THE ROLE OF STUDYING TECTONIC FACTORS IN REDUCING THE RISKS OF EXPLORATION

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Abstract

A comprehensive study of geophysical, geological, tectonic, lithofacies, petrophysical and a number of other factors of oil and gas content and their changes in space over time make it possible to develop the foundations of the main criteria for predicting the distribution of oil and gas territories and the development of hydrocarbon deposits. In order to assess the prospects for prospecting for oil and gas accumulations and reduce the risks of ineffectiveness of exploration and further development and drilling operations in the lower section of the Productive Strata (PS) of the western side of the South Caspian Basin (SKV), based on the available material and taking into account the large number of published works, We considered the tectonic criteria and conditions for the preservation of the formed accumulations of hydrocarbons in the South Absheron archipelago, in the example of the Gum-Deniz and Bahar areas. By specifying the development of uplifts, tectonic faults and the lithofacies composition of more ancient sediments, paleostructural analysis can provide significant assistance in identifying promising areas for prospecting and exploration, and ultimately thereby significantly reduce the risks of inefficiency in drilling operations.

Keywords: structure, rock, stratum, horizon, prospects

As is known, among all the factors that control the development of the formation of oil and gas bearing territories, the main role belongs to the structural and paleostructural factors. The South Caspian Basin (SCB) is a large sub-latitudinal structure that was fully formed in the Lower Pliocene. The tectonic boundaries of the SCB are: in the northwest, the subsidence of the southeastern part of the meganticlinorium of the Great Caucasus, in the northeast of the Absheron-Balkhan zone of uplifts, in the west of the Talysh-Vandam gravity maximum, in the east of the Aladag-Messerian step and in the south of the folded structures of the Elburz. In the depression, the outer near-rim framing and the inner region are distinguished [1, 3, 4, 8].

The inner area includes the shelf areas adjacent to the land and the deep-water part of the Caspian Sea, experiencing the greatest subsidence. Large geostructural elements are widespread within the boundary framing, favorable for the formation of oil and gas regions developed in the Eastern part of the Transcaucasian oil and gas province. These include the Kura intermontane depression, as well as the structural elements of folding of the southeastern subsidence of the mega anticlinorium of the Greater Caucasus. The inner region of the South Caspian Basin is a depression of maximum bending and differs in tectonics from the near-edge regions.

In the study area, more precisely, in the southern part of the Absheron archipelago, numerous anticlinal belts are developed. The structures developed in these belts are associated with oil and gas accumulation zones, and with local uplifts of anticlinal belts - oil and gas accumulation locations. The structures with which the sites of accumulation are associated developed consedimentally, and their formation occurred before the migration of hydrocarbons from the generating area. The emerging local structures did not lose their isolation in the

subsequent development. Our research is based on a wide range of geological surveys, geophysical studies, mapping, structural prospecting and deep drilling. It should be noted that the Gum-Deniz and Bahar areas studied by us (Figure 1) formed in the southern part of the Absheron archipelago belong to the Fatmai-Zykh-Bahar anticlinal belt, which is part of the oil and gas bearing area of the same name [1, 3, 7, 8].

Figure 1: *Overview map of the Absheron archipelago. Location of structures Gum-deniz and Bahar [2].*

For the effective conduct of prospecting and exploration work, it is of great importance to clarify the history of the geological development of individual local structures in time and space. It is in this regard that the widely used paleostructural analysis can be of significant assistance in the discovery of both ancient uplifts, which can represent promising areas for exploration, and lithofacies skills along the section of the study area. The study of older deposits in this way and the refinement of the development of tectonic disturbances ultimately significantly reduce the risks of inefficiency both in prospecting and drilling operations.

The analysis of the capacities when obtaining the construction of the corresponding maps makes it possible to clarify the formation and destruction of oil and gas deposits, since it is by this method that it is possible to identify and explain the regularity of the distribution of hydrocarbon accumulations in different horizons of individual areas. As you know, identifying and clarifying the distribution of hydrocarbon accumulations in various areas significantly reduces the risks of unnecessary and unnecessary costs when drilling production wells. We carried out paleotectonic analysis for the structures of Gum-Deniz and Bahar [2].

