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SEISMIC-GEOLOGICAL ANALYSIS OF THE SOUTH CASPIAN MEGA DEPRESSION EVOLUTIONARY DEVELOPMENT TO IDENTIFY HYDROCARBON ACCUMULATIONS

(Представлено членом редакційної колегії д-ром геол. наук, проф. О.М. Карпенком)

Background. ***The South Caspian Mega Depression (SCMD) is a territory limited in the west by the Dziruly massif, in the east by the Western Turkmenian Depression (inclusive), in the north by the mountain structures of the Greater Caucasus, Greater Balkhan and in the south restricted by the Lesser Caucasus, Talysh and Albours (including the aquatic area of the Southern Caspian) which in turn is related to the South Caspian oil and gas mega-basin. In the geodynamic model, the SCMD represents the Caucasian segment of the Alpine-Himalayan folded belt (its intermountain part) with elements of the active stage of development inherent in this area – earthquakes, sea level changes, mud volcanism, etc.***

Methods. ***This article examines the history of the development of SCMD based on data from geophysics, drilling, volcanology, geodynamics in order to identify accumulations of hydrocarbons.***

Seismogeological sections presented throughout the study area explain the complex geological structure and geodynamics, starting from the baikalian tectonic genesis and up to the present time. The clear boundaries of sedimentary basins and the island arcs surrounding them, which controlled lithology and stratigraphy, make it possible to predict probable petroleum source rock and oil and gas-producing rocks.

Results. ***The construction of structural multi-temporal sediment surfaces in the Petrel program made it possible to trace the geological development of a certain segment (the South Caspian Aquatic Basin) of the studied territory, to clarify the influence of both long-lived deep and short-term local faults on the petrological composition of sediments and their thickness to determine the contours of possible objects of oil and gas formation.***

Conclusions. ***The approximation of the outlined oil and gas source rocks (by PetroMod modeling) stratigraphic units on the territory of Western Turkmenistan to the western part of the SCMD assumes the allocation of hydrocarbon sources in deep-submerged rocks in the rest of the territory.***

The combination of seismometry and volcanology data makes it possible not only to outline geological bodies on seismic profiles, but also to determine their density composition and chemistry by the speed of propagation of seismic waves.

Keywords: ***South Caspian Mega Depression, Greater Caucasus, Lesser Caucasus, Talysh, Alborz, geodynamic model, hydrocarbon sources.***

Background

The South Caspian megadepression (SCMD) is an intermountain trough bounded: from the west by the Dziruly massif, from the east by the West Turkmenian Depression, from the north by the orogens of the Greater Caucasus, Greater Balkhan and from the south by the Lesser Caucasus, Talysh and Alborz, including the waters area of the Southern Caspian (fig. 1). All these structural units are the Caucasian segment of the Alpine-Himalayan folded belt, which is in its active stage of development (earthquakes, sea level changes, mud volcanism, etc.).

The oil and gas potential of this territory is associated to its location on the active margin of the Tethys Ocean, which certainly indicates the presence of hydrocarbon accumulations. For example, the Western Siberia, the Pre-Urals territories and many other oil and gas basins are the ancient active margins of the continents.

The considered territory is part of a united South Caspian oil and gas megabasin, but its geological formation at certain stages took place in different ways.

Volcanogenic sedimentary rocks of the Mesozoic-Quarternary are included into the geological structure of the studied oil and gas basin.

In the Mesozoic period, that territory was represented by the active continental margin of Eurasia and was under compression conditions associated with the convergence of Gondwana with Eurasia (Golonka, 2007) (fig. 2).

Methods

The history of the development of SCMD based on data from geophysics, drilling, volcanology, geodynamics in order to identify accumulations of hydrocarbons allows optimizing prospecting and exploration methods in oil and gas industry.

To analyze the history of the development of such a large and diverse genesis of the territory, various research methods were applied, in particular, the interpretation of seismic profiles, the construction of structural maps and profiles, the use of chemistry of volcanic rocks to clarify the nature of the geodynamic model in different periods of geological time.

Results

Methodology and laying out the main material

The western border of the SCMD is the Dziruly massif, located on the Georgia territory (Mikhailov, 2017). Towards the east of it, the Kartly depression stretched up to the border with Azerbaijan, made by thick strata of Miocene-Pliocene molasses (up to 2–3 km) and Paleocene-Eocene volcanogenic-terrigenous-carbonate formations with a thickness of up to 4.5 km. That means the basement here is situated shallow – about 4–6 km.

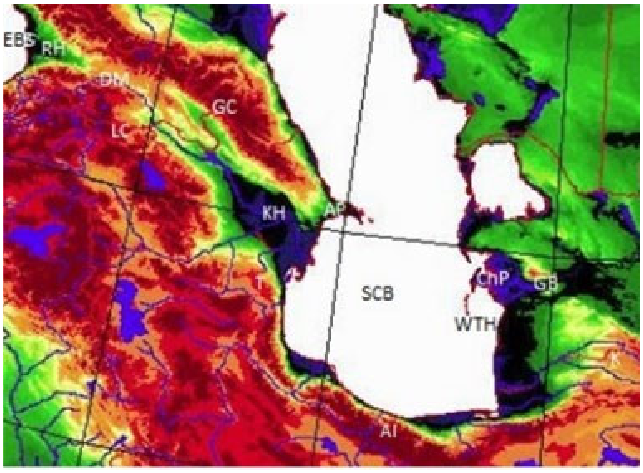

Fig. 1. South Caspian Megadepression:
EBS – Eastern Black Sea hollow; SCB – South Caspian basin; RH-Riony hollow; KH – Kura hollow; WTH – West Turkmenian hollow; GC – Greater Caucasus; LC – Lesser Caucasus; DM – Dziruly Massif; AP – Absheron Peninsula; T – Talysh mountain; A – Albours; GB – Greater Balkhan; K – Kopetdag; ChP – Cheleken Peninsula

