

# DEVONIAN DEPOSITS – PERSPECTIVE DIRECTION OF SEARCHING FOR OIL AND GAS IN CASPIAN BASIN

D.K. Azhgaliyev

Nedra-Engineering Company LLP, Almaty, Kazakhstan, e-mail: [dulat.azhgaliyev@gmail.com](mailto:dulat.azhgaliyev@gmail.com)

**Abstract.** The regional features of the structure and distribution of the Devonian deposits in the subsalt Paleozoic complex of the Caspian basin are considered taking into account the new drilling data and the results of the interpretation of the aeromagnetic studies data. A general assessment of the prospects of the Devonian strata and, in general, the Paleozoic deposits lying at elevated depths (5.5-8.0 km) is given, with an emphasis on promising objects which are the large uplifts along the Devonian-Lower Carboniferous complex of sediments. The characteristics of individual zones with identified large local uplifts at the level of the seismic horizon  $P_3$  in the southeast (Kashagan-Tengiz and South Emba zone) and in the east (Zhanazhol-Tortkol zone of barren rises and the Borzher-Akzhar tectonic stage) of the sedimentation basin are presented.

**Keywords:** Devonian deposits, oil, gas, Caspian basin

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Nowadays, the study of subsalt Paleozoic deposits which are associated with the main prospects of the oil and gas potential of the Caspian basin is at a qualitatively new stage of the study. Based on the results of recent years' studies, within the framework of the regional project called "Integrated study of sedimentary basins of the Republic of Kazakhstan" (2009-2013), initiated by "KazMunayGas" NC JSC and the Committee for Geology and Subsoil Use of the MID RK, the Paleozoic complex scientifically substantiated the need for prospecting works at elevated depths up to 5.5-8.0 km.

In the context of this particular direction, the results of the conducted exploratory work on the study of the deep-lying deposits of the Paleozoic (Devonian-Carboniferous) period over the recent years have made it possible to obtain a number of important and principled positions and conclusions, which are as follows:

a) Preservation of the stratigraphic completeness of the section in the relatively submerged interior regions of the sedimentation basin (along with the onboard zones), in which the reduction of the cut was previously assumed: in one case, due to erosion and deposition of individual sections of coal deposits and older complexes, in another due to the development of large paleo-elevations (Bikjalsky fold and others). In the process of refinement of the model of Paleozoic sedimentation and the emergence of new actual geological and geophysical data, it has been established that the formation of large local uplifts was characterized in large part by the sedimentary accumulation of precipitation in these zones.

b) Sufficiently proven tracing of Paleozoic seismic horizons  $P_3$ ,  $P_2^D$ ,  $P_2^1$  characterizing the Devonian-Lower Carboniferous part of the section and a relatively more reliable separation of the two main Devonian-Midvissean and Uppervisean-Artinian seismic complexes (Eskozha, Voronov, 2008).

c) Confirmation of the petroleum potential of the Paleozoic complex in the inland, more submerged areas of the subsalt Caspian basin at depths of up to 7.0 km in the Tasim South-East area, timed to the northern slope of the Atyrau-Shukat foundation projections. Along with this, new drilling and seismic data allows us to highly evaluate the prospects of

the Paleozoic layers in a number of new structures, both in traditional depth-approachable areas – in the instrumental areas and in relatively deeply embedded areas of the sedimentation basin, where an emphasis is placed on the Upper Devonian-Lower Carboniferous part of the section to solve search problems.

d) The low content of sulfur and hydrogen sulphide, noted during prospecting operations at the above-mentioned promising sites at depths of 5.5-7.0 km, which is an important prerequisite in the planning of prospecting works (Iskaziyyev et al., 2014), based on the forecast of hydrocarbon deposits that are environmentally friendly from hydrogen sulphide and sulfur (hereinafter referred to as HC).

e) The representations on structural-tectonic and spatial models of the occurrence of Paleozoic deposits in the more submerged inner sections of the basin have been refined, taking into account the interconnection of the main subsalt seismic horizons (OG  $D_1$ ,  $P_3$ ,  $P_2^D$ ,  $P_2^1$ ,  $P_2$ ,  $P_2^c$  and  $P_1$ ). As a result, a new assessment of the resource potential and prospects of the oil and gas potential of the Paleozoic deposits, especially in the depth interval 5.5-7.0 km has been done, and we have substantially adjusted the approaches in assessing the prospects of Paleozoic deposits, the preparation of priority objects, and the forecast of development zones for large Paleozoic uplifts which serve as oil and gas traps for setting up geologic exploration.

