UDC 553.98(262.81)
DOI: http://doi.org/10.17721/1728-2713.107.04

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OIL AND GAS BEARING COMPLEXES AND LITHO-STRATIGRAPHIC CHARACTERISTICS OF PLIOCENE DEPOSITS OF THE BULLA-DENIZ FIELD

(Представлено членом редакційної колегії д-ром геол. наук, проф. В.В. Огарем)

Background. *In the current and long-term plans for the development of the country's fuel and energy balance, there is a significant emphasis on increasing and objectively assessing hydrocarbon resources to ensure a steady rise in oil and gas production. A decrease in geological exploration in the South Caspian basin has been observed, partly due to overestimates of predicted resources made before the twentieth century, which may have overly optimistic characterizations of the oil and gas potential of various regions and areas. In the Baku Archipelago, industrial deposits have been discovered in several geological horizons, with stratal deposits mainly associated with crestal tectonically shielded areas. A characteristic feature of the Productive Series (PS) section is the regular replacement of oil accumulations with gas and gas condensate in the direction of regional layer immersion.*

Methods. *The purpose of the study is to clarify and evaluate the prospects of oil and gas-bearing deposits within PS sediments. This involved analyzing a complex of geological and geophysical materials to determine the reservoir properties of these sediments. The study incorporated stock materials, published articles, and factual data. An inter-well correlation was performed based on well data to assess the reservoir properties of PS sediments. The geological structure, lithological confinement, and petrophysical features of the deposits were also examined.*

Results. *The analysis of the V horizon of the Bulla-Deniz field revealed that the section is predominantly clay (91 %) rather than sandy (9 %). The porosity of the section varies from 2 to 16 %, while the gas saturation parameter ranges between 0.47 and 0.61. The VII horizon, in contrast, has a relatively less clayey composition, which positively influences the reservoir parameters.*

Conclusions. *The study highlights the need for a more nuanced evaluation of hydrocarbon resources in the South Caspian basin, specifically within the Baku Archipelago. The results indicate that the Productive Series (PS) sediments, particularly in the V horizon of the Bulla-Deniz field, present significant challenges due to their high clay content and variable porosity and gas saturation. However, the VII horizon's relatively better reservoir properties suggest that targeted exploration and development efforts could yield promising results. To optimize future resource assessment and exploitation, it is essential to integrate updated geological and geophysical data with modern exploration techniques. This approach will ensure a more accurate understanding of the region's hydrocarbon potential and contribute to the sustainable management of its oil and gas resources.*

Keywords: *South Caspian basin, Baku archipelago, Bulla deniz, field, pliocene, Productive Serie, sediment.*

Background

One of the priorities for the development of the country's fuel and energy complex is a wide turnaround in geological prospects for oil and gas within the offshore zones of the seas and oceans, and the assessment of hydrocarbon resources using modern geological, geophysical and mathematical methods.

Oil and gas-bearing complexes confined to the depressions of Alpine tectogenesis are distinctive of epicontinental basins separated from the oceans by island arcs, and the coastal part of the oceans. These include the American Pacific coast and the aquatorial part of the Japanese Islands.

Oil and gas deposits are found throughout the entire area of the depression, but it is more likely that they will be found near its near edge parts. The same patterns are inherent in heterogeneous (intermountain) depressions of the Alpine cycle, which include the southern basin of the Caspian Sea, where the largest deposits are found near the northern, eastern and western sides; there is a high probability of rich oil and gas accumulations at the central part of the depression.

Nowadays, the whole Caspian Sea is one of the regions that play a key role in energy security in the world, whereby neighboring countries and foreign corporations actively participate in the extraction of its hydrocarbon resources.

The Baku Archipelago, being an integral part of the South Caspian Basin (SCB), is distinguished by a wide variety of geological conditions and prospects for the oil and gas potential of its various parts (Pogorelova, 2019, Mikhailov, 2017). Hence, increasing the efficiency of geological exploration in the oil and gas bearing area of the Baku Archipelago requires their clear orientation to the most deeply submerged horizons, where a growth in industrial reserves of oil, condensate and gas can be obtained with minimal time and material expenses.

Deep exploration drilling was carried out in a number of areas within the Baku Archipelago, among which the Bulla-Deniz field attracts special attention (Fig. 1).

In the Baku Archipelago, industrial deposits were discovered in the VIII horizon of the Balakhkhany suite, the Fasila suite, and the Postkirmaky sandy suite. Deposits of the stratal type are associated mainly with crestal tectonically shielded deposits. A characteristic feature of the oil and gas content of the Productive Series section is the regular replacement of oil deposits with gas and gas condensate deposits in the direction of the regional immersion of layers.

The Sangachal-Deniz – Duvanny-Deniz – Khara-Zira-Bulla-Deniz anticline belt is located within the northern part of the Baku Archipelago oil and gas region. A characteristic feature of the tectonic structure of the anticline belt is the presence of large longitudinal faults in the axial parts of the structures. Foci of mud volcanic activity are often associated with longitudinal faults. Numerous transverse faults divide the structures into separate tectonic blocks (Alizade et al., 2018).

