, and the research methodology needed for the solution of other issues was justified, and an appropriate methodological approach was proposed.

Gravimetric, magnetometric, electrical, seismic and geological data are analyzed in a number of structures, and the geological structure is specified. On the other hand, for effective course in exploration, localization of the research areas is possible by specifying the anomalies geophysical parameters associated with oil and gas occurence. In addition, using the refracted wave method, the geological environment is radiated from the seismic boundary from the surface of the lower Cretaceous sediments up to the ground surface, that is, the information can be obtained from the Upper Cretaceous deposits. For many years, it was difficult or impossible to track the waves reflectedat that boundary by the studies conducted with common depth point method. The progress is achieved in this sphere by new technical and methodological possibilities, currently. Structural diagrams were developed related to intra Cretaceous sediments.

Comparison of structural maps based on the surface and intra Cretaceous seismic horizon shows the significant difference in the structure of these surfaces, angular mismatch observed between their occurrence forms [4, 8]. Exploration operations in the areas for which the diagrams have been compiled, shall be oriented according to the intra Mesozoic sediments taking into account the distribution zones ofeffusive volcanoes and volcanogenic rocks, predicted by gravimetric and magnetic data. This is the basis for the expansion exploration operations. Thus, first of all conduct of comprehensive geological and geophysical studies are advisable in areas where intra Cretaceous sedimentation is developed. Thus increases search of anticlinal and non-anticline traps in sedimentary rocks located under volcanogenic, volcanic rocksand prediction of oil and gas bearing capacity. Fractured carbon-bearing and granular rocks prevail in the upper Cretaceous sediments on promising structures located in the north of the Ganja OGR and are considered potential source of hydrocarbons in the south.

At present, the identification of relevant geophysical deviations and the provision of their geological description is one of the key factors in the search for oil and gas fields. The detected anomalies, as a rule, reflect the combined effect of local inhomogeneities of the geological environment. Distribution of other anomalies from the common area, which can have a significant effect on the anomaly formed by oil and gas, makes the interpretation of geophysical data even more reliable.

The observed anomalies in the wave refraction zone can occur in the zone of waves passing through the corresponding inhomogeneities from the source of the wave to the receiving line. Thus, the features of the geological environment along the refraction path from refractor boundary to the earth surface are investigated and the corresponding inequality and potential anomalies that it can generate are determined. This problem is solved by determining inhomogeneity in various ways [9].

Oil-gas resources were investigated by the method of refracted waves (RWM) and a system of gravimetrical survey, field-type anolmalies were determined, and potential fields were predicted based on their correlation. RWM, CDP (Common Depth Point) and gravimetrical survey data were analyzed together, the location and stratigraphic position of the predicted fields were determined in Gazanbulag-Chaily, Naftalan-Godakboz, Yevlakh-Aghjabadi depressions (fig.2) [6, 7].

Based on gravimetric data, the local minimum values of the Bouguer anomaly in the structures of Gazanbulag and Ziyadkhan are fixed in the range of 0.2–0.3 mGal. It was found that these minimums align with the amplitude anomalies of the refracted waves detected by the RWM. The in homogeneities that cause these anomalies are in the interval corresponding to the pinch out zone of the Paleocene and Eocene sediments. The non-anticline traps described here consist of sand, sandstone and calcareous marls, according to a near-drilled well. Taking into account the fact that blanket deposits are mainly clayey, it can be concluded that non-anticline traps have high oil and gas potential [6, 9].

The results once again show that investigation should be aimed at obtaining geophysical parameters that directly represent oil and gas, and should be carried out on blocks. So, it is recommended to determine oil and gas prediction, their limits and depths, trap elements and stratigraphic features applying a proper geophysical complex based on existing geological and geophysical data.