It should be noted that a qualitatively new stage of research has been possible to a large extent due to increased technical capabilities and a new level of processing and interpretation of geological and seismic data.

In the Paleozoic cut, in accordance with the formation composition and the existing interruptions of sedimentation and regional disagreements, two strata/mega-complexes are distinguished: The Lower Devonian (Riphean-Lower Paleozoic) and the Upper Devonian-Artinian mega-complex. Accordingly, two structural levels are distinguished (the lower one is Lower Paleozoic-French and the upper one is Famenian-Artinian), which characterize the various stages of development and sedimentation. The thickness of the allocated levels on seismic data is 1-2 km and 4-6 km, respectively.

The deposits of the Lower Paleozoic period (Ordovician, Silurian) according to seismic data are assumed to be in the Pogodaevo-Ostafievsky ridge, at the Karpovsky protrusion and in the zone to the north of the Karachaganak ridge. The relationship of sediments in the section characterizes the seismic reflecting horizon  $D_1$ . The thickness of the sediments in these areas according to data provided by Akchulakov U.A. and others, is amounted to about 450-1000 m (Akchulakov et al., 2012). The Lower Paleozoic deposits are also projected on large, elevated blocks of the southern, eastern, and central parts of the Caspian basin.

The analysis of the available data as a result made it possible to identify large uplifts in the Devonian and Lower Carboniferous in some parts of the southern, eastern and northern frames, as well as in the more submerged interior regions of the basin, the structure of which can be traced at the level of horizons  $P_3$ ,  $P_2^D$ ,  $P_2^1$  and  $P_2$ . These objects are distinguished by considerable dimensions in terms of plan, the large amplitude of the structures and the similarity of the seismic parameters of the wave pattern. In many cases, the data also indicates the connection and confinement of most major uplifts to the projections of the basement. At the same time, in assessing the prospects of Paleozoic uplifts and as the main reference point for exploratory research, attention is focused on the Upper Devonian-Lower Carboniferous range and, in particular, on the Devonian part of the section.

For a long time, local (or limited) data on the southeastern (Tengiz, Ansagan), northern (Chinarevskoye, Karachaganak) and southwestern (the well of Volodarskaya G-2 on the northern submerged slope of the Astrakhan arch) edges of the Caspian pool were indicative of the productivity of the Devonian deposits. In recent years, data has been obtained on the possible industrial petroleum potential of the Devonian sediments within the eastern side of the basin in the Urikhtau area (Zhanazhol-Tortkol zone of uplifts). Also, the high probability of oil and gas content of Devonian deposits is evidenced by drilling data, GIS and seismic surveys in a number of areas of the south-eastern and northern borders of the basin (Fig. 1).

Therefore, there are real grounds for delineating the zones of regional productivity of the Devonian parts within the Caspian Basin. Obviously, the potential results of the Devonian complex of the subsalt Caspian pool are far from being exhausted. The new drilling data makes it possible to more broadly assess the internal structure and formation of deep-seated Devonian deposits.

At a depth of up to 7.0 km in recent years, the prospects for large Paleozoic uplifts in the north (Koblанды, Shirak, Tamdy, Zhelayevskaya), south (Kobyakovskaya, Zaburunye, Novobogatinskoye, Saraishik, Zhambai), southeast (Kuzbak, Kyzylkuduk, Buyrgiyin, Kyrykmergen – Northern Munayly) and east (Akzhar Vostochny, Urikhtau, Akkemir, Koskol – Shubarkuduk zone) of the Caspian basin. Large objects are projected in the “transitional” Bozashin-Emba zone in the extreme southeast of the basin (Munai bai, Sarytau, Burinshik Vostochny, Ostrovnaya).

Note that the results of the interpretation of these new aeromagnetic studies carried out within the framework of the Comprehensive Study of the Caspian Sedimentary Basin significantly supplemented the assumptions about the regional distribution of promising sites and provided information on

the depth of occurrence of Devonian sediments throughout the basin as a whole.

Based on the analysis of new maps of the anomalous magnetic field, extensive projections of the latitudinal foundation are clearly traced, stretching for 50-60 km on both sides of the middle reaches of the Emba river, administratively occupying the north-eastern regions of the Atyrau region (Kovrizhnykh P.N., Karimov S.G., 2009-2012) (Akchulakov et al., 2012). Two main categories of areas (regions) with characteristic features and intensity of distribution of an anomalous magnetic field are identified.