ISSN 1728-2713 (Print), ISSN 2079-9063 (Online)

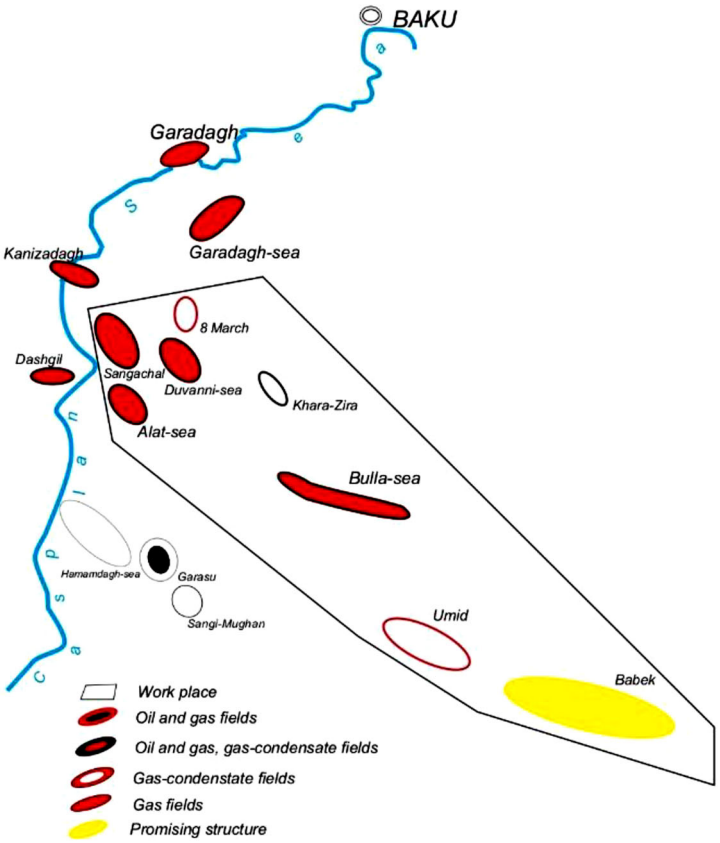

Fig. 1. Overview scheme of oil, gas and gas condensate deposits of Baku Archipelago

Methods

The study utilized a comprehensive dataset that included geological and geophysical data obtained from SOCAR seismic profiles, exploration wells, and stock materials. Key sources of data included:

1. Seismic data provided detailed structural and stratigraphic information about the Bulla-Deniz field.
2. Data from exploration wells were crucial for understanding the lithological and petrophysical properties of the Pliocene deposits. Well logs, core samples, and drilling reports were analyzed.
3. Relevant scientific publications provided additional context and supporting information for the analysis.

The litho-stratigraphic characteristics of the Pliocene deposits were examined by analyzing core samples and well logs. The stratigraphy was correlated across different wells to construct a comprehensive geological profile of the area.

The reservoir properties, such as porosity and permeability, were determined through laboratory analysis of core samples (made in AZLAB laboratory). These properties were mapped to identify areas with the highest potential for hydrocarbon accumulation (Menshov, 2021).

An inter-well correlation was performed to understand the spatial distribution of reservoir properties across the field. This involved aligning the stratigraphic sections of different wells to identify continuous reservoir layers.

Statistical methods were used to analyze the variability in porosity, permeability, and hydrocarbon saturation across different horizons. Based on the compiled geological and petrophysical data, reservoir maps were created to simulate the distribution of hydrocarbons. These constructions helped in forecasting the planning future exploration activities.

Structural-tectonic setting and Stratigraphy. The Bulla-Deniz field is located in the northern part of the Baku archipelago and is included in the Kanizdag-Bulla-Deniz anticlinal belt. The formation of the Baku Archipelago fold began in the early Pliocene and ended a little later than the Absheron peninsula.

Bulla-Deniz uplift is a closed fold (Fig. 2). According to the VII horizon of the Karadag division of the Productive Series of the Bulla-Deniz field consists of a large brachyanticline fold symmetrical in the transverse section and asymmetrical in the longitudinal section.

The length of the structure is 27 km, the width is 9 km, the height of the fold in the northeast limb is 1400 m. A characteristic feature of the region tectonics is the presence of large longitudinal faults in the structures of anticlinal belts along the axis, and many of them are traced up the entire length of the anticlinal fold. There has been indicated the activity of mud volcanoes (gas manifestation, gryphon and etc.) within longitudinal faults (Fig. 3).

According to seismic works, exploration wells in the northwestern periclinal and the northeastern limb, the Bulla-Deniz uplift connects with the southwestern limb of the Khara-Zira uplift, and the southwestern limb of the structure crosses a wide synclinoria and consociates with the northeastern limb of the Umid structure.

According to the deep drilling and seismic exploration data the top VII horizon, of the Bulla-Deniz structure evolved as a brachyanticlinal fold with the dimensions of 27 x 9 km, extending towards the northwest and southeast, the height of the fold is 1400 m (Fig. 4b.). The fold is asymmetric: the lying angle of the layers is 22° in the northeastern limb, 15° in the crestal part, 22–11° in the southwestern limb, and 11–12° in the periclinal part.

ISSN 1728-3817

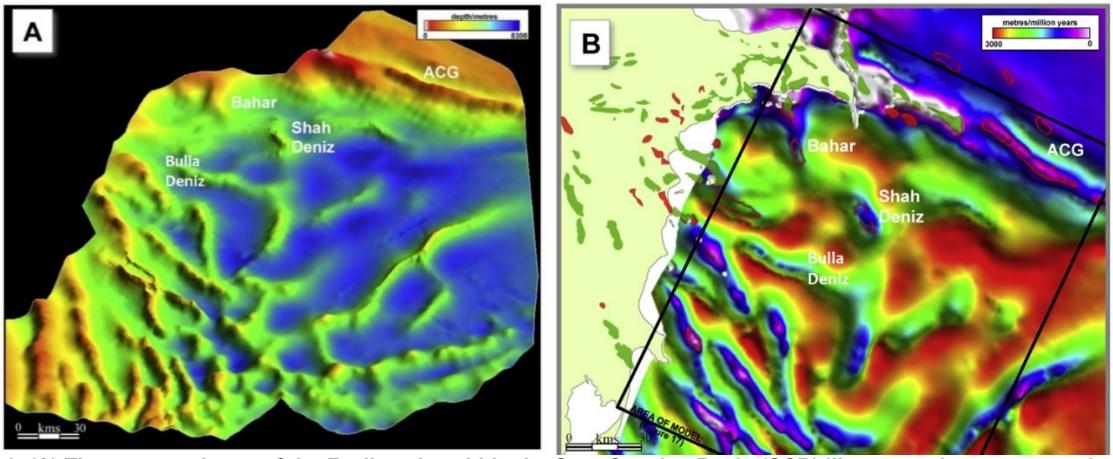

Fig. 2. (A) The structural map of the Fasila suite within the Sout Caspian Basin (SCB) illustrates the pronounced relief of SCB anticlines, with the elevation change from syncline to the crest of the structure exceeding 3 kilometers. (B) The sedimentation rate from the Pleistocene epoch to the present is depicted in meters per million years within the SCB, highlighting significant disparities in sedimentation rates between synclines and the crests of structures (According to Javanshir et al., 2015)

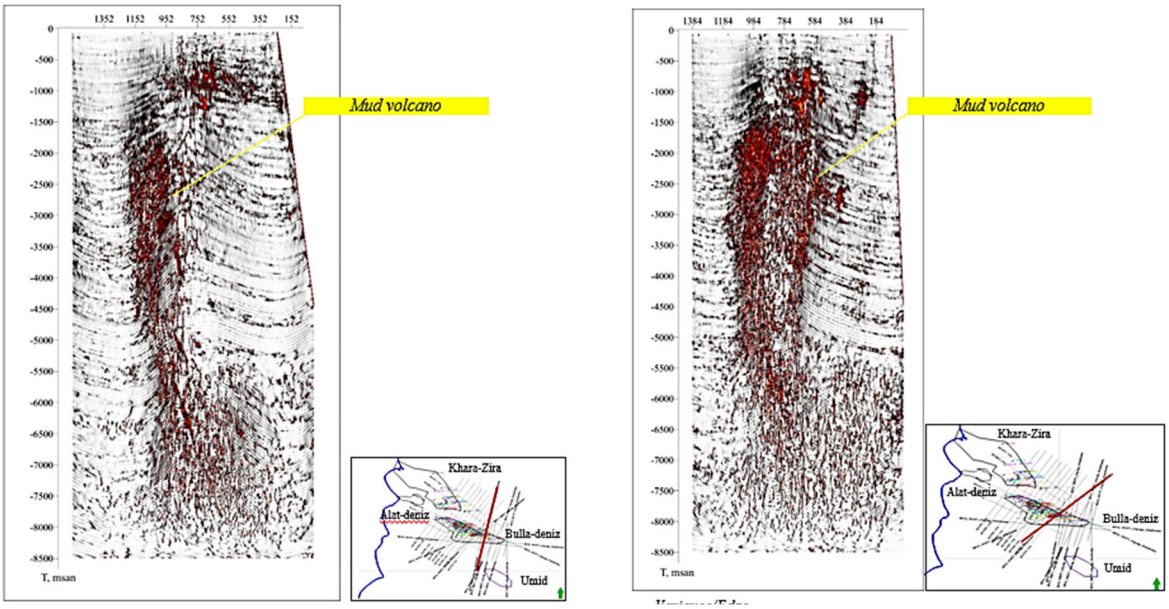

Fig. 3. Sublongitudal seismic sections. Activity of mud volcanoes within longitudinal faults (SOCAR)

The crestal part of the structure and its southwestern limb are characterized by two longitudinal faults in the northwest direction with an amplitude of 900–1000 m, and they divide the structure into separate tectonic zones: the northwestern, central area, and southwestern limb. The V horizon in the central area and southwest limb has not been intersected with deep wells. In the north-eastern limb of the structure, six transverse fractures (NN 3,4) were marked, which divided it into six blocks (Fig. 4a.). The amplitude of some of them (NN 3,4,6) reaches 250 m, while the amplitude of other faults is less than the thickness of the horizon (40–60 m) (Kerimov et al., 2015; Glumov et al., 2004).

means of several wells (wells 53, 56, 70, 71, 74, 72, 77), these well data are not enough to establish an accurate structural map of the VIII horizon. Therefore, the law of normal sedimentation was used.

In the geological section of the Bulla-Deniz field Quarternary, Upper Pliocene and PS sediments were encountered. The existence of Miocene sediments confirmed by deep drilling in the adjacent fields is also beyond doubt. Lithologic and facial characteristics of the section are based on results of core analysis and well log interpretation.

The Productive Series formed due to various sources of sedimentary supply, the main routes of which were the paleorivers of the Volga, Kura, and Araks, in the northwestern part of the South Caspian Basin is represented by the Absheron, Gobustan, and Lowerkura facies (Khalilova, & Seyidov, 2023; Kerimova, 2023).

The Absheron facies is a rhythmic alternation of sands, siltstones and clays, the thickness of which varies widely – from several meters to several hundreds and thousands of meters. The Gobustan type of sediments is marked by poor sorting and weak differentiation. Alternation of pure sandy and clay packages is not observed, mixed types of rocks prevail – clay-sand, sand-siltstone and others, which are characterized by the predominance of one or another fraction. The Lowerkura type of sediments is represented by an alternation of siltstone-clay-sand rocks and is characterized by significant clay formation compared to the Absheron type, a small content of quartz and an increase in the amount of feldspar, pyroxene, hornblendite, which indicates the dominance of igneous rocks in the area of erosion (Abdulla-zada, & Vakhably, 2021; Alieva, 2004).