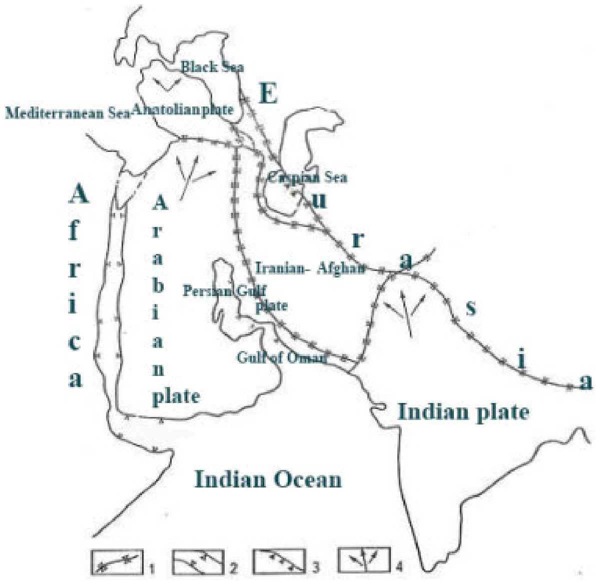

Fig. 2. The scheme of interaction of lithospheric plates of the Caucasian region according to (Narimanov, 2003).
Borders: 1 – collision; 2 – spreading; 3 – subduction; 4 – direction of movement of lithospheric plates

Along the sides of the Kartly depression, narrow folds, overturned to the south, complicated by disjunctives, are developed in Paleogene-Neogene sediments, since both the folding of the Greater Caucasus and Adjara-Trialety have been thrusted onto the Kartliy trough, and the intensity of the former is more significant than latter (Kekelia et al., 2011).

The main oil Georgia's areas are concentrated in the Colchis and South Kakhety oil and gas bearing regions (intermountain troughs in the body of the Transcaucasian microcontinent), as well as in the Guri and Pre-Tbilisi regions (marginal troughs of the superimposed Adjara-Trialety folded zone), which oil-content is associated with the Upper Cretaceous-Pliocene deposits (Lebedev et al., 2004) (fig. 1).

To the east of the Kartly (Upper Kura) depression the Mid-Kura depression with complex tectonics is situated, especially in the interfluve of the Kura and Gabyrri rivers. The South Kakheti tectonic region distinguished here, represented by a thick Paleogene-Neogene stratum (4–5 km), and the Mirzaani-Arashi meganticlinorium with a huge thickness of the Pliocene complex, was folded and torn apart by thrusts (fig. 3).

The southern part of the Transcaucasian microcontinent (island arc) has been passed through the Late Mesozoic and Cenozoic development regime of the marginal basin. As a result, Cretaceous-Paleogene hollows (inter-arc rifts) formed at the junction with the orogeny of the Lesser Caucasus (island arc in the Mesozoic) with structural-formation zones: Adjaria-Trialety, Bolnisi-Ganja and Sakiry. The farthest northern downwarping of some of them are part of the intermountain trough (Khain, 2005).

A relatively stable tectonic block, the Artvin–Bolnisi block, remained unaffected by this regeneration, within which the protrusions of the ancient basement – the Khramy and Loki massifs – have been preserved.

This entire territory in the Mesozoic time was the active margin of Eurasia, composed, in general, of the same sedimentary complexes that form the oil systems of the modern margins of this megaplate.

The recognized sources of oil and gas generation are the deposits of Maikopian (Oligocene-Early Miocene) and Late Eocene. Modern research has added Lower Jurassic shales to the oil source rocks. The main productive reservoir rocks are fractured Middle Eocene volcanic tuffs, dolomitized limestone of Cretaceous age, as well as Chokrakian (Middle Miocene) and Upper Eocene sandstones.

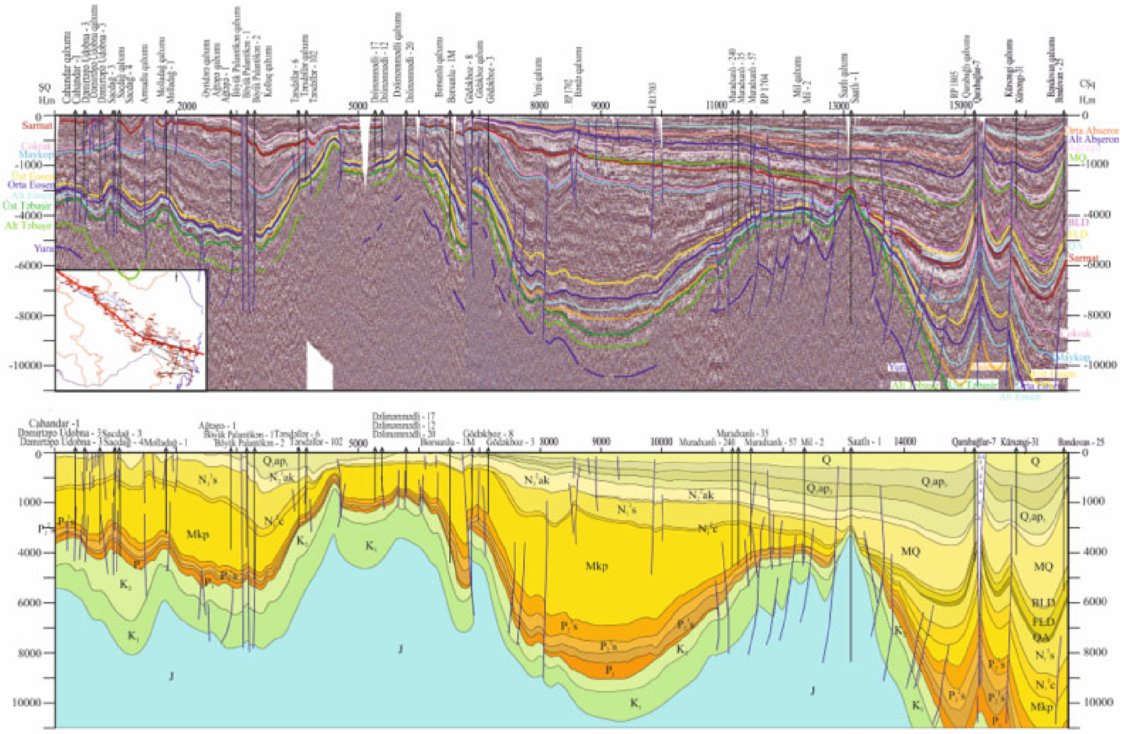

Fig. 3. Seismic time and geological section along the Kura-Gabyrri interfluve to the Lower Kura depression

The Georgian part of the Mid-Kura Trough smoothly passes into the Azerbaijani territory of the depression of the same name, where terrigenous-carbonate (Naftalan, Gazanbulag, etc.) and volcanogenic (Muradkhanli, Jarli, etc.) Meso-Cenozoic deposits have been discovered.

The above-mentioned oil and gas bearing areas belong mainly to the Pre-Lesser Caucasian and Yevlakh-Agjabadi hollows. However, tectonically, the Middle Kura basin from north towards south is represented by the Alazany-Ayrichay superimposed synclinorium, Gakh-Dashyuz anticlinorium, Mirzaany-Arashy synclinorium, Chatma anticlinorium, Jeyranchel synclinorium (fig. 4). The strikes of the listed structures are Caucasian (Gadirov, 2002). The heterogeneity of this depression's structure, as well as the Riony and Upper Kura depressions, is explained by its location in the front of converging plates with active tectonics, including volcanism, folding, and faults.

The Mid-Kura and West Turkmenian depressions were formed on the blocks of Adjara-Trialeti, the Lesser Caucasus, the Pre-Balkhanian zone and the zone of southwestern Kopetdag virgations that continued descending in the Cenozoic. The Kura depression is essentially a Molasse, but mostly a non-superimposed trough. Within its limits, the Gabyrry (Late Cretaceous), Alazani-Ayrichai (Pliocene) and Sabirabad (Quaternary) troughs are superimposed.

The territory of the Kura trough and the Samkheti-Agdam zone were part of the unified Transcaucasian Island arc, or in a narrower sense, the Lesser Caucasus, after the collision in the Bathonian time of the Samkheti-Agdam and Central Kura Island arcs (Pogorelova, & Serikova, 2010; Yusubov, & Guliyev, 2022) (fig. 5).

The age range of volcanism within the territory of the Kura Depression is wider than in the Samkheti-Agdam zone. In addition to the Late Jurassic, Coniacian-Santonian volcanism, which is characteristic to the Samkheti-Agdam zone, the Albian Cenomanian, characteristic to the Vandam zone and Adjara-Trialeti, as well as Campanian volcanism, characteristic to the Vandam zone, is also manifested here (Harutyunyan, 2010). Here, the island–arc volcanism of the first of these zones and the riftingly one for the second are added.

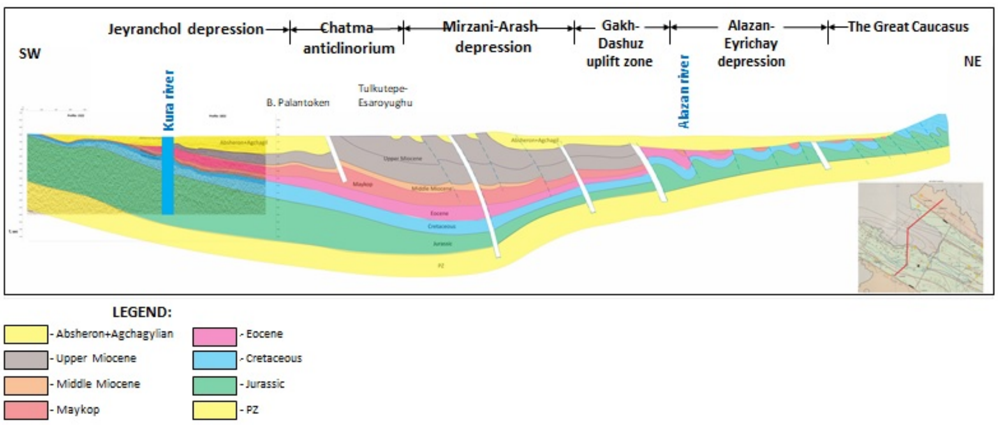

Fig. 4. Geological profile of the Middle Kura depression

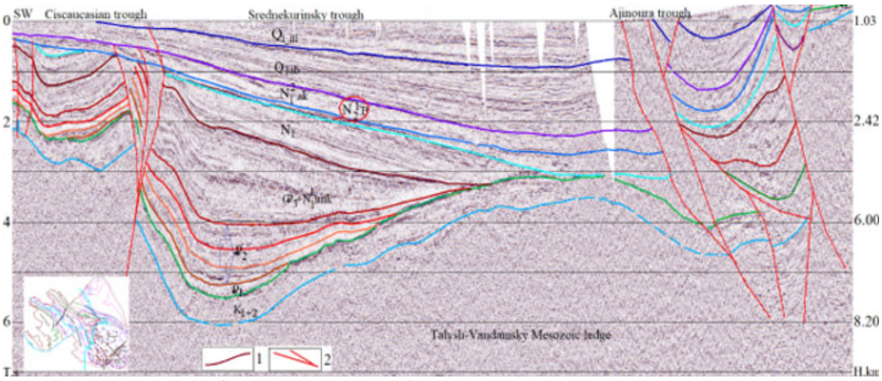

Fig. 5. Seismic time section of the central part of the Mid Kura depression along the line in the diagram in the corner from Southwest to Northeast