We believe that on a significant territory of the Caspian Paleozoic basin (southern, eastern and northern airborne

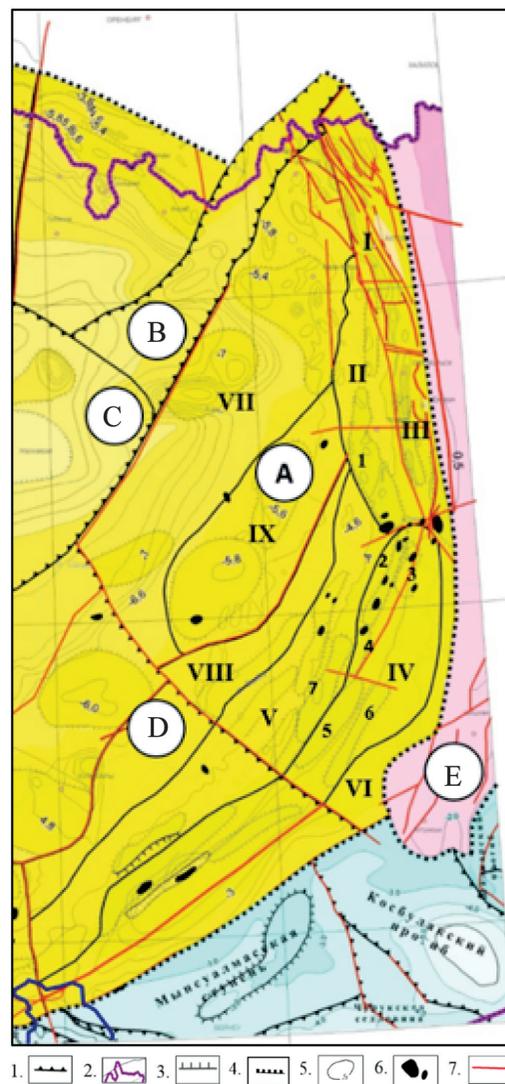


Fig. 1. The tectonic scheme of the south-eastern and eastern sides of the Caspian basin according to the subsalt complex (according to the data of Akchulakov U.A. et al., 2009-2013). 1. Geoblocks /foundation blocks: A – East, B – Novoalekseevsky, C – Central Caspian, D – South, E – Sakmaro-Kokpektyyn stage/Paleozoic outcrops on the surface; 2. Tectonic structures of the Order II. Areas of sprawling uplifts: I – Aktyubinsk, II – Temirskaya, IV – Zhanazhol-Tortkolskaya, IX – Shubarkuduk-Koskolskaya; Deflections: III – Ostansuk, VI – Teresken; Tectonic steps: V – Borzher-Akzharskaya, VIII – Baiganinskaya; VII – Yegendy-Sarykumak; 3. Shafts/Upfolds: 1 – Kenkiyak-Akkuduk, 2 – Urikhtau-Kozhasai, 3 – Zhanazhol-Sinelnikovskiy, 4 – Tuzkum, 5 – Tortkolsky, 6 – East-Tortkolsky; 7 – Borzhersky; 4. Contours of the Caspian Basin; 5. Isogipses on the roof of the subsalt sediments (OG P), km; 6. HC fields; 7. Regional deformations and tectonic disturbances

“segment”) corresponding to zones of a lower anomalous magnetic field, where the Devonian complex is located at depths of about 8 km. The results of the regionalization of the magnetic field show that the magnetic field “ $\Delta T$  reg.”. Is the most informative for these zones. The basis for such conclusions was the results of comparison and correlation of the corresponding anomalies with elements of the forecast of oil and gas potential (trends of fault tectonics and large local structures along the reflecting horizons in the Devonian and Carboniferous complexes).

An important result of the complex analysis is the correspondence of the identified anomalies of a certain rank to the zoning scheme of the magnetic field, to the large oil and gas accumulation zones along the Paleozoic complex (Karachaganak, Kashagan, Tengiz, Zhanazhol-Kozhasai).

In continuation of this, the approach to the evaluation of the prospects for large local uplifts in the Paleozoic complex in a number of blocks, where the Devonian-Lower Carboniferous part of the section is more confidently distinguished on the basis of the prepared seismic models and attributes, is quite correct from these positions.

The second category includes lands with a slightly higher intensity of the observed anomalous magnetic field. They are relatively smaller in area, although they stand out in the central (western half), northern (south-western quarter) and north-eastern part (the articulation area of the northern and eastern sides) of the basin. Perspective Devonian deposits are associated with a depth interval of the order of 10 km. We believe that with the progress in the development and exploration of deep drilling technologies on the world level the projected major uplifts in the Devonian complexes can become the main objects of prospecting works in the period of 2020-2040.