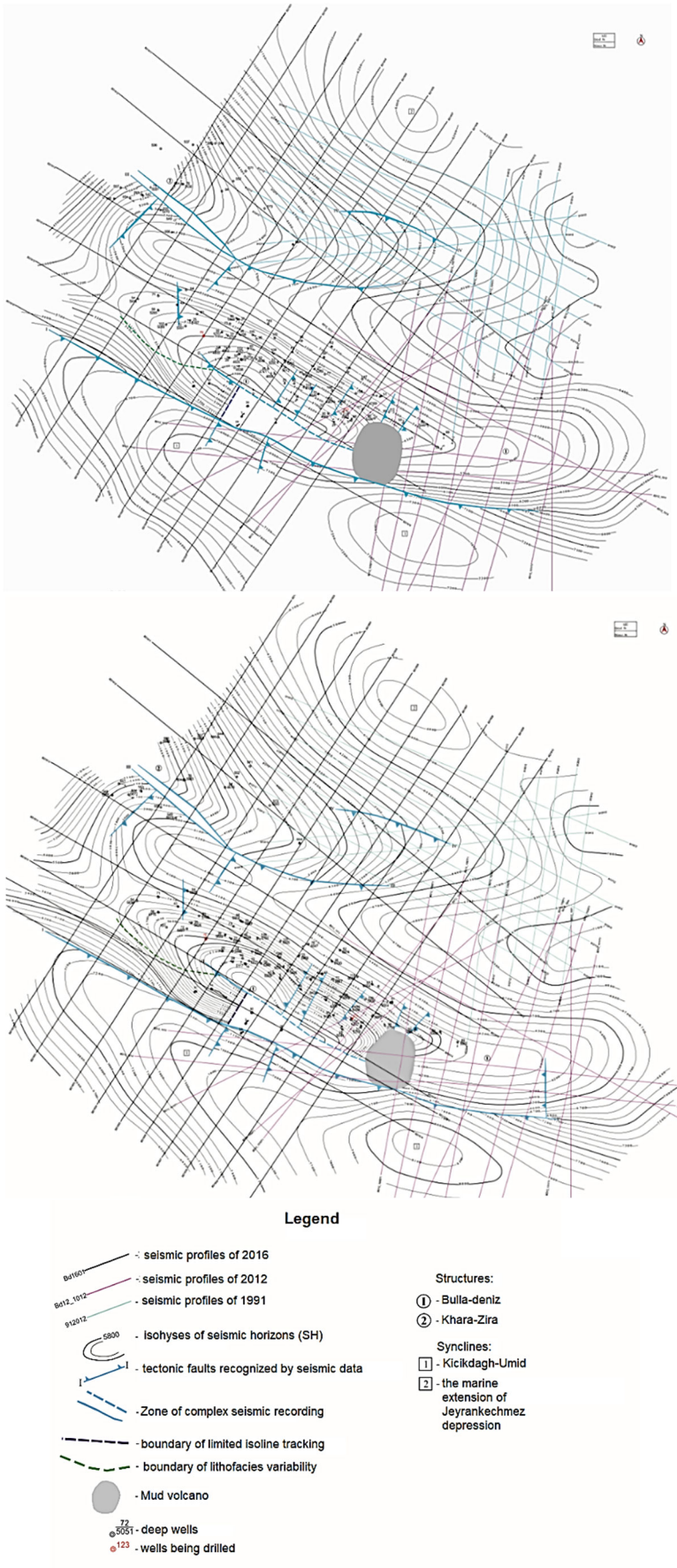

Fig. 4. Structural maps of (a) V horizon and (b) VII horizon (Compiled by SOCAR)

The VIII horizon in Bulla-Deniz field was encountered by Lithologically, the section of sediments of the Productive Series within the South Absheron anticline belt and the Baku Archipelago is represented by alternating layers of clays and sands (Fig. 5.). Reservoirs within the South-Absheron anticline belt are stacked in mainly sands and sandstones, and in the Baku Archipelago, the predominant rocks in the composition of reservoirs are siltstone differences (Aliyeva, 2021). In general, the section of the Productive Series in the Baku Archipelago is more clayey compared to the South Absheron anticlinal belt. In the direction of the Baku archipelago, the sandy material decreases in its section and the mixing of three facies occurs with the gradual disappearance of the Absheron facies to the south (Yusubov, Guliev, & Guseinova, 2020; Yusubov, & Guliev, 2015).

Quaternary sediments consist of a complex of ancient Caspian and modern marine sediments and are up to 650 m thick. The section of the Absheron suite is dominated by clays, and there are intersections of sand and clayey sand sediments. The total thickness is 800 m. Aghchagil suite consists mainly of clay layers, where the thickness is 70 m.

Productive Series section is represented here by two types of sediments, Lowerkura and Absheron facies.

The section of PS was encountered till the upper parts of Kirmaki suite. The deepest well No. 62 in the field reaches the depth of 6400 m (to the VII top horizon). So, well No. 74 reached the Kirmaki suite (KS) at a depth of 5792 m and dissected the top of KS only up to 100 m. The bottom horizons of the Productive Series (Prekirmaki suite, Gala suite) were not reached by exploratory wells in the Bulla-Deniz field.