The zone of Mesozoic rise position extending from the Kurdamir-Saatli buried uplift area does not extend in the direction of the Vandam zone to the north by the revealed drilling data. This zone turns in a west-northwesterly direction, corresponding to the strike of the Mingachevir-Goychay gravitational maximum. The Mingachevir-Goychay-Kurdamir-Saatli-Mugan gravitational maximum system is emerged, which has a Caucasian strike on the Mingachevir-Goychay segment, and acquires a submeridional strech close the Kurdamir region. This whole system of maxima is blocked from the north (in the western part) and from the east (in the eastern part) Mingachevir-Goychay-Padar-Gizilagach (Mingachevir-Goychay-West Caspian) deep fault system, which is the boundary of blocks with developed and undeveloped granite layer, i.e. encialic and encymatic blocks (Pogorelova, & Serikova, 2010) (fig. 6).

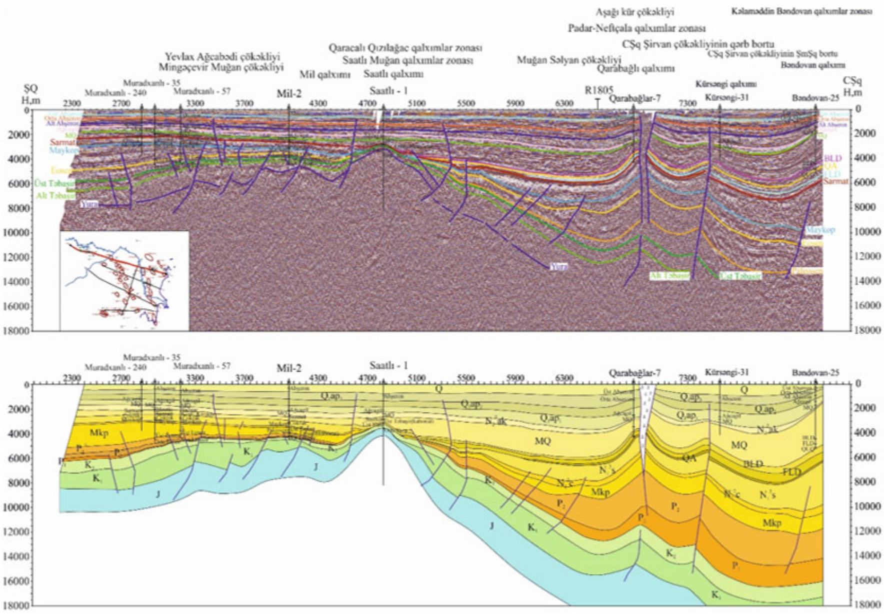

Fig. 6. Mingachevir-Geychay-Kurdamir-Saatly-Mugan gravitation maximum on the seismic-geological section

Since the Mesozoic, the above-mentioned maxima within the Kura basin form uplifts and troughs, which further develop throughout the Meso-Cenozoic. Thus, already in the early Jurassic time, Mingachevir-Goychai-Kurdamir-Saatli-Mugan, Alazani-Agrichai uplifts, Shiraki-Ajinour-Lower Kura, Yevlakh-Agjabadi troughs appeared, which developed up to the Pliocene (Rakhmanov,2007; Yusubov, & Guliyev, 2022) (fig. 7).

In the Pliocene, only the Shiraki-Ajinohur-Lower Kura trough remained (fig. 5). The Yevlakh-Agjabadi trough is being disbanded, and structural noses of the anti-Caucasian strike are forming here at this time. But in the Quaternary, the Yevlakh-Aghjabadi trough reappears (Pogorelova, & Serikova, 2010) (fig. 8).

All structures that develop and eventually cease to exist are controlled by faults: long-lived – Lankaran, West Caspian, Mingachevir-Goychai-Padar-Gizilagach, Ajichai-Alat, Telavi-Ismayilli, Kvareli-Gutkashen; Bilasuvar-Karadonli and Sheki-Yevlakh transverse faults.

The Bilasuvar-Karadonli transverse fault system (Lower Araz) restricts the Bilasuvar-Karadonli transverse uplift (West Caspian, according to E.Shikhalibeyli) from the north and south. This uplift is crucial in the formation of various historical and formational settings in the Eocene period within the Samkheti-Agdam zone of the Lesser Caucasus and Talysh. This faults system connects to a deep fault running in the central part of the Kurdamir-Saatli-Mugan uplift, cutting off the Talysh from the Samkheti-Agdam zone of the Lesser Caucasus.

The Middle Kura Depression expanding to the east, passes into the Lower Kura Depression, into which the Lower Araz trough enters, separating the Talysh fold system from the Lesser Caucasus.

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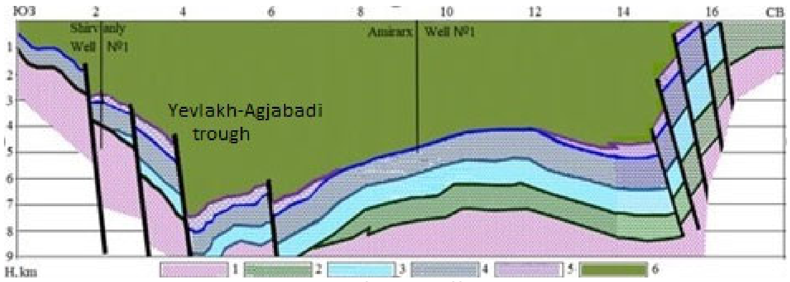

