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STRUCTURAL-TECTONIC FEATURES OF THE SOUTH-EASTERN PART OF THE GREATER CAUCASUS THE PRE-CASPIAN GUBA AS AN EXAMPLE OF THE NQR

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ABSTRACT. Determination of tectonic structure of mesocenozoic sediments, monitoring of various aged sediment complex based on well data, establishment of a dynamic depth cross sections and a study of geodynamic activity analysis in the Pre Caspian-Guba oil-gas region are pressing problems for the south-eastern part of the Greater Caucasus.

The article deals with the importance of determining geodynamic activity by formulating a detailed understanding of the region's tectonics. This is done by expanding geophysical, especially seismic exploration works and highly accurate study in the field of research subjected to active tectonic processes.

Introduction

The territory of the Azerbaijan Republic is situated in the eastern part of the Caucasian segment of the Mediterranean fracture zone and is characterized by high geological activity related to the dynamics of Arabian and Eurasian lithosphere plates.

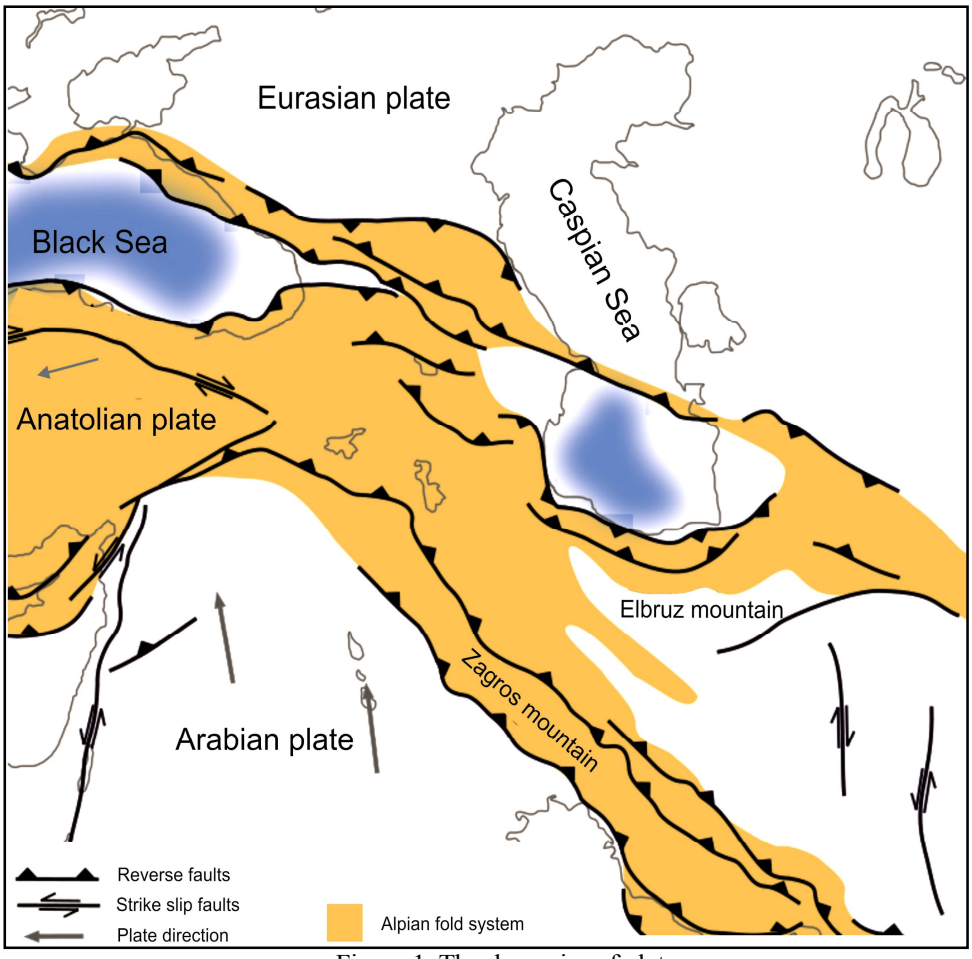

Figure 1. The dynamics of plates

[1] SOCAR, "Azneft PU"

The zone which has a complicated geological structure is characterized by high seismicity, modern magnetism and mud volcanism in all covered areas. As the geodynamic activity has different effects on the region, you can formulate certain ideas on geological cross-section based on seismic data. The complexity of the zone's tectonic structure is characterized by the extensive development of vertical and horizontal dislocation processes. Apart from the overlap and reverse faults the availability of areas that are complicated by transformation faults is undeniable. The research area considered in this paper is pre Caspian-Guba oil-gas region that covers the south-eastern part of the Greater Caucasus, and modern geodynamic processes are widespread here (Fig.2).