Taking into account the justified and refined directions on this basis, there are 3 proposed main types of zones/areas of concentration of prospecting works for the further study and forecast of oil and gas content of Devonian deposits.

So, at the first stage (until 2025), the emphasis in the placement of prospecting works should be given to:

- Large carbonate platforms, their peripheries and deep sides at depths of 6-7 km (Tengiz-Kashagan carbonate platform, Karachaganak-Koblandy and Teplovsko-Tokarevskaya carbonate development zone).

- Relatively submerged zones in the instrumental parts and in the inner regions of the Caspian basin, where there are the proposed predominantly terrigenous and carbonate-terrigenous compositions and the character of sedimentation in the depth interval of 7-8 km (Koshalak-Oktyabrskaya, Novobogatinskaya, Atyrau-Shukat, Temir-Utybayskaya and Koskol-Aschikolskaya systems of protrusions of the basement).

In Phase II (until 2040), the areas of concentration of prospecting works in this direction will be the inner and central regions of the Caspian Basin with an interval of depths of Devonian deposits which is at 8-10 km. In these terms, they correspond to the zones of the Zhaik and Azgir projections of the basement, the Khobdinsky “maximum”, the section to the south-west of the Tokarev-Teplovskaya group of oil and gas bearing structures, the Pre-Ural system of downfolds (the eastern and northern side joints), the lower reaches of the Paleozoic Riphean complex, including weathering crusts of

possible bodies of granitic-magmatic composition.

The structure of the most promising part of the Upper Devonian part of the section is known to reflect the behavior of the seismic horizon  $P_3$ . In general, in the subsalt Caspian area, the horizon  $P_3$  is stratigraphically linked to the Devonian-Lower-Carboniferous interval of the section and is practically universally emitted with varying degrees of intensity of elastic oscillations. In the wave field, the reflections are recorded by a variable and at times chaotic intensity of the phase oscillations, which to a large extent allows one to rely on at some places to a more biogermic and reef-like character of sedimentation in the thickness associated with the horizon  $P_3$ .

A clearer and more unequivocal tracing of this stratum is characteristic of the southeast of the Caspian basin, where the boundary of  $P_3$  corresponds more toward the surface of the pre-Devonian deposits (Eskozha, Voronov, 2008). In the southeast, some important regional features of the structure of the Devonian and pre-Devonian sediments have been identified in the sections of the individual structures of the Matken-Biikjalsky and Kulsarin elevated zones (Mashli, Shokat, Munayly, Kirykmergen-Munayly Severny, etc.) according to seismic data (Fig. 2). On the profiles 84-850521 and 84-850519, a layered nature of the strata between the OG  $P_2^D$  and  $P_3$  is observed. This stratum is detected in the lower part of the terrigenous Devonian-Lower Carboniferous seismic-geological complex and has a capacity of 600-800 m. On it at the Devonian level, large structural uplifts have been identified (Eskozha, Voronov, 2008).

On the eastern side of the subsalt Caspian basin (Fig. 1), this boundary presumably corresponds to the surface of the lower and middle Devon (Iskaziyeve et al., 2014). In the time field, this reflection is represented as a 1 or 2-phase oscillation with an apparent frequency within 20-25 Hz. According to seismic data, the reflecting horizon  $P_3$  lies in absolute values at depths of 5.7-8.6 km (Akchulakov et al., 2012). In the western part of the Zhanazhol step (Zhanazhol-Tortkol zone of barren rises) within the limits of the Urikhtau-Kozhasai shaft, according to the results of research in 2011, a large Urykhtau uplift with anomalous spatial characteristics was singled out for the Devonian complex. On the surface of the foundation, this zone corresponds to the Zhanazholsky protrusion of the Temir-Utybay system of protrusions (Akchulakov et al., 2012). The Temir-Utybay system of projections is delineated along the line of 8.0 km. Consistently, from north to south along the isohypse of 7.0 km within the system of blocks, in the form of separate independent peaks, the Enbekskey, Temirsky, Zhanazholsky and Utibaysky projections of the basement are distinguished.

In the Urikhtau uplift, the Devonian complex, supposedly the Upper Devonian, is confined to the “R” horizon (PGD Services), below which a stable boundary is defined that characterizes the socle part of a large carbonate body and, presumably, is associated with the upper Devonian sole (Fig. 3). A seismic horizon  $P_3$  is confined to this age boundary.