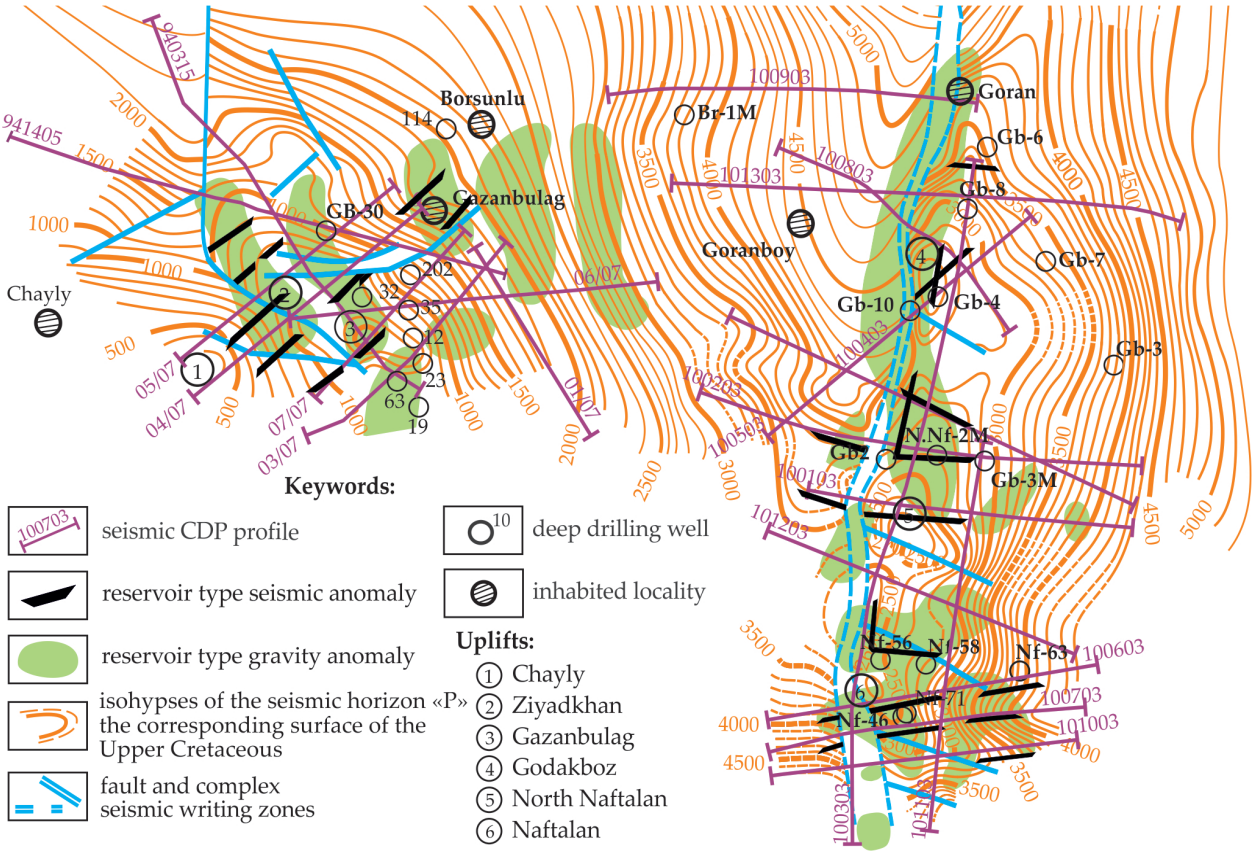

Fig.2. Scheme of distribution of seismic and gravity anomalies [7, 8]

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Некоторые особенности поисково-разведочных работ в Гянджинском нефтегазоносном районе

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Реферат

Продолжительными поисково-разведочными и скважинными исследованиями подтверждена высокая перспективность нефтегазоносности отложений верхнего мел-майкопа в многочисленных структурах в Гянджинском нефтегазоносном районе. Структуры, выявленные в НГР, имеют сложное строение и также осложнены разнонаправленными разломами. Хотя закономерность формирования месторождений была выяснена, необходим индивидуальный подход к поисково-разведочным работам на каждом блоке. Учитывая результаты недавних комплексных геофизических исследований на месторождениях Газанбулак-Чайлы и Нафталан-Гедекбоз, необходимо направить поисково-разведочные работы на получение прямых геофизических параметров, представляющих нефтегазоносность по другим блокам. С учетом имеющихся геофизических данных и с применением соответствующих геофизических комплексов прогнозирования нефтегазоносности в строениях антиклинального и не антиклинального типа, определение их границ и глубин, элементов ловушек и стратиграфической принадлежности является эффективным направлением для дальнейших поисково-разведочных работ на нефть и газ.

Ключевые слова: сейсморазведка; преломленная волна; гравимагнитная разведка; сейсмическая и гравиметрическая аномалия; ловушка; нефтяные и газовые месторождения; верхний мел-майкоп.

Gəncə neftli-qazlı rayonunda axtarış-kəşfiyyat işlərinin bəzi xüsusiyyətləri

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Xülasə

Gəncə neftli-qazlı rayonunun (NQR) çoxsaylı strukturlarda Üst Təbaşir Maykop çöküntülərinin yüksək neft-qazlılıq perspektivləri aparılan uzunmüddətli axtarış-kəşfiyyat və quyu tədqiqat işləri vasitəsilə təsdiqlənmişdir. NQR-da aşkarlanmış strukturlar mürəkkəb quruluşa malikdirlər, həmçinin müxtəlif istiqamətli yarıqlarla mürəkkəbləşmişlər. Yatağın əmələgəlmə qanunauyğunluğunun müəyyənləşdirilməsinə baxmayaraq, hər blok üzrə aparılan axtarış-kəşfiyyat işlərinə fərdi yanaşma tələb olunur. Qazanbulaq-Çaylı və Naftalan-Gedəkboz yataqlarında son zamanlar aparılmış kompleks geofiziki tədqiqatların nəticələrini nəzərə alaraq, axtarış-kəşfiyyat işlərinin istiqamətini digər bloklar üzrə neft-qazlılıq təşkil edən geofiziki parametrlərin əldə edilməsinə yönəltmək lazımdır. Mövcud geofiziki məlumatların nəzərə alınması və antiklinal və qeyri-antiklinal tip quruluşlarda neft-qazlılğın proqnozlaşdırılmasına dair müvafiq geofiziki komplekslərin tətbiqi ilə onların sərhədlərinin və dərinliklərinin, tələ elementlərinin və stratiqrafik mənsubiyyətlərinin müəyyən edilməsi neft-qaz sahəsində gələcək axtarış-kəşfiyyat işləri üçün effektiv istiqamətlərdəndir.

Açar sözlər: seysmik kəşfiyyat; sınan dalğa; qravimaqnit kəşfiyyat; seysmik və qravimetrik anomaliya; tələ; neft və qaz yataqları; Üst Təbaşir Maykop.