Fig. 7. İn the Oligocene-Neogene the Kura depression flexed differently and created a modern intermountain zone – the Transcaucasian trough with a median massif in the basement:
1 – pre-Jurassic basement, 2 – Jurassic carbonates, 3 – Lower Cretaceous (volcanic sediments),
4 – Upper Cretaceous (carbonates), 5 – Paleocene (carbonates), 6 – not yet formed Cenozoic

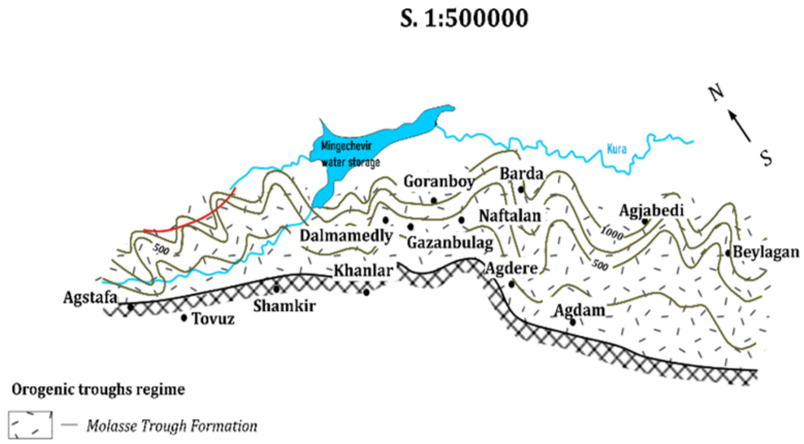

Fig. 8. Paleotectonic map of the Pliocene stage of the southern limb of the Middle Kura depression

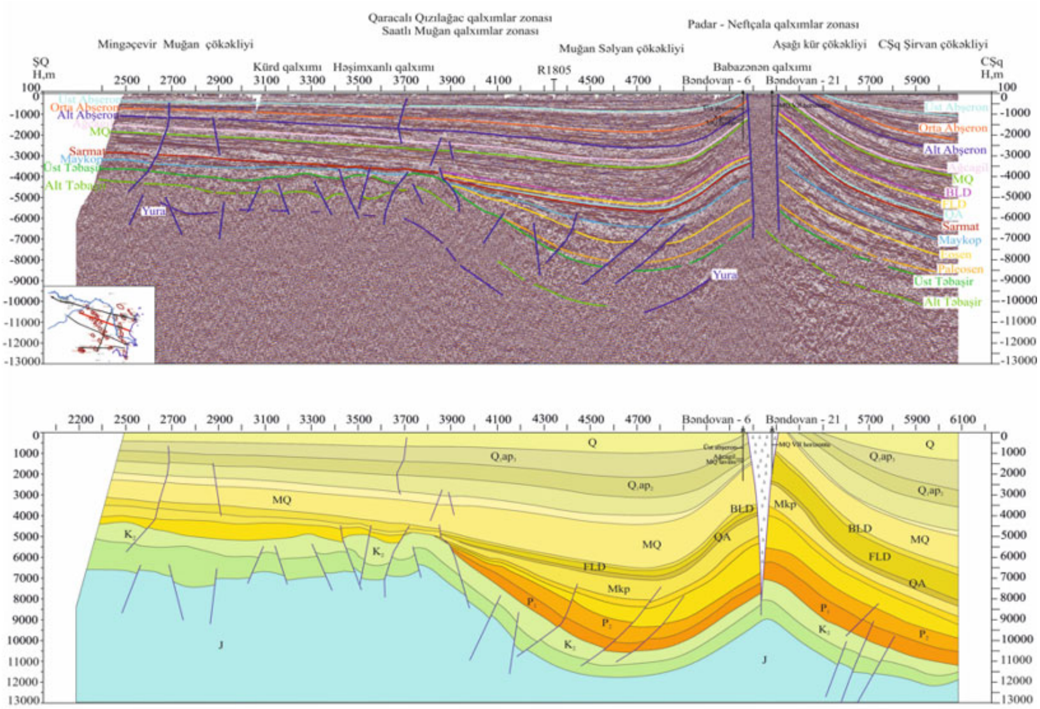

Fig. 9. Seismogeological cross-section along the Mingachevir-Shirvan line

The Lower Kura depression is the widest part of the intermountain Kura trough, composed of 10 km molasses mainly due to the appearance of Early Pliocene continental sediments in the section – an analogue of the "Productive strata". That entire complex of formations, including the Absheron layers (early Quarternary), forms lines of brachianticlinal folds (Kurovdag, Neftchala, Kursangi, etc.) complicated by normal faults and mud volcanoes. In the modern structural plan of the Lower Kura depression, the Navahy local gravitational maximum of the submeridional strike is a reflection of the existing encialic island arc. These maxima are a reflection of the relatively shallow occurrence of dense rocks composing the island-arc series.

The border of the Lower Kura Basin with the Greater Caucasus is expressed in the same way as its entire southern side, by the latter's thrust onto the edge of the depression. In the west it is flattest, where Pliocene molasses are overturned on their heads in the recumbent limb of the thrust, in the east it is steeper.

Towards the east, the Lower Kura Hollow is opened into the South Caspian depression as an oil and gas bearing area of the Baku archipelago, as well as the southeastern end of the Shamakhi-Gobustan depression, more precisely its southern ending, the Langabiz-Alat ridge. As mentioned above, almost all structures are brachianticlinal folds complicated by faults and mud volcanoes with a sedimentary thickness of more than 20 km (Yusubov, & Guliyev, 2022) (fig. 10).