Based on the interpretation of 3D seismic data (PGD Services) on the seismic horizon “R” (Devonian roof), a forecast for a large carbonate structure was made. The isohypse is 4700 m, the Devonian uplift of Urikhtau is 4.7 km x 3.4 km, the amplitude is more than 300 m. The area of the proposed reservoir is 12 sq km. The presence of a large carbonate building in the Upper Devonian sediments was the basis for

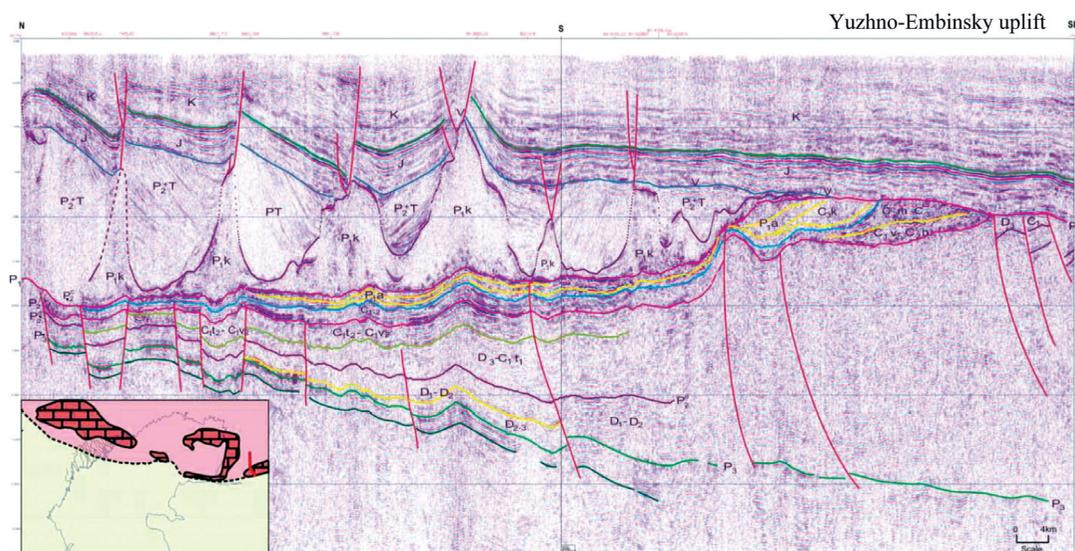


Fig. 2. Characteristics of the Paleozoic complex of the southeast of the Caspian Basin according to the regional seismic profile 84-850521 and 84-850519 (According to the data of Eskozha B.A., Voronov G.V., 2008)

setting work and drilling in 2013 on directional exploration of well U-5 with a design depth of 6000 m (the author took an immediate part in justifying the location of this well and in the progress of its wiring). By the way of drilling of the top, the Devonian carbonates were exposed at the level of 4948 m (along the trunk) which is 152 m higher than envisaged in the design data and 3D seismic constructions. When drilling in the interval of 4,966-4,975 m in the well, an increase in gas indications up to 52% (gas mainly of the methane series) was noted. Below, in the range of 5361-5374 m, an increase in the gas content in the solution (up to 54%) was also obtained, which subsequently led to an intensive oil and gas manifestation. At the bottom of 5374 m, the well was put into conservation due to complications of the trunk and the impossibility of further deepening.

According to the laboratory analysis of a sample of gas and formation fluid, a low content of sulfur and hydrogen sulphide was observed – up to 0.024% (“Kaspimunaigas” Research Institute). During the drilling in the Devonian part of the section, the core was sampled in 4 intervals (4973-4982 m, 5090-5108 m, 5220-5229 m, and 5326-5335 m). Numerous direct signs of HC were noted in the rock samples. Lithologically, the Devonian carbonates are predominantly organogenic fissured limestones. According to the results of laboratory studies (AktjubNIGRI), the rocks from the interval 4972.6-4982 m are dated by the Upper-Famen Age of the Upper Devonian.

Based on incomplete drilling results, the assessment of resources in category  $C_3$  was refined, structural adjustments were made to the subsalt seismic horizons (PGD Services). As a result, according to the “R” exhaust gas, the lift has more significant spatial characteristics. The size of the uplift along the isohypse of 5400 m was 7.2 km x 5.4 km, the amplitude of the ascent is more than 800 m (Fig. 3). The area of the reservoir is 36.2 square kilometers. Taking into account the new data obtained, the Urikhtau uplift is expected to continue exploratory work in order to study and determine the full prospects of the oil and gas potential of the Devonian complex in this area.