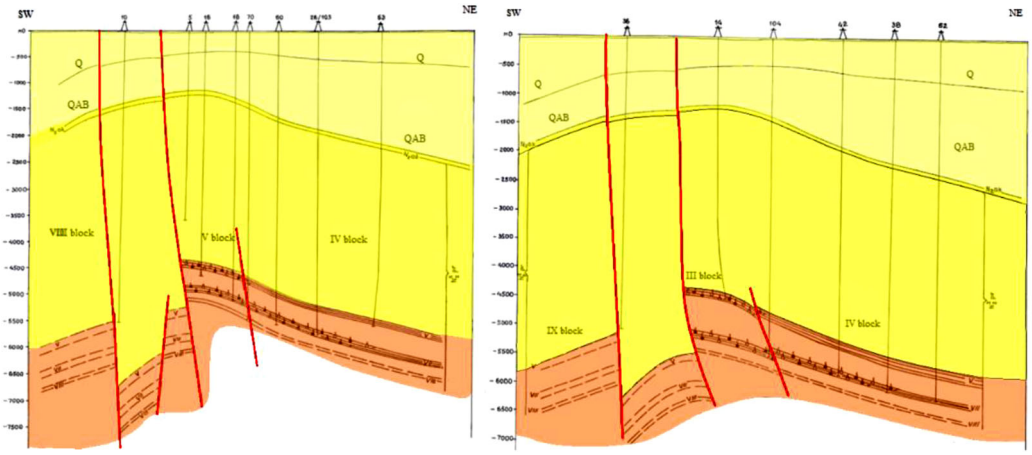

Fig. 5. Geological profiles through the Bulla-deniz field (authors' constructions based on SOCAR seismic profiles)

The PostKirmaki shaly suite (unseparated thickness) of the Productive Series (PS) is up to 3300 m and differs in the absence of oil and gas deposits. In the lower part of the PS (from the top of the V horizon – analogue to the VIII and IX horizons of the Absheron section's Balakhany suite) Absheron facies are widespread and they are of interest in terms of oil and gas content.

Miocene sediments have not been studied by drilling yet. Taking into account the tectonic setting of the area, it can only be assumed that the sediments lying below the PS can begin with the Pontine age (thickness 150–200 m).

The confident division of the upper part of the Productive Series (Surakhany suite, Sabunchu suite, Balakhany suite and Fasila suite) on the Absheron division is uncertain. So, we divide the upper part of the PS into the following lithological units:

V horizon (analogue to the VIII and IX horizons of the Absheron section's Balakhany suite);

VII horizon (according to the Absheron division is analogue to the "Fasila" suite).

The sediments of V horizon are represented by sandy layers with a thickness of 130 m, which are calculated to be 45 %. The upper part of the V horizon (thickness 55 m) is composed of clays with an estimated resistivity of 3–5 Ohms, which is not attracting from the point of view of gas content.

In the section of the V horizon, two well-permeable objects (V_{top} and V_{bot}) were identified for calculating hydrocarbon reserves, both according to the peculiarities of electric logging and the results of well exploitation (Fig. 6). The average thickness of these objects is 21 and 31 m, respectively. Layers 3–7 m thick, sometimes 14 m prevailing, are marked inside each object with a calculated reserve, and their true resistivity reaches 8–10 Ohms. The permeable parts of the object, whose reserves are calculated, are separated by a 20 m thick clay layer.

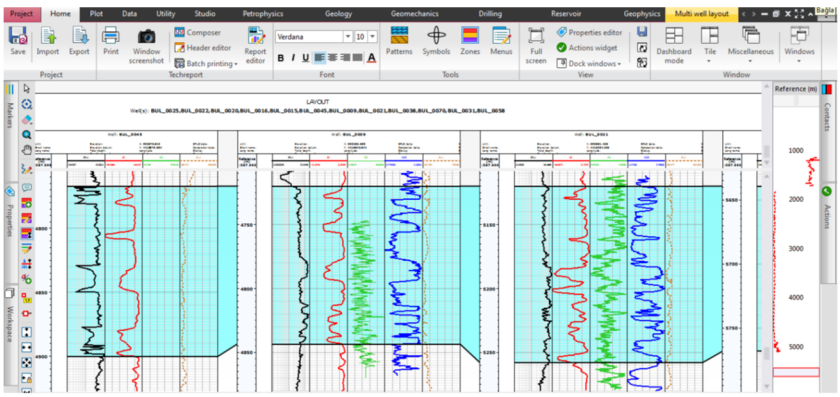

Fig. 6. Well correlation scheme of V horizon

Unit V–VII consists of homogeneous clay with an estimated resistivity of 2–4 Ohms, without differentiation along the SP line.

In the lower part of the section, thin sandstone interlayers are observed, which make up – 10 % of the entire section. The thickness of the V–VII unit varies sharply within the field and averages 370 meters. The lowest value of V-VII unit (up to 320 m) was observed in wells No. 20, 46, and the largest (557–575 m) in wells No. 104, 80, respectively.

The VII horizon (according to the Absheron division is analogue to the "Fasila" suite), has a thickness of 100 m and consists of sandstones and clay interlayers (Fig. 7). The cross-section of the horizon is sandy, where the thickness of sandstone layers constitutes 59 %. Correlation of the well sections allows selecting two objects for reserve calculation in this horizon (VIItop and VIIbot) separated by 25 m thick clay layer.

In the section of the VII horizon, sandy layers are characterized by a resistivity of 10–20 Ohms, in some cases the resistivity values reach even 40 Ohms. The thickness of the sandy layers is 3–6 m, and in some cases, it reaches 12 m. The average thickness of the calculated reserve objects is VIItop – 49 m and VIIbot – 25 m.

The lower part of the PS, we divide into the following lithological units:

VIII horizon (according to the Absheron division is analogue to the "Postkirmaki sandy" suite).