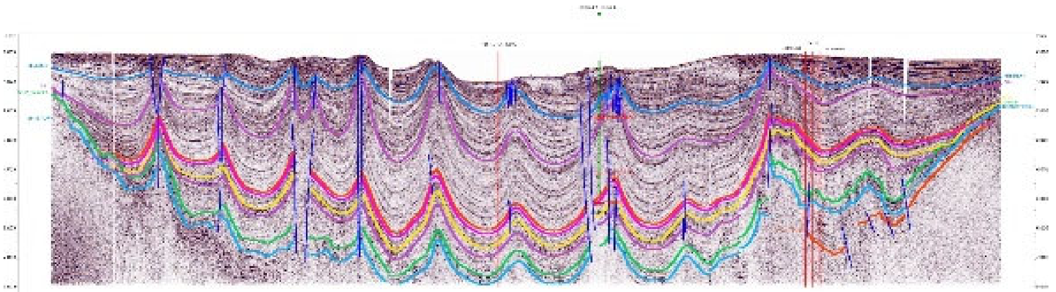

Fig. 10. Seismogeological section of the structures of the western part of the South Caspian Hollow

The island arc bounding the depression of the Southern Caspian Sea from the north is the eastern continuation of the Encialic Island Arc. The latter was founded as mentioned above within the Vandam zone. In modern structural plan its reflection is the Sangachal submeridinal segment of the Yavanidag-Sangachal gravitational maximum and the local gravitational maximum of the Baku archipelago (Glumov et al., 2004).

The above mentioned reflects the strike change tendency of the eastern elements of the Kura Basin from the Caucasian to the submeridional. This trend is also evident for elements of the Vandam zone. It was also revealed by geophysics to the south of the Absheron Peninsula (Goberman, 1975; Menshov, 2021). These eastern elements of the Kura Hollow and the Vandam zone descend into the western part of the Southern Caspian basin, and elements of the West Turkmenian Depression descend into it from the east. These elements of both hollows are often connected to each other within the basin of the Southern Caspian Sea. Thus, in the north of the Southern Caspian Sea depression in the Meso-Cenozoic time the Absheron-Pre-Balkhanian trough develops. The Kurdamir-Saatli-Mugan uplift is connected to the Godin uplift through the depression of the Southern Caspian Sea, and the trough is connected to the Keimir-Chikishlyar trough (Akhmedbeyli et al., 2010).

Although the structures of the Southern Caspian Sea are a continuation of land structures in the sea, it must still be repeated that at certain stages this active margin of the Tethys Ocean had a different history of development. Therefore, despite the relative youth of the Southern Caspian Hollow (SCH) and its riftogenic origin (Alizadeh, & Khain, 2005), dense Mesozoic rocks, possibly of an older age, were found under the layer of Cretaceous-Cenozoic sediments (Khaustov, 2011). All the main geophysical signs, such as increased heat flux, decompression of upper mantle rocks and high occurrence of the roof of the Mohorovichich boundary and the asthenosphere, testify to the riftogenic nature of the Southern Caspian Hollow (Neprochnov et al.,1968; Mammadov, 2002). The Absheron Archipelago is situated to the north of the above-mentioned Baku archipelago – a continuation into the sea of the southeastern end of the Greater Caucasus,namely the Absheron Peninsula, that is connected to the Balkhanian uplift zone in the eastern part of the Caspian Sea, forming a united tectonic structure – the Absheron-Pre-Balkhanian, separating the South Caspian and Middle Caspian basins (Figs. 11, 12).

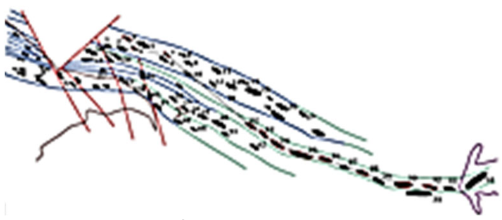

Fig. 11. Tectonic scheme of the Absheron-Pre-Balkhanian uplift zone

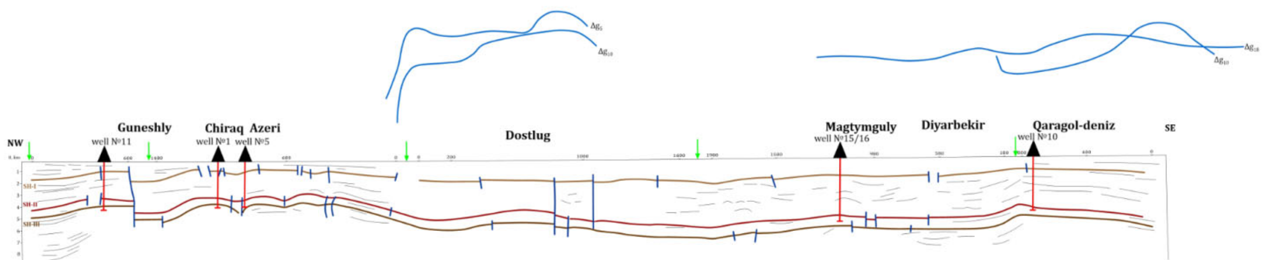

Fig. 12. Sublatitudinal geological and geophysical profile along the Absheron-Pre-Balkhanian uplift zone (Abdullazada, 2022; Pogorelova and Abdullazada, 2023)

All structures formed in the Southern Caspian depression were controlled by the geodynamic situation, which led to the accumulation of sediments with favorable reservoir properties, and the formation of hydrocarbons, and their migration into reservoirs.

The sandy-clay layers of the "Productive Strata" of the Lower Pliocene of the Absheron Peninsula in the depth range from 200 m up to almost 4 km contain hydrocarbon deposits. These layers, downwarping to the southeast, into the Caspian Sea aquatory to the depths of 5–6 km, are productive, and currently the largest deposits are discovered: Shah Deniz, Absheron block, Garabakh, Azeri, Chirag, Guneshli, etc. Figures 11 and 12 show how these "Productive Strata" pass into the Turkmenian part of the Caspian Sea and, according to Zalova (1982), local maxima correspond to Pliocene structures in areas where the presence of an uplifted block in the Paleogene-Mesozoic is assumed, i.e. in the areas of local maxima of Makhtumkuli and Diyarbakir, and Garagol-Denisz. Therefore, it is obvious that the reflection of Pliocene structures in the local fields are subordinated to the influence of the Mesozoic (Abdullazada, 2022; Pogorelova, & Abdullazada, 2023; Aliyeva, 2023).