Improvement of the quality of processing and interpretation of seismic data makes it possible to establish the character of

the behavior of the most promising Devonian-Middle Visean stratum in other parts of the eastern side of the subsalt Caspian region (Fig. 1). Thus, according to the 3D data, the structure and the structural plan of certain areas of the Borzher-Akzhar tectonic stage, located to the west of the Zhanazhol-Tortkol zone of uplifts (AktobeNIGRI JSC, 2012-2013) have been clarified. Within the limits of the Borzher-Akzhar tectonic stage, in turn, differentiated into a series of ramp-like uplifts (Kindysai-Akzharsky, Borzhersky Val, Oymaut-Tokai and Akshunkolsky Valy), large structural uplifts along the Devonian-Lower Carboniferous part of the cuthave been allocated in the area west of the G5 Akzhar Vostochny well (Kursay – Akzhar Vostochny zone) (Fig.4). According to OG  $P_3$  and  $P_2$ , the uplifts are separated in the meridional (along the side) orientation, are delineated along the isohypses of 5375 m and 4650 m, respectively. The amplitude is 225 m and 300 m, respectively. According to these seismic horizons, two vertices are distinguished in the area of elevation, respectively, at the mark of 5350 m ( $P_3$ ) and 4625 m ( $P_2$ ). According to available data, the uplift and elevated perspective zone in the direction to the north is not excluded. At present time, these structures are represented as large Paleozoic uplifts, and can be recommended for exploratory drilling as highly prospective objects.

Thus, with the example of the eastern on-board zone of the subsalt Caspian Sea, the available materials and the new data obtained justify the high prospects for further detailed study of the deep-lying sediments of the Devonian and the Lower Carboniferous complexes and allow them to predict large objects in them. The accomplishment of this task for the next few years is justified by other selected and forecasted large objects – the Paleozoic uplifts along the Devonian-Lower Carboniferous interval in the section of the Temir carbonate massif in the same zone of barren rises (Akkemir) and Shubarkuduk-Koskol zone of uplifts (Shilikty Severny) in the deepwater part of the basin (Akchulakov et al., 2012).

The prospects and favorable outlook for major Paleozoic uplifts in these areas are further justified on new ideas about the model of the structure of the traps and, on the whole, favorable structural prerequisites.

As is known, earlier in the eastern part of the subsalt area

of the Caspian Sea, 5 wells were drilled (G-4 Kumsai, G-1 Baktygaryn, G-5 Akzhar Vostochny, G-9 Bozoba and G-1 Akkum), in which the sediments of the lower, middle and upper Devonian complex at a depth of 4830-5843 m (Bakirov et al., 2003) were cut open to a different degree and proportion. The relatively large distance between these areas indicates the regional tracking and distribution of the Devonian deposits in the east of the Caspian Sea. According to these data, and judging from the distribution of the thicknesses of individual suites, on the uplifts there is noted to a greater degree the stratified consedimentation occurrence of Devonian deposits, which, as it appears, is inherited from the older protrusions of bedrock. Along with the objects with the carbonate composition of the reservoirs (Urikhtau), it is assumed that the newly discovered large uplifts of the Devonian-Lower Carboniferous, having a bedded occurrence, will in most cases be confined to the areas of terrigenous and carbonate-terrigenous sedimentation. It

should be noted that these local uplifts meet new conditions and patterns of occurrence, and the nature of sedimentation, and are objects prepared at a higher level of interpretation and a comprehensive analysis of existing geological and geophysical materials. The author predicts areas with a favorable absence or low sulfur and hydrogen sulphide content in prospecting, which is typical for terrigenous and carbonate-terrigenous sedimentation.

Above the cut along the eastern side, significant hydrocarbon deposits are already detected in carbonate reservoirs of massive reservoir character in the deposits of the middle – upper Carboniferous (Zhanazhol, Kozhasai, Urikhtau, Alibekmola, etc.). In sediments of the deep-water cone of bottom Permian removal, an impressive fountain of oil was produced with a flow of 650 m<sup>3</sup>/day at the Akzhar East area in well No.1 from terrigenous sediments in the interval 5049-5075 m.