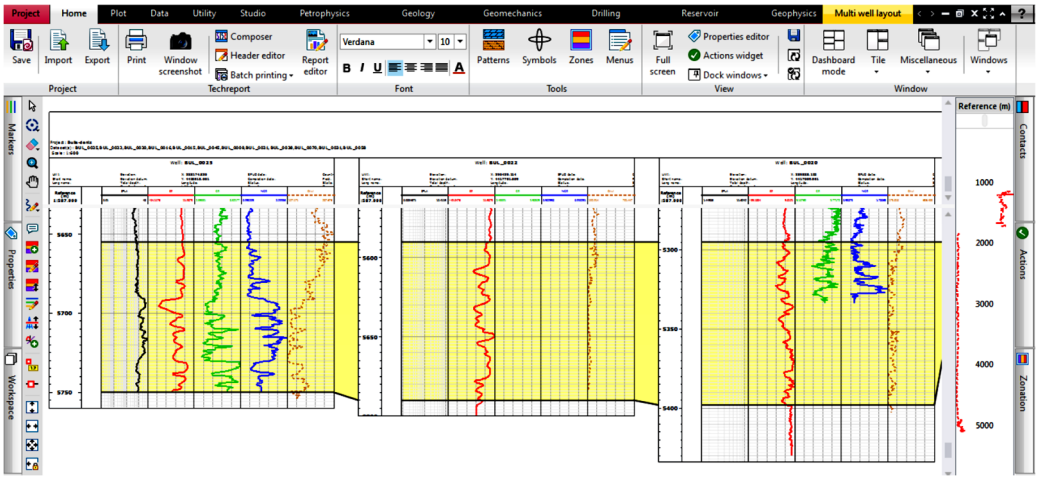

Fig. 7. Well correlation scheme of VII horizon

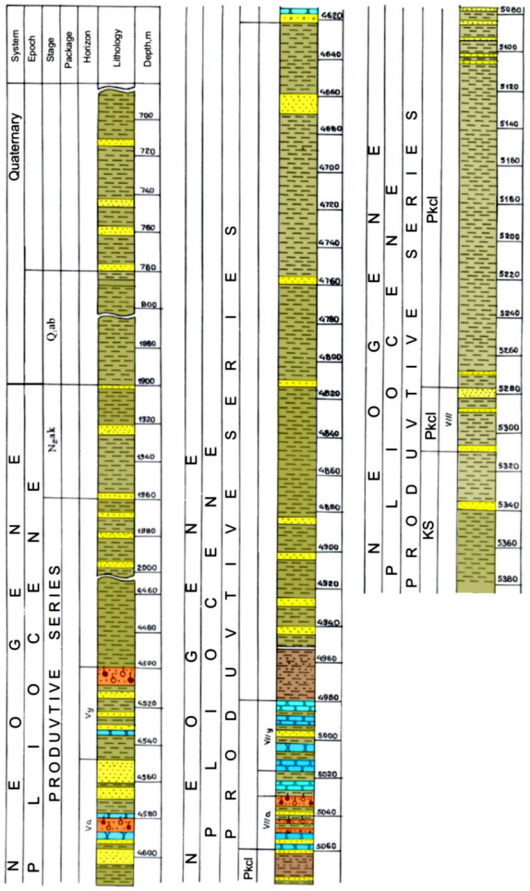

Fig. 8. Generalized geological cross-section

ISSN 1728-3817

PostKirmaki clayey suite consists of a variety of clays with sand interlayers, sandstone, siltstone of small thickness. The thickness of the suite ranges from 120–250 m. Suite pinchout, unlike the lower horizons, is not observed. The electric log curves are poorly differentiated. Sandy sediments are characterized by high resistivity values.

As mentioned above, deeper horizons were not intersected in the Bulla-Deniz field (only Kirmaki suite was encountered up to 100 m). Therefore, the section is given analogously to the adjacent Sangachal-Deniz – Duvanni-Deniz – Khara-Zira fields.

Kirmaki suite was intersected in 6 wells in the Bulla-Deniz field. The maximum thickness (more than 100 m) was noted in the well No. 74, the depth of the well is 5792 m. In the Sangachal-Deniz – Duvanni-Deniz – Khara-Zira fields, located in the neighboring area, the average thickness of the sediments of Kirmaki suite is 350 m, and it consists of clays characterized by interlayers of sand and sandstone with very little thickness (Kerimov, Sharifov, & Zeynalova, 2023). To assume so, it is possible that this layer group will be presented as the same lithofacies in the Bulla-Deniz field.

PreKirmaki suite consists of sandy-clay lithofacies, with sand-siltstone predominance in the Sangachal-Deniz – Duvanni-Deniz field. It can be assumed that the 9 m thick PreKirmaki suite in the Bulla-Deniz field will be suitable for the accumulation of hydrocarbons (Javanshir et al., 2015).

In the Bulla-Deniz field, the Gala suite has a thickness of 400 m, and is characterized by clay facies and an increase in sand-siltstone material in its lower part (Fig. 8).

Sediments underlying the PS. It is assumed that there are no Pontine sediments in the southern lower part of the adjacent Sangachal-Deniz – Duvanni-Deniz – Khara-Zira fields, so the lower part of the PS in the wells is included in the diatom formation. Taking into account the geological structure of the studied region, it can be assumed that in the Bulla-Deniz field, Pontine sediments with a thickness of not less than 150 m lie in the lower part of the PS.

Results

The results of the analysis of rock samples from wells drilled at the Bulla-Deniz field were obtained, analyzed and investigated in order to monitor the area and section of perspective horizons.

The rock samples taken from wells drilled in the Bulla-Deniz field consist mainly of clays, siltstones and sandstones.

Reservoir properties of rocks taken from the Bulla-Deniz field by means of wells were mainly studied on 97 rock samples. They are represented by clays, clayey siltstones and thin sand interlayers. Clays are gray, brown-gray in color and mostly poorly sorted.

Clay rocks consist of the following fractions: the sandstone fraction varies from 1.1 to 9 % and makes up an average of 2.3 %, the siltstone fraction makes up from 14 to 23 % and makes up an average of 18 %, the clay fraction makes up from 71 to 86 % and makes up an average of 77.3 %.