The folds buried under the seabed, making up the folding of the West Turkmenian intermountain depression, are located between the Alpine folding mountain structures of the Greater Balkhan, Kopet Dagh and Albours. Like the entire South Caspian megahollow, it is characterized by a large thickness of Mesoceinozoic sediments (15–20 km in its central parts), the manifestation of plicative and disjunctive dislocations, linear folding, and the presence of mud volcanism (Rustamov, 2005). The main tectonic elements of the West Turkmenian Depression are the Pre-Balkhanian, Gograndag-Okarem uplift zones and, separating them, the deep Kyzylkum trough (fig. 1).

The Pre-Balkhanian uplift zone stretches in a sublatitudinal direction in the northern part of the depression and is represented by anticlinal structures (Cheleken, Kotur-Tepe, Barsagelmes, etc.) descending into the Caspian Sea (Zhdanov Bank, Gubkin Bank, LAM, etc.), and connects with the Absheron threshold stretching towards it. The Gograndag-Okarem's uplifts zone stretches in a submeridional direction parallel to the Caspian Sea coast. The folds of this zone, unlike those of the pre-Balkhanian zone, are flat with wide hinges, with a small amplitude and less complicated (Ibrahimov, 1998).

These folds morphology allows us to conclude about their genesis. Firstly, their orientation reveals their dependence on the submeridional (West Turkmenistan) fault, which forms folding processes (normal faults in Neogene deposits correspond to these fractures, which, in turn, are associated with numerous mud volcanoes). Secondly, the folds shapes and amplitudes confirm their origin, most likely from the vertical forces of the earth's crust, and not from the horizontal ones.

The Kyzylkum trough is situated between the Absheron-Pre-Balkhanian and Gograndag-Okaremian uplift zones and subjected to the horizontal and vertical forces of the Earth's crust in this segment of the West Turkmen Depression. This is explained by the fact that the hollow develops in the interaction of small plates zone of the earth's crust both along shear's boundaries and along deep crustal faults. This is reflected in the folding genesis and its orientation in space. Literally, the Absheron-Pre-Balkhanian zone of uplifts, that limits the hollow from the north, reflects the subduction zone of the SCH under the Eurasian plate in the sedimentary cover (Mammadov, 2002). The Gograndag-Okarem zone of uplifts limits the hollow from the southeast borders the Kyzylkum downwarping along the shear, which ultimately controls its folding in Neogene-Quaternary layers. On the border with the shear, suture zone, the folds have a sub–meridional orientation; in the central and northern parts of the trough, the orientation of the folds is sub-latitude.

The farthest eastern tectonic unit of the SCH – Aladak-Messarian tectonic zone represents an area of buried Mesozoic folding descending to the west towards the Gograndag–Okaremian uplift zone along a system of large, stepped deep faults, to the west of which deposits of red-colored strata appear that are absent in the Aladak-Messarian zone (Guliyev, Fedorov, & Kulakov 2009).

In the West Turkmenian depression all identified fields (Pre-Balkhanian and Gograndag-Okaremian vicinity) belong to the Red-colored (Productive) strata where they are also multi-layered and to the Akchagyl and Absheron suites of the Upper Pliocene and the Quarternary (Babaev, & Hajiyev, 2006).

Speaking about oil and gas generating deposits, taking into account the history of formation and the lithological composition of the SCH, they can be attributed, referring to the results of modeling the processes of generation and accumulation of hydrocarbons in the sedimentary complex, to Mesozoic-Pliocene stratigraphic units (Kerimov et al., 2011).

Moreover, the main focus of gas phase generation is deposits located in the zones of apocatagenesis and metagenesis of the Mesozoic. The focus of the liquid phase here is Paleogene-Miocene sediments with the clearly subordinate participation of the lower part of the "Red-colored strata" section (grades MK1—MK2, partially MK3), that in the sedimentary cross-section corresponds to the current actual position of the oil formation zone – the depth range is up to 8–10 km. Condensate and fat gas generation zones are at depths up to 12–14 km, i.e. these processes are carried out mainly in the underlying "Red-colored strata" sediments, determining the clearly allochthonous nature of its HC saturation (Serikova, Allanazarova, & Idiatullina, 2022) (fig. 13).

Discussion and conclusions

Having examined the evolution of the South Caspian Mega Hollow, having traced the stage-by-stage development of each major element of the region, we come to the following conclusions:

- On the site of the modern Kura and Gabyrri interfluve up to and including the Lower Cretaceous there was the Artvin-Bolnisi uplift;
- The Gabyrri (Late Cretaceous), Alazani-Ayrichai (Pliocene), Sabirabad (Quaternary) troughs and the Araz transverse trough within the Kura depression are superimposed troughs;
- The Bilasuvar-Karadonli transverse uplift developed in the Cretaceous-Oligocene time, and the Lower Araz transverse trough developed only in the Miocene;
- In the Kura and West Turkmenian hollows Mesocenozoic uplifts and troughs change their strikes from the Caucasian to the submeridional and go into the depression of the Southern Caspian;
- Due to the change of the structures strike it is wrong to talk about a single Talysh-Vandam submeridional uplift since the Mingachevir-Goychay gravitational maximum is separated from the Vandam maximum by the Ajinohur minimum, and the Mugan gravitational maximum goes into the Southern Caspian Sea reaching the Talysh mountains.