The new capabilities of 2D/3D seismic exploration

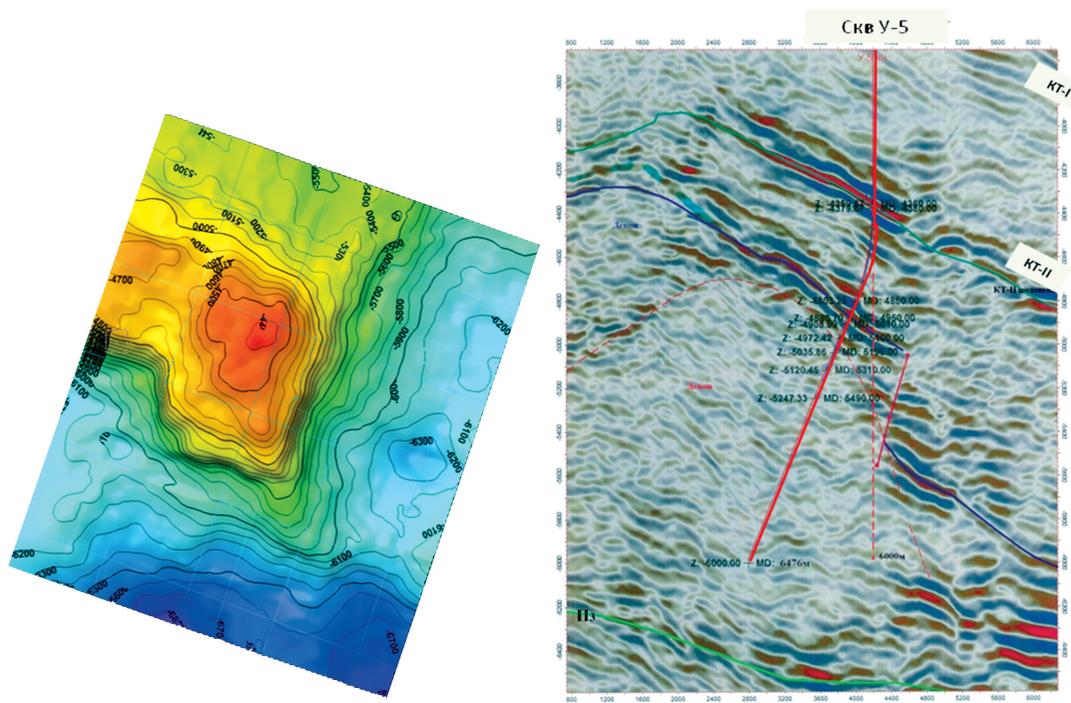


Fig. 3. Uplifts of Urikhtau (Zhanazhol-Tortkol zone of barren rises). The structural scheme for the roof of the Devonian deposits (OG “R”) (according to the “PGD Services” company)

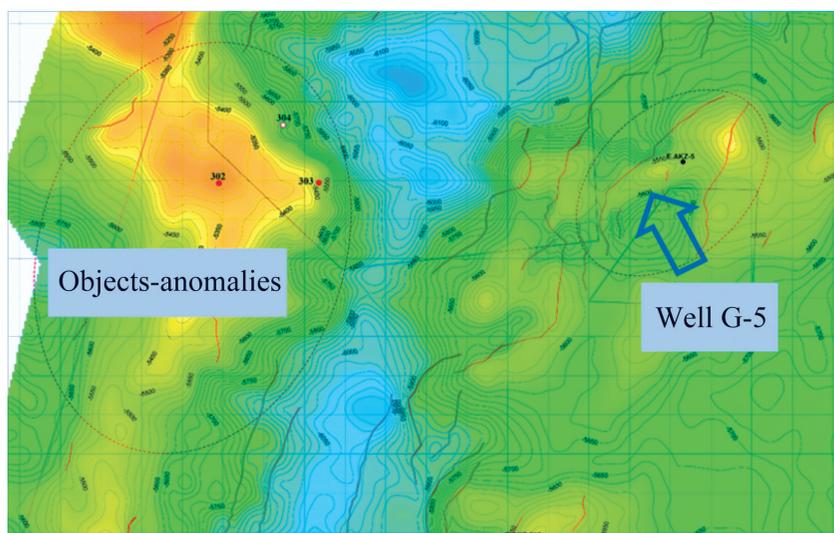


Fig. 4. East side of the Caspian basin. Projections of large uplifts in the Devonian deposits (OG P<sub>3</sub>) of the Borzher-Akzharsky tectonic step (according to the data provided by the “Kazakhmys” company)

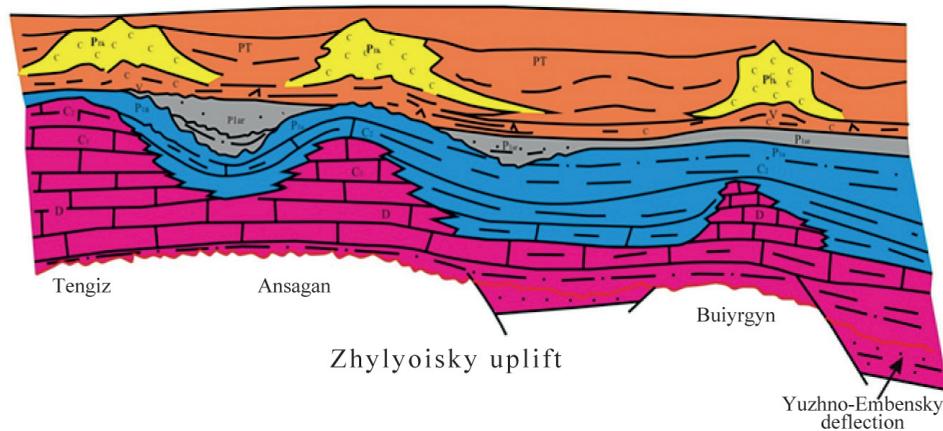


Fig. 5. Paleozoic uplifts model (carbonate structures) in a latitudinal direction under the Tengiz – Ansagan – Buiyrgyn profile. Models of large Paleozoic structures in the southeast of the Caspian Basin (Tengiz, Kashagan, Koroleovskoe, Ansagan); Possible large structures on the periphery of the carbonate platform (Buiyrgyn); Age of structures: Upper Devonian – Lower Carbonous (turne)

methods make it possible to count on a favorable forecast and discovery of large-scale oil and gas deposits associated with large subsalt objects, which are the structural inherited uplifts of embedded and massive type and carbonate structures. For these objects, as shown by the results of drilling in recent years (Koblandy, Shirak, Tasym Yugo-Vostochny, Chinarevskaya, Ansagan, Buiyrgyn), a low content of hydrogen sulphide and sulfur is typical in general. In certain cases, the concentration does not exceed 3-5%. In this regard, important outcomes of No.2 Volodarsk well drilled on the northern embedded slope of Astrakhan Anticline are impressive. Industrial inflows of lightly non-sulphurous oil were obtained within it from a depth of 6200 m in the Middle Devonian deposits (Iskaziyeu et al., 2014; Matloshinsky, 2013).

More clear pattern of regional distribution of productive horizons in Devon almost without hydrogen sulphide emerges with opening of gas-condensate non-hydrogen sulphide and low-sulphurous oil basin at a depth about 5200 m in carbonate deposits of the Biysk horizon of the Middle Devonian at Chinarevskaya Square on the northern side of the Caspian basin. Productive deposits of the Middle Devon in this region are also attached to structures located on the southern slope of the “internal” near edge zone strip of the basin.

Eventually, a turning point in exploration of the deeply embedded horizons of the Paleozoic and the projections of non-hydrogen sulphide of UV congestions is obtaining inflow of non-sulphurous UV (gas condensate) in 2011 at the increased depths in deposits of carbon fabrics in the well No. 1 Tasy Southeast of 7050 m depth on the northern slope of the Atyrau system of ledges on the base. As can be seen, along with onboard zones, searching have seriously progressed over the last years to rather embedded internal areas of the Caspian sedimentation basin.

Remarkable feature of the obtained outcomes is the confinement of deposits of non-hydrogen sulphide and low-sulphurous oils to slopes of large “cross-cutting” carbonate platforms (based on Tengiz, Kashagan types). From regional perspective, these platforms are associated with separate, often isolated and localized areas, which are figuratively characterized as “hydrosulphuric contamination”. In more mature by age (the lower and Middle Devon) the embedded sites (outside these “contamination” areas, at slopes), we believe,

generally low-sulphurous UV congestions are mostly expected. The above-mentioned outcomes in Ansagan, Chinarevsky and Volodarsk areas confirm the need to consider the age “antiquity” productive complexes (Fig. 5).

Therefore, the favorable geological and geophysical prerequisites noted above appear to be important and are proposed as new substantiating material for further focused study and assessment of the prospects for deep-lying sediments of the Devonian and Lower Carboniferous rocks at depths of 5.5-8.0 km in the southeast and east regions of the subsalt Caspian pool. First of all, the possibilities of practical implementation of measures on these recommendations are important. In regional terms, similar large anomalous in size and area of objects in recent years are increasingly allocated. One of the important tasks in this key is to elucidate the regularities of their regional position and further geological and geophysical identification of their genesis with potentially oil and gas bearing structures.

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## About the Author

Dulat K. Azhgaliyev – PhD in Geology and Mineralogy, Technical advisor, Nedra-Engineering LLP  
Kazakhstan, 010000, Astana, Prospect Dostyk, 5/1, 173  
e-mail: dulat.azhgaliyev@gmail.com

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