Siltstone rocks are characterized by the following fraction composition: the sand fraction varies from 8.2 to 14.4 % and constitutes an average of 11.2 %, siltstone fraction varies from 54.8 to 66.0 % and constitutes an average of 59 %, the clay fraction varies from 18 to 34.5 % and constitutes an average of 22.5 %.

Sandstones are characterized by the following fractional composition: the sand fraction varies from 20.2–26.5 % and constitutes an average of 21.5 %, the clay fraction varies from 31.8 to 43.7 % and constitutes an average of 34.2 %.

The porosity of the studied rocks of the upper part of the PS varies in the following interval:

- clays 11.3–21.0 % (average 14.0 %);
- siltstones 14.1–25.5 % (average 17.3 %);
- sandstones 17.1–22.0 % (average 19.3 %).

The permeability of the studied rocks of the upper part of the PS varies in the following interval:

- clays 3.5–13.4% (average 8.1 %);
- siltstones 5.6–13.6 % (average 10.7 %);
- sandstones 8–10.4 % (average 9.1 %).

In the Bulla-Deniz field, silty layer sediments were opened by means of exploration wells. The sediments of this part of the section consist of silt, clay and clay-silt sand interlayers.

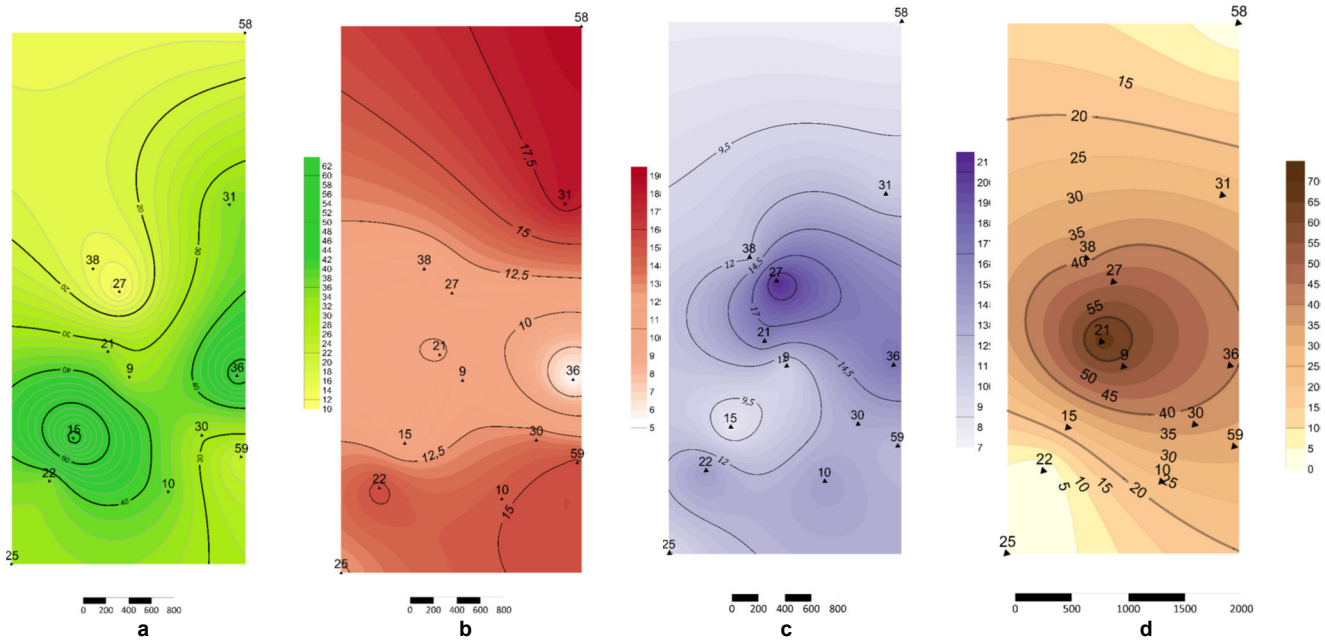

Fig. 9. (a) Vsh, (b) Cc, (c) Porosity and (d) Permeability maps of the V horizon

The porosity of rocks in the lower part of the PS is 6.4–10.6 % for clays (average 9 %), for siltstones 5.4–20 % (average 18.8 %), for sandstones 20.4–28 % (average 22.7 %).

The permeability of these rocks varies from 0.8 to 9.3 mD for clays (average 1.6 mD), for siltstones it varies from 4.8 to 9.5 mD (average 7.4 mD), for sandstones from 18.4 to 28 mD variable (average 21.6 mD).

Clay rocks are practically impermeable.

The comparison of the lithological and reservoir properties of the upper and lower parts of the PS sediments is observed with the improvement of their reservoir properties, permeability and porosity as the depth increases.

Industrial oil and gas potential of the Bulla-Deniz field was determined in 1973 by means of wells of VII horizon (No. 18), in 1974 – V horizon (No. 14) and in 1982 – VIII horizon (No. 56).

The daily productivity of wells pumping powerful gas from great depths from the VII horizon of the Bulla-Deniz field was much higher than the daily productivity of wells operated from the VII horizon of the Khara-Zira uplift and Sangachal-Deniz field (Abbasov, & Guyiev, 2003).

In 1982, the exploitation of Well No. 56 in Bulla-Deniz field showed the accumulation of oil and gas reserves of industrial importance in this horizon.

In 2012–2013, there was a fire in the well as a result of the exploitation Well No. 90 with high pressure gas during drilling. The fire in the well was extinguished after a period of 2 months. This well, starting from 23.10.2013 continued to work with 1.3 mln m^3/g of gas and 200 t/g of condensate. After the comparison of the logging diagrams, it was confirmed that with the fountain the gas-bearing object corresponds to the VIII horizon of PS sediments (Bagirov, Minzverg, & Kondrushkin, 1975). As a result, the high productivity of the VIII horizon was once again confirmed. In terms of oil and gas prospects, the VIII horizon of the PS has a high potential. Drilling deep wells in this horizon is economically viable, although technically difficult.

In the Bulla-Deniz field, according to the reservoir properties of the V horizon of PS, the sand content is about 9 %, and the clay content is 91 %. The values characterizing the calculated porosity coefficient are approximately 2–16 %, and the oil viscosity parameter values range from 0.47 to 0.61 (Fig. 9). These parameters range from 16 %, 84 % for VII horizon, 0.9–14 % for porosity and 0.54–0.64 % for oil saturation. From the obtained data it can be seen that according to V horizon relatively high values of porosity are observed in the central part of the research area, and a slight increase in this parameter is observed in the southern part. The value of oil saturation in these areas is also changing. Within the VII horizon the values of porosity and oil viscosity ratios are spread chaotically across the area.

Discussion and conclusions

Proved oil and gas content in the sediments of the Productive Series within the Baku Archipelago has a fairly wide distribution both in the central and northern areas, and in the stratigraphic interval of the section.

Based on the consistently performed work on the anticline zone, the tectonic setting of the deposit, its lithological and stratigraphic affiliation and oil and gas potential were clarified.

It was concluded that, based on the compiled maps of the V horizon of the Bulla-Deniz area, it turned out that the section is composed predominantly of clay facies (91 %), rather than sandy (9 %) sediments. Values of porosity here changes in span from 2 to 16 %, where the gas saturation parameter varies between 0.47–0.61.

The VII horizon is characterized by a relatively less clayey section, which mainly has a positive effect on the remaining parameters.

Authors' contribution: Elena Pogorelova – writing, investigation, methodology, formal analysis, conceptualization, data curation, supervision; Murad Abdulla-zada – investigation, writing, visualization, data curation, formal analysis, supervision.

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Отримано редакцією журналу / Received: 28.05.24
Прорецензовано / Revised: 19.09.24
Схвалено до друку / Accepted: 20.12.24

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НАФТОГАЗОНОСНІ КОМПЛЕКСИ ТА ЛІТОЛОГО-СТРАТИГРАФІЧНА ХАРАКТЕРИСТИКА ПЛІОЦЕНОВИХ ВІДКЛАДІВ РОДОВИЩА БУЛЛА-ДЕНІЗ

В с т у п . ***У сучасних та довгострокових планах розвитку паливно-енергетичного балансу країни важливим є підвищення та об'єктивна оцінка ресурсів вуглеводнів з метою забезпечення постійного зростання об'ємів видобутку нафти та газу. Спостерігається зменшення обсягу геологорозвідувальних робіт у Південнокаспійському басейні, частково через те, що оцінки прогнозованих ресурсів, зроблені до двадцятого століття, були завищені і, можливо, надмірно оптимістично характеризували нафтовий і газовий потенціал окремих нафтових і газових провінцій, регіонів та районів країни. На Бакінському архіпелазі виявлено промислові поклади в горизонтах VIII ярусу Балаканської свити, свити Фасіла і посткірмакінської піщаної свити. Поклади стратиграфічного типу переважно асоціюються з гребеневими тектонічно захищеними відкладами. Характерною рисою нафтового і газового змісту секції Продуктивного ярусу (ПЯ) є регулярна заміна нафтових покладів на газ і газовий конденсат у напрямку регіонального занурення шарів.***

М е т о д и . ***Метою дослідження є уточнення та оцінка перспектив нафто- і газоносних покладів відкладень ПЯ. Для цього було проведено аналіз комплексу геологічних і геофізичних матеріалів з метою визначення властивостей резервуарів цих відкладів. Дослідження включало використання матеріалів фондів, опублікованих статей та фактичних даних. На основі даних зі свердловин було виконано міжсвердловинну кореляцію для оцінки властивостей резервуарів відкладів ПЯ. Також було вивчено геологічну структуру, літологічне обрамлення і петрофізичні характеристики покладів.***

Р е з у л ь т а т и . ***Аналіз V горизонту Буль-Денізського родовища показав, що секція складається переважно з глини (91 %), а не піску (9 %). Пористість секції коливається від 2 до 16 %, тоді як параметр газонасиченості варіюється між 0,47 і 0,61. VII горизонт, навпаки, має відносно меншу глинистість, що позитивно впливає на резервуарні параметри.***

В и с н о в к и . ***Дослідження підкреслює необхідність більш детальної оцінки вуглеводневих ресурсів у Південнокаспійському басейні, зокрема в Бакінському архіпелазі. Результати показують, що осадові відклади Продуктивної серії, особливо у горизонті V родовища Булла-Деніз, становлять значні виклики через високий вміст глини та змінну пористість і газонасиченість. Проте кращі параметри резервуарів у горизонті VII свідчать про те, що цілеспрямовані зусилля в розвідці та розробці можуть принести перспективні результати. Для оптимізації майбутньої оцінки та експлуатації ресурсів важливо інтегрувати оновлені геологічні та геофізичні дані із сучасними методами розвідки. Такий підхід забезпечить більш точне розуміння вуглеводневого потенціалу регіону і сприятиме сталому управлінню його нафтогазовими ресурсами.***

К л ю ч о в і с л о в а : ***Південнокаспійська западина, Бакинський архіпелаг, Булла-Деніз, родовище, пліоцен, Продуктивний ярус.***

Автори заявляють про відсутність конфлікту інтересів. Спонсори не брали участі в розробленні дослідження; у зборі, аналізі чи інтерпретації даних; у написанні рукопису; в рішенні про публікацію результатів.

The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.