The main part of the Kura depression up to the Pliocene was a Molasse inherited trough, and the Lower Kura trough developed later, and only in the post-Baku time a modern relief was formed here.

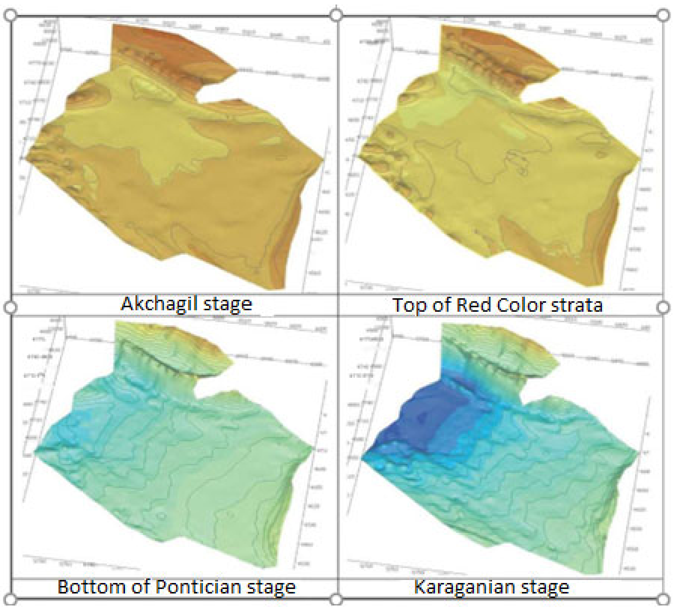

Fig. 13. Structural-tectonic models of the Turkmen sector of the South Caspian basin according to (Serikova, Allanazarova, & Idiatullina, 2022)

Based on the study of the structural plans ratios of the Kura depression folding, we come to the conclusion about the hydrocarbon prospects of the structural protrusions of the anti-Caucasian direction within the interfluve of the Kura and Gabyrri. The structural promontories of the Anticaucasian direction and the anticlinal folds of the same direction indicate their ancient formation, which in turn indicates that they were already formed by the time of the migration of hydrocarbons and could be the place of their localization. In this regard, volcanogenic sedimentary formations of the Eocene and Upper Cretaceous with good reservoir properties may be promising in terms of oil and gas potential.

Zones of inherited deflection (as yet undetected) may be promising in terms of oil and gas potential, as they have developed a continuous section of sediments. Such zones are the Absheron Peninsula, the Lower Kura Depression, and the Shiraki-Ajinohur zone.

In the West Turkmenian basin the structural plan changing in the Paleogene occurred. The modern structural plan within its boundaries has been formed since the Pliocene. The oil and gas potential both discovered and promising is associated with Paleogene (sub "red-colored") terrigenous and Neogene-Quaternary deposits.

Authors' contribution: Elena Pogorelova – conceptualization, methodology, writing (original draft); Murad Abdulla-Zada – data treatment, formal analysis, writing (revision and editing); Lala Abilhasanova – data validation; Telli Shikhmammadova – data validation.

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СЕЙСМОГЕОЛОГІЧНИЙ АНАЛІЗ ЕВОЛЮЦІЙНОГО РОЗВИТКУ ПІВДЕННОКАСПІЙСЬКОЇ МЕГАПРОГИНУ З МЕТОЮ ВИЯВЛЕННЯ СКУПЧЕНЬ ВУГЛЕВОДНІВ

В с т у п . ***Південнокаспійський мегапрогиб (ПКМП) – це територія, обмежена на заході масивом Дзирули, на сході Західнотуркменською западиною (включно), на півночі гірськими структурами Великого Кавказу, Великого Балхану, а на півдні – Малим Кавказом, Талишем і Албуром (включаючи акваторію Південного Каспію), яка, у свою чергу, пов'язана з Південнокаспійським нафтогазоносним мегабасейном. У геодинамічній моделі ПКМП являє собою кавказький сегмент Альпійсько-Гімалайського складчастого поясу (його міжгірську частину) з елементами активної стадії розвитку, притаманними цій території, а саме – землетрусами, змінами рівня моря, грязьовим вулканізмом тощо.***

М е т о д и . ***У статті розглянуто історію розвитку ДДЗ на основі даних геофізики, буріння, вулканології, геодинаміки з метою виявлення скупчень вуглеводнів.***

Сейсмогеологічні розрізи, представлені по всій досліджуваній території, пояснюють складну геологічну будову та геодинаміку, починаючи з байкальського тектонічного генезису і до сьогодення. Чіткі межі осадових басейнів та острівних дуг, що їх оточують, які контролювали літологію та стратиграфію, дають змогу прогнозувати ймовірні нафтогазоносні та нафтогазопродуктивні породи.

Р е з у л ь т а т и . ***Побудова структурних різночасових поверхонь відкладів у програмі Petrel дозволила простежити геологічний розвиток певного сегмента (Південнокаспійської западини) досліджуваної території, з'ясувати вплив як довготривалих глибинних, так і короткочасних локальних розломів на петрологічний склад відкладів та їх потужність, визначити контури можливих об'єктів нафтогазоутворення.***

В и с н о в к и . ***Наближення виділених (за моделюванням PetroMod) стратиграфічних одиниць нафтогазоносних порід на території Західного Туркменістану до західної частини ДДЗ передбачає виділення джерел вуглеводнів у глибокозанурених породах на решті території.***

Поєднання даних сейсмометрії та вулканології дає змогу не тільки окреслити геологічні тіла на сейсмічних профілях, але й визначити їхній густинний і хімічний склад за швидкістю поширення сейсмічних хвиль.

К л ю ч о в і с л о в а : ***Південнокаспійський мегапрогиб, Великий Кавказ, Малий Кавказ, Талиш, Албурс, геодинамічна модель, джерела вуглеводнів.***

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