To trace the history of the development of the Gum-Deniz and Bahar structures, we selected the following as reference surfaces and analyzed the following graphical results: - Under Qirmeki (UQ) and Qirmeki retinue (QR) (layer qroup); - On the Qirmeki Clay (OQC) and On the Qirmeki Sandy (OQS) retinue; - Fasile retinue, X, IX horizons of the Balakhani retinue; -VIII + VII + VI + V horizons of the Balakhani retinue and the clay section between the VIII horizon and IVb horizon of the Sabunchy retinue; - Sabunchy retinue; - Surakhani retinue [4].

Studies have shown that the Qala retinue (QaR) is absent in the submerged direction in the Bahar area and adjacent territories, and the deposits of the Podkirmakinskaya suite directly overlap the Miocene. As can be seen from paleotectonic maps, the structure of Gum-Deniz and Bahar has a more ancient origin. By the end of the QR century, three uplifts were formed on the Bahar square: northern, central and southeastern. The northern rise along the isolines of 400 m, having a height of 10-15 m, is characterized by a length of 1.7, and a width of 0.7 km. The uplift is located in the area of wells 74, 46 and 19, and extends in the meridional direction (Figure 2) [5, 7].

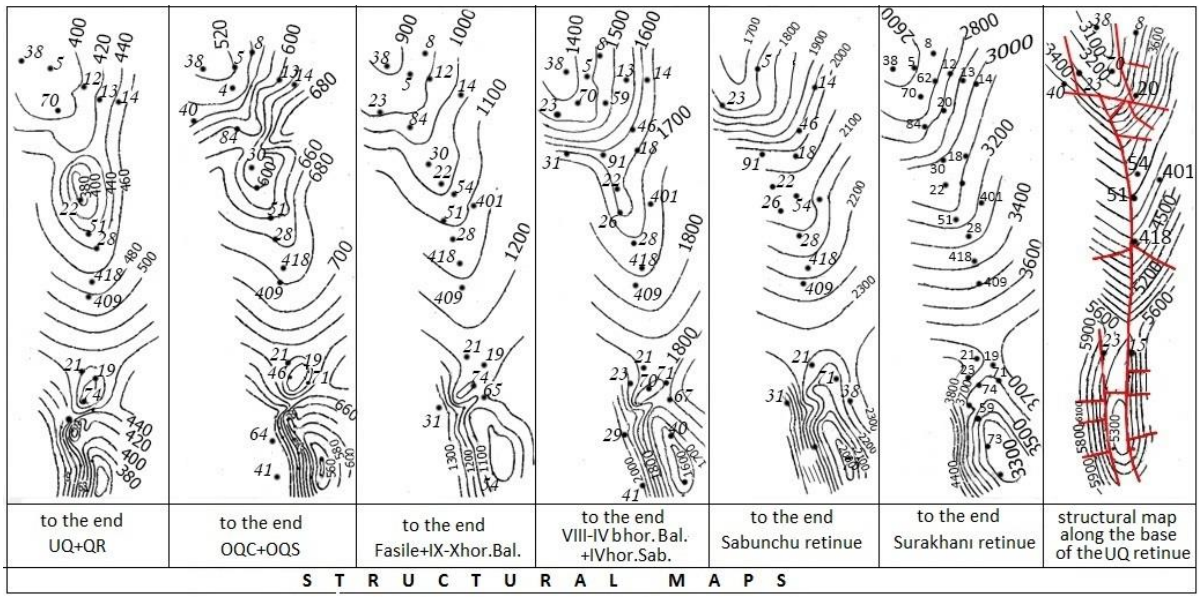

Figure 2: *Paleostructural and area structures*
Bahar and Gum-deniz along the sole of the UQ retinue

The central uplift also extends in the meridional direction. This uplift has an asymmetric structure, because the west wing is steeper than the east. Its height along the 400 m isoline is 45 m, and its dimensions are 1.5x0.8 km. The southeastern uplift is located in the area of wells 12 and 50. Its northern pericline is directed to the northwest. Measuring 1.8x0.6 km along the 400 m isoline, the fold has a height of 60-70 m.

The buried Gum-Deniz uplift finds its expression on the same surface. This uplift is located in the area of wells 30, 22, 26, 54 and has a meridional orientation. The Gum Deniz structure is outlined by isohypses of 380 m, 400 m and 420 m. The dimensions of the closed vaulted part of the structure are 4x1.8 km, and the height is 30 m. The Gum Deniz structure is complicated by a mud volcano, as a result of which longitudinal and transverse tectonic faults of various directions. The fold is 17 km long and 6.5 km wide. In the south of Gum Deniz, geophysical surveys have discovered the buried structure of Janubi Gum Deniz. It is assumed that the uplift is a reflection of the ancient structural plan of the lower PS and underlying sediments [7, 8].

The Bahar and Gum Deniz uplifts (Figure 3) are complicated by longitudinal and transverse faults. As can be seen from the structural surface, by the end of the UQ and the beginning of the OQC centuries, the base of the Bahar square was beginning to form. This is also indicated by the sediments of the formation. The uplift appeared in the form of folds: the central uplift developed in the form of a structural nose, while the northern one retains its configuration [2, 5].

This map clearly shows the almost unchanged Southeast Uplift. The Gum Deniz Rise has retained its previous configuration. The thickening of isopachs between individual wells indicates a significant activation of movements along tectonic faults. The anticlinal fold along the base of the UQ retinue by the end of the formation of the Fasile retinue, horizons X and IX of the Balakhani retinue underwent significant changes. On the Bahar square, the southeastern uplift, uniting with the central one, expands its boundaries. The dimensions of the fold along the 1100 m isoline are 5x2.5 km, and the height reaches 100 m.

It should be noted that the northern uplift has also undergone a change. The arch of the structure gradually moves to the southwest, to the area of wells 13, 62 and 74. The fold height is 20 m, and the dimensions along the 1100 m isoline are 1.7x0.6 km.

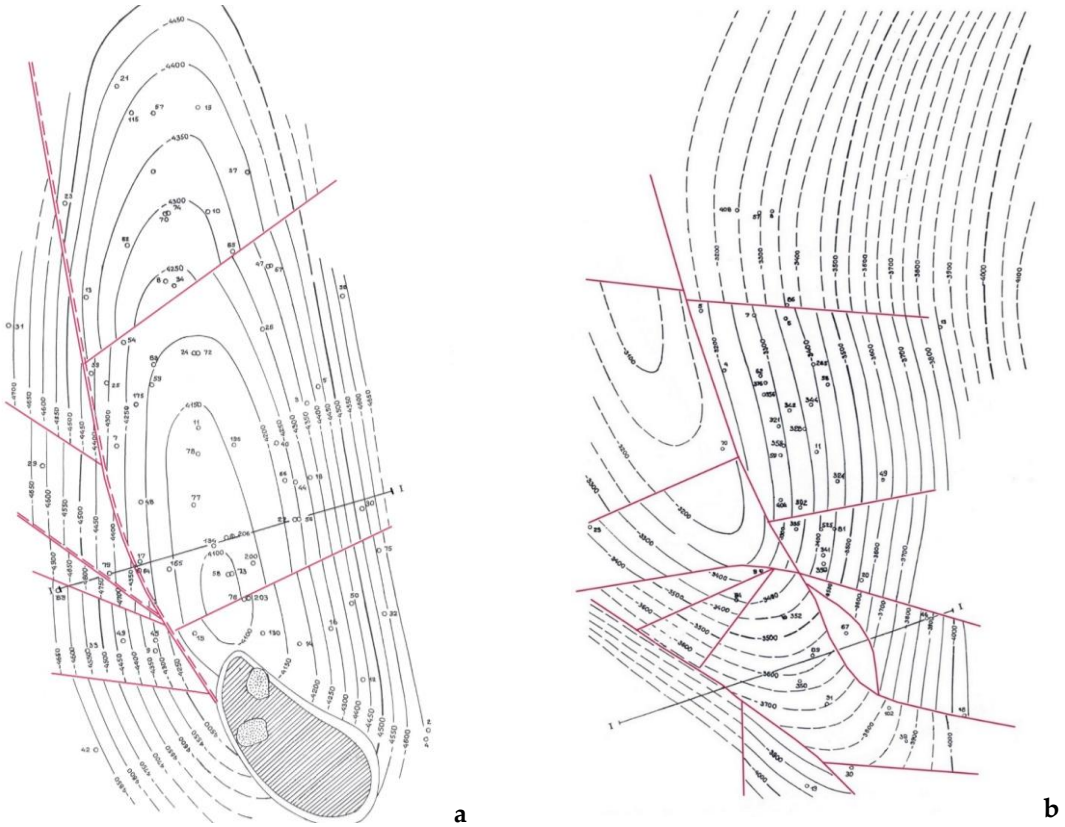

Figure 3: *Deposits Bahar (a) and Gum-Deniz (b).*
Structural map of the 2nd horizon QaR [2].

The buried Gum-Deniz uplift acquires the shape of a structural nose by the end of the accumulation time of horizon VIII of the Balakhani retinue. As can be seen from the isolines, the northeastern limb of this structure is flatter than the southwestern one. It should be noted that by the end of the 4th century sediments of the horizon of the Sabunchu age, the structures of Gum-Deniz and Bahar had hardly undergone significant changes. But a detailed study showed that it was at this time that the Gum-Deniz structure joined the Karachukhur uplift, forming its southern pericline.

By the end of the Sabunchu century, only the southeastern uplift looms along the Bahar fold, and a structural nose can be traced in the place of the northern one. As can be seen on the map, the structure of Bahar, starting from this century, gradually acquires its modern shape. By the end of the formation of the Surakhani retinue, the Gum-Deniz uplift did not undergo any changes. The structural nose in the area of wells 22, 54, 26, 78 and 51 remains unchanged. By the beginning of the accumulation of sediments from the top of the PS, the roof of the Bahar uplift moves to the southwest, and it acquires a shape close to the modern one. By this time, the base of the PK formation lay at a depth of 3650-4050 m. The Bahar structure has an asymmetric shape, more precisely, the southwestern wing of the fold is more steep than the northeastern one. The Gum-Deniz uplift at this time remains practically unchanged with the difference that the isoline between wells 91 and 18, 7 and 12 is thickened. This indicates the intensive development of tectonic disturbance. In modern terms, the Bahar uplift along the base of the UQ retinue is an anticline stretching from northwest to southeast. It should be noted that a mud volcano located on the southern pericline complicates the structure with numerous faults of various scales, amplitudes and directions. The base of the UQ retinue lies at a depth of 5300-6100 m. The structure is complicated by a series of faults, two of which extend almost parallel to the fold axis and complicate its arch part. Structurally, the Gum-Deniz area is the southeastern pericline of the Karachukhur-Zykh anticline. Thus, the performed paleostructural analysis shows that the Gum-Deniz and Bahar uplifts are elements of early origin; their development in the PS age took place under conditions of stable subsidence of the basin bottom and intensive accumulation of sediments.

Investigations of the territory of the formed structures Gum-Deniz and Bahar showed a more intensive bowing of the basin bottom in the PS century, more precisely, the southern part of the western side of the South-Caspian depression sank more intensively than its northern part. The studies make it possible to assert that an increase in thickness is observed in the direction from the coastlines of the basins of the formations of the lower section of the PS towards the subsidence of the bottom, at a different rate for individual formations. In the uplifts, an increase in thickness is observed from the arched parts to the wings, and this indicates their consedimentary development. Within the Bahar uplift, QaR falls out of the section, which indicates an intensive increase in the uplift and erosion during these deposits.

Conclusions

1. The considered structures are characterized by different initiation times and changes in the intensity of their development in different periods of geological time.

2. Within the Gum-Deniz structure, areas of minimum thickness of the lower support surfaces are observed, indicating the presence of a buried uplift in the underlying productive strata of sediments.

3. Most of the longitudinal and some lateral faults are consedimentary, and their occurrence occurred at different times.

4. Longitudinal consedimentary fractures of early occurrence served as a screen on the path of hydrocarbons from the areas of their generation to the formations of the lower part of the PS. Post-depositional ruptures have contributed to the destruction of previously formed oil and gas deposits, and this increases the risks of ineffective work.

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