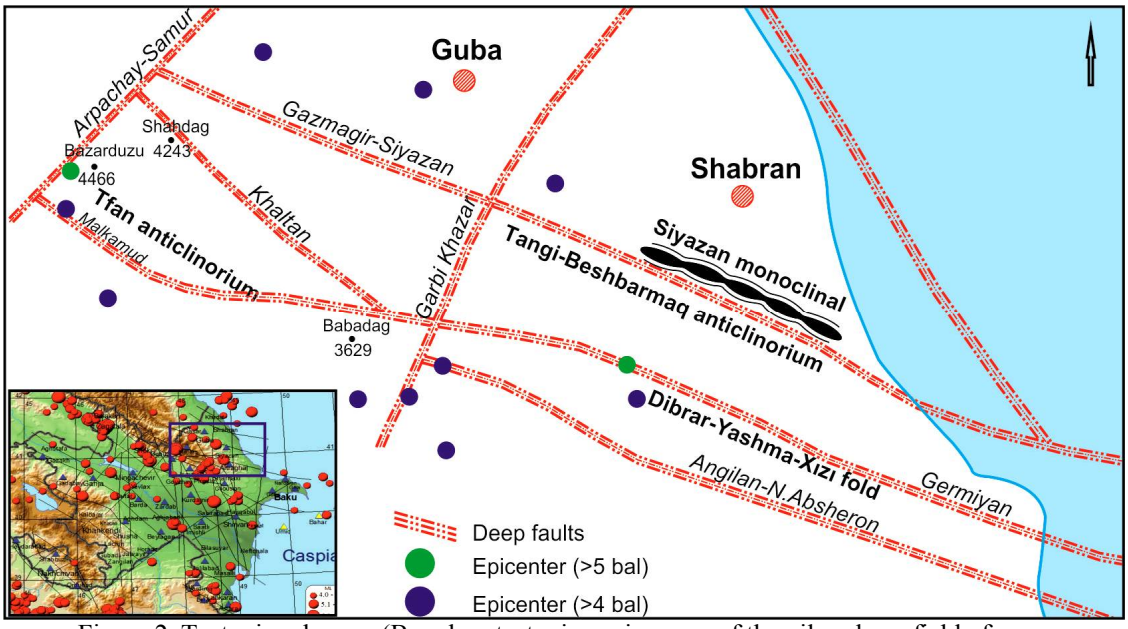

Figure 2. Tectonic scheme. (Based on tectonic zoning map of the oil-and-gas field of Azerbaijan, Baku 2002, Editor-in-chief: K.M. Karimov)

Geodynamic aspects

Earthquake origins are found to be at a depth of 20-30 km into the Earth's crust. The release of accumulated energy occurs suddenly within a few seconds leading to the formation of the embedding, uplifting, landslide in the horizontal direction as well as other types of complications. The active parts of deep faults are determined with the study of earthquake origin. The study of the geological characters of macroseismic area anomalies accompanied by a sharp decrease in the intensity of seismic effect in the researches, allows to guess the connection with tectonic fault zones where seismic waves are absorbed.

Structural-tectonic features

Due to the complex seismo-geological structure of the area, quality of geophysical research, especially seismic material is poor which makes it difficult to obtain a detailed understanding of the tectonics of local uplifts found on Mesozoic.

Mesozoic sediments distinguished by its activity in terms of data analysis consist of Gusar-Devechi basin and Khizi tectonic zone that are sharply different from one another because of their tectonic structure.

The near Caspian-Guba NGR consist of two tectonically different structural elements - Gusar-Devechi (Shabran) syncline and the north flank of the south-east set of the Greater Caucasus meganticline. Based on the seismic exploration and deep drilling data, three structural ages have been observed here.

Lower age covers Jurassic sediments and according to the accurate seismic data The North Charkhi, Charkhi, The North Aghzibirchala, Aghzibirchala, Southern Aghzibirchala have been

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discovered. The most explored one of them is Aghzibirchala structure. In this uplifted anticline deep drilling has been conducted and the presence of Jurassic and Triassic sediments has been confirmed based on obtained drilling information.

The medium structural age is detected with a seismic horizon reflecting the surface of Cretaceous.This horizont has a monoclinal subsidence in south-east direction. There are found to be present Khudat, Khachmaz and South Khachmaz anticlines, East Khachmaz, Charkhi and Devechi (Shabran) structural pinchout in this subsided region. Pliocene sediments which are deposited on the top layer in this area have monoclinal subsidence as well in the south-east direction and it is characterized by poorly followed pinchouts matching with the Mesozoic uplifts.

The south-western slopes of the Gusar-Devechi syncline are characterized by intense and sharp-shaped folds of Neogene sediments. Anticlinal structures of Neogene sediments have been studied in Talabi, West Gaynarja and Gaynarja by means of geophysical planning and drilling works.

Tectonically the Talabi structure is an asymmetrical anticlinal fold extending along latitude scope. Its north flank is steep (35-40^o), while its south flank is relatively less steep (15-20^o).

As well as the structure of Gaynarja is an asymmetrical anticlinal fold lying in north-west direction. It is characterized by a relatively steep south-west flank (25-40^o) and slightly less inclined north-east flank (14-20^o). The hinge zone of the fold is complicated by longitudinal fault which has an amplitude of 100-150 m and therefore the south-western limb of the fold has been exposed to uplifting.

The structure of Gaynarja that has got steep limbs in the upper part (60-80^o) and relatively less inclined flank towards the lower parts (30-40^o). There is a tectonic fault that is along the fold axis which is originated from mud volcano processes.

Several anticlinal elements were found apart from the above mentioned structures in this area and of them Dashdemirli anticline which is located in the north of Gaynarja is to be highlighted. This upward fold is contoured by 3700-3800 m isohypse according to the Mesozoic surface.

Khizi tectonic zone is bordered by Garabulag in the north-east, Germian faults in the south-west and mainly is consisted of synclines of upper Cretaceous sediments. Beyimdagh-Tekchay-Sitalchay-Yashma anticline chain has been overlayed Beyimdagh fault. There are Keshchay and Shurabad to the north-east of it and Germian anticline to the south-west of it.

According to geological-geophysical data Beyimdagh–Tekchay upward fold of Khizi syncline is a north-west-south-east oriented anticlinal structure of cretaceous sediments.

The north-east flank has become complicated by a reverse fault on Beyimdagh-Tekchay-Sitalchay areas, while south-west flank is complicated by normal and reverse faults of Germian zone that is reflected on the surface as well.

Complex researches, geological-planing, structural mapping have been conducted for a long time, and as a result it is obtained that, Sitalchay anticline fold extends in the direction of SE and NW. Its north-east flank is of moderate dip angle (25-40°), while the south-west flank is steeper (40-55°). The north-east part of the hinge zone of the anticline is complicated by a transverse fault of 100-120 m amplitude. The south-west flank of anticline has more complex structure and it is divided into ladder-like tectonic blocks as a result of transverse faults. Gadisu anticline is an asymmetric brachianticline lying in the north-west-south-east direction, its south-west flank has dip angle of 30-40°, while north-east flank is steeper (50-60°). The north side which has a high dip angle is overlaped by the Greater Caucasus. According to the structural mapping data, south-east periclinal of Gedisu structure's sediments is limited to the Sumqayit horizon and is embedded within only Caspian Basin without changing its direction. The north-east flank of anticline is complicated by a huge fault and its amplitude reaches to 240 meters in the south-east periclinal. According to the bottom and top of the Lower Cretaceous, Gedisu anticline is divided into two parts: West Gedisu and Gedisu uplifts.

Generally, the deep tectonics of the region, in particular the Mesozoic sediments have been studied poorly.

The territory of Caspian - Guba NQR belongs to the south-east flank of the Greater Caucasus meganticline in the sketched tectonic schemes (V.E.Khain et al.).

Spatial distribution of macroseismic field anomalies of the well-researched earthquakes within the boundaries of the Azerbaijani part of the Greater Caucasus helps to distinguish positive and negative anomally zones distinctly. Comparison of the selected anomalies with the structure of the Azerbaijani part of the Greater Caucasus demonