THE ROLE OF THE GEODYNAMİC REGİME İN THE FORMATİON OF STRUCTURES AND THE FORECASTİNG OF OİL AND GAS PROSPECTS İN THE AJİNOHUR DEPRESSİON

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Abstract

Taking into account the main role of compressive stresses in the formation of local folds developed in the Ajinohur depression, the distribution characteristics along the depression, influence intensity and direction over the an idividual zones of the depression were determined.
For the analysis, the local folds of the Ajinohur depression were studied and they were scaled according to size on the plan. The isomorphic maping method was applied for the first time for qualitatively assess the intensity of compressive stresses in the study area. The influence direction of compressive stresses were determined.
The Ajinohur depression is located in the southwestern limb of the Greater Caucasus folding system close to the arch, terefore, the intensity of compressive stresses is higher. In the isomorphic map constructed for this depression, the isolines generally extend in the west-northwest-east-southeast direction, while isolines are relatively close in the longitudinal direction, at the same time, these are with high values (2.4-7.5 unit). So, it is indicate the high intensity of compressive stresses in the area. This situation is also confirmed by the morphological and isomorphic maps constructed on the same scale based on the dimensions of the local folds found here in the Neogene sedimentary complex. As can be seen from the maps, long brachyfolds are mainly more developed than the short brachyfolds in the area. The linear alignment of the folds in the all Caucasus direction and the complexation with upthrust faults indicate that compressive stresses play a major role in their formation.
The Ajinohur depression surrounded by the Kura-Gabirri, Yevlakh-Aghjabedi, Lower Kura, Shamakhi-Gobustan oil and gas regions. This regions are characterized by the presence of industrially significant oil and gas accumulations. İndustrially significance of these regions are identifide by the digging wells, and are characterized by the presence of numerous deposits that are in operation. It should be noted that there is a great risk of having industrially important hydrocarbon resources in the Acinohur possible oil and gas region, which is surrounded by promising oil and gas regions on four sides.

Keywords: Ajinohur depression, compressive stresses, upthrust, mud volcanoes, folds, oil, gas

I. İntroduction

Ajinohur depression, as is the object of the study, covers the northwestern part of the Kura intermountain depression and the southern slope of the Greater Caucasus folding system. İt is contains 28 local folds. Jurassic-Cretaceous and Pliocene-Quaternary sediments are spread in

different parts of the area. Tectonically, the Acinohur area is divided into 3 zones. The folds that made up these zones are complicated by upthrust faults.

Ajinohur depression has a complex tectonic structure, geodynamically it is located adjacency of collision zones of Greater and Lesser Caucasus. İt is surrounded by the Ghabirri-Ajinohur basin from the west and stretches along the south of the Greater Caucasus megaanticlinorium. The folds located in the northern part of the depression complicated by cleavages and upthrusts with an enormous amplitude, are mainly Jurassic and Cretaceous age. The structures located in the area, which have a shingle- shaped, were formed by the influence of upthrusts. The sediments forming the section are terrigenous-carbonate. The uncovered thickness of Cretaceous system section is 3000 m [3,4].

The Pliocene-Quaternary age rock complexes are wide spread over the southern and central part of the depression.

A complete cross-section of the Productive series belonging to Lower Pliocene is exposed on the right bank of the Girdman River and is represented by two facies. The upper part of the section consists of grayish-brown clays and coarse-grained sands, and the lower part consists of alternating layers of different-grained sandstone and sand-clay interlayers. The thickness of the Productive series is up to 2000 m [5].

Aghjagil sediments are widely distributed within the Ajinohur. Lithological composition consists of hard limestone clays, sandstones and conglomerates. The thickness of these sediments is up to 1500 m.

Absheron sediments are spread over a wider area and lithologically consists alternation of coarse-grained sandstones and clays.

The Quaternary sediments are also widespread in the depression and it is section lithologically consists alternation of clays, sands and sandstones. Its thickness varies from 30 m to 1700 m [6].

5 anticlinal zones running parallel to the Greater Caucasus megaanticlinorium are singled out in the Ajinohur depression: 1. Dashyuz-Heyvanli; 2. Gudbarakdag-Gamigaya-Acibulag; 3. Acinohur-Savalan-Kurdmashi; 4. Khojashen-Goychay; 5. Bozdag-Garaja-Garamaryam [7,8].

In the mentioned anticlinal zones, local folds are mainly brachy and linear, and in rare cases, short brachy and isometric folds have developed. A characteristic feature of the folds is that they are complicated by upthrusts faults.

The amplitudes of the upthrust type of faults that complicate the folds located in the northwest of the area are greater than those of the same type of structures in the central and southern zones. The amplitude of the upthrust that complicates the Gudbarakdag structure located in the northwest of the depression is 1700 m, the amplitude of the longitudinal upthrust that complicates the Gamigaya fold located next to in the southeast is 700 m, while the amplitude of the upthrust that complicates the Western Khojashen fold is 1500 m [9,10]. This is due to the high intensity of compressive stresses in the northwestern part of the depression.

The southwestern limb of the Ajinohur depression dip steep. The reason for this the anticlines are asymmetric, echelon folding of the structures, and the complication of arch parts of the folds by upthrust type faults. The central and southern zone of the depression is characterized by this view.

Gradual weakening of intensity of disjunctive and plicative dislocations of different sizes distributed throughout the area from north to south is observed [11].

II. Method

The local folds developed in the Ajinohur depression are mapped to scale in the plan. In addition, the new method of isomorphic maps was applied for the first time in the research work, which allows qualitative assessment of the intensity of compressive stresses on the territory, as well as determining the direction of influence. As can be seen from the morphological scheme, the

anticlinal zones formed by the local folds in the Ajinohur depression extend perpendicularly to the directions of compressive stresses, that is from the northwest to the southeast (Fig. 1).

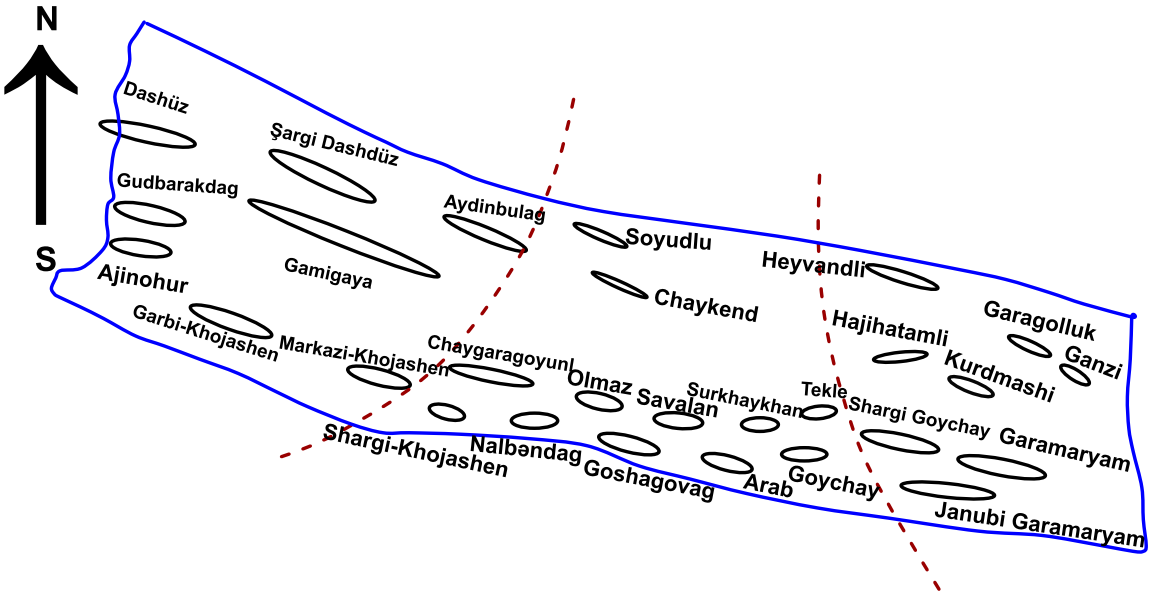

Figure 1: *Ajinohur possible oil and gas-bearing region. Morphological scheme of local folds*

-local folds, -boundaries between of zones

Ajinohur depression is characterised by the high intensity of compressive stresses. İt is confiemed by the course of the isolines from the west-northwest to the east-southeast on the isomorphic map drawn up for the area, the variation of the width-to-length ratio of the structures between 7.5-2.4 unit, as well as the contour intervals (Fig. 2). Based on the size of the folds, it is possible to distinguish 3 zones in the area: north-west, center, south-east. Short brachy and isometric folds are developed in the central part, while linear and long brachy folds are developed in the northwest and southeast part of the depression. According to the mentioned characteristics, local uplifts in all three zones have different morphology and are complicated by faults of different amplitudes. Folds were formed in zones of compressive stresses of different intensity. The difference in the structure of the folds is due to compressive stresses of different intensity.

Local folds in the Ajinohur depression, which rests on the West Caspian deep fault from the southeast, and is relatively close to the Greater Caucasus collision zone from the northeast, are long brachy and linear elongated forms, because they are more affected by compressive stresses. The folds located in the north-northwest part of the depression are more complex. Also, this structures are complicated by cover and upthrust type faults, with an amplitude of 1200-1300 m, while horizontal displacement is 2 km [1,12].

Despite the fact that the study area is located in a geodynamically active zone, the formation of long brachy and linear elongated folds, as well as comlpication of this folds by the cover and upthrust type faults due to the influence of high-intensity compressive stresses, mud volcanism did not develop in the area [13,14].

The relationship between mud volcanoes and compressive stresses can be determined by correlating some features of the geological structure. The sedimentary layer in the Ajinohur depression is relatively thin (7-9 km) and consists of 46% clayey, 48% sandy, and 6% carbonate sediments (Fig. 3).

Although the length-to-width ratio of local uplifts is 7.5 - 2.4 unit, several structures, for example, Garbi Khojashen, Shakgi Khojashen, Chaykend, Gamigaya were complicated by mud volcanism consisting of mud gryphons and salses related to the longitudinal upthrust type faults [15]. Mud gryphons and salses are accompanied by water flow with gas and oil films. Despite the

high intensity of compressive stresses in the Ajinohur depression, the rheologically active clay mass that will create mud volcanoes in the cross section of the sedimentary layer has a low energy potential capable of forming mud gryphons and salses. There are a small number of salses and mud gryphons on the upthrust that complicates the folds along the axial line in the depression. İt is shows the transverse bending mechanism is involved for development of these folds. Despite of this, the linear arrangement of the salses and mud gryphons toward the all Caucasus direction, especially their genetic connections with upthrust type faults, shows that there is a main role of compressive stresses in the formation of there structures.

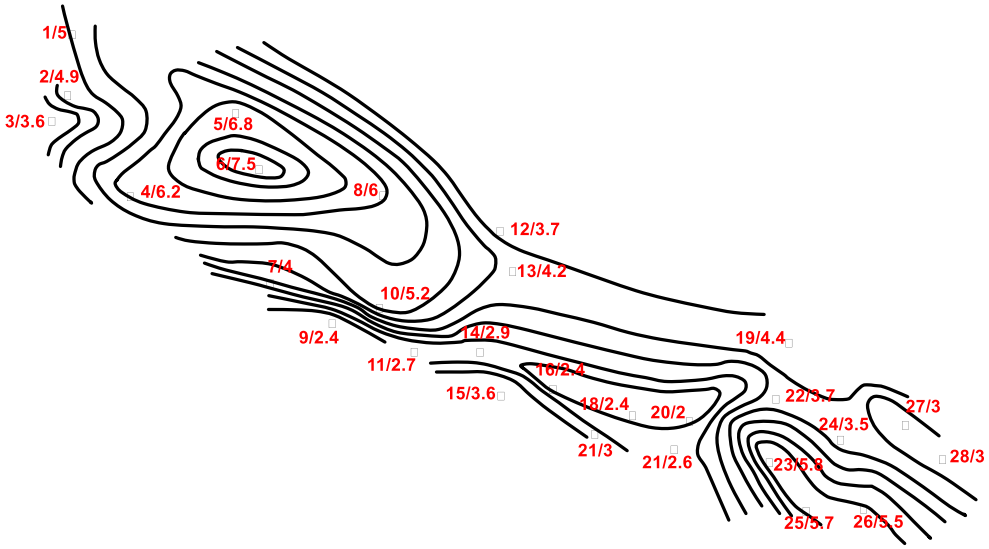

Figure 2: *Ajinohur possible oil and gas-bearing region. Isomorphic map*
1/5-well number (in the numerator) and the ratio of length to width (in the denominator);
-isohypses; - structures

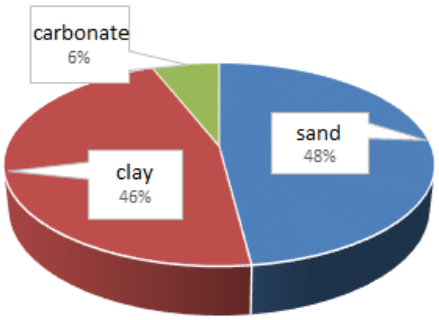

Figure 3: *Composition of the sedimentary layer in the Ajinohur depression*

It should be noted that the lithofacies composition of the sedimentary layer is one of the factors influencing the formation and types of both mud volcanism and faults.

If the rock complexes that make up the fold are relatively hard, that is, more competent, or if relatively plastic layers are in the minority in the section, then due to the tensile stresses created in the arch part of the fold, a relatively dense network of cracks is first formed, and then due to the continuation of the external influence in that zone, the integrity of the layers is destroyed, breaks, while as a result, the hanging wall of the fault under the effect of compressive stresses moves along the fault surface onto the foot wall and causes the formation of an upthrust type of fault [16].

As it can be seen from what has been said, upthrust (as well as shariage) type fault is actually the development of a plicative dislocation, that is a fold in the direction of a disjunctive, that is, a fault dislocation. In such cases, the reservoirs existing in the footwall, that is in the autochthonous (since they are screened by the allochthonous) can be promising in terms of oil and gas.

Thus, as can be seen from what has been said, the occurrence of residual (plastic or brittle) deformation in rocks as a result of external influence depends significantly on their physical properties, that is, whether they are competent or incompetent [8].

Due to the fact that the layers composed of competent rocks are more prone to brittle deformation, they undergo brittle deformation under the influence of compressive stresses and cause the formation of disjunctive dislocations in the development of folds.

As mentioned above, the northern tectonic zone of the Ajinohur depression is characterized by a wide spread of Jurassic-Cretaceous structures, where mainly competent terrigenous-carbonate sediments were formed. For this reason, the local folds developed here under the influence of compressive stresses are mainly complicated by upthrust, cover and sliding type faults. The fact that faults with huge amplitudes indicates the high intensity of the effected compressive stresses.

In the central and southern Ajinohur, the amplitudes of the faults that complicate the latitudinal directed anticlinal folds of the Pliocene-Quaternary sediments are smaller than in the northern zone. It is due to the lack of the intensity of the compressive stresses is relatively weak here, and at the same time, there are more incompetent rocks.

It is known that oil and gas are produced from almost all of the oil and gas-bearing regions surrounding the Ajinohur depression. Oil is exploited from wells dug into the Shirak formation and Sarmatian sediments in the Mirzaani-Aresh depression located in the north-west of Georgia [9,12]. Industrially important oil is extracted from Eocene sediments in the Tarsdallar area in the Kura-Gabirri interfluve oil and gas-bearing region, located in the western part, and the field is being exploited. Intensive oil flows were obtained from wells drilled in Mammadtepe, Demirtepe-Udobna areas. Oil and gas-bearing of Maykop sediments has also been proven here. Oil and gas manifestations from Sarmatian sediments in Sajdag, Armudlu, Chobandag, Palantoken, Akhtakhtatepe, Keyruk-Keylan areas were obtained. The oil-gas content of terrigenous-carbonate sediments of Eocene, Maykop and Chokrak in the Yevlakh-Aghjabedi, Ganja oil-and-gas-bearing region in the southwest has been proven. In the southeast, the Umbaki and East Hajiveli oil fields in South-West Gobustan are assossiated with the Chokrak horizon and sandy-siltstone reservoirs of the Maykop (Oligocene-lower Miocene) series.

Evidence of oil-gas content of Paleogene-Miocene, Pliocene sediments in the regions surrounding Ajinohur depression, analysis of geological-geophysical researches, structure-mapping drilling and exploration wells gives grounds for high assessment of the prospectivity risk of the mentioned sediments in this area.

III. Conclusıon

1. The intensity of compressive stresses in the Ajinohur depression is unevenly distributed along the area and section.

2. The north-western and south-eastern parts of the Ajinohur depression were more suffer to the influence of compressive stresses, while the central zone was relatively less.

3. The local folds of the Pliocene-Quaternary sedimentary complex in the Ajinohur depression were mainly formed as a result of the action of the longitudinal bending mechanism caused by compressive stresses.

4. Mud volcanism does not develop in the study area. The reason is assossiated with the sedimentary layer that is characterized by a relatively small thickness and the low clay content.

5. Oil-gas content of Paleogene-Miocene, Pliocene sediments in the regions surrounding the Ajinohur depression is identified, therefore, it is an indicator of the risk of formation of oil and gas accumulations in the reservoirs of the autochthonous limbs of cover-type structures in this area, taking into account other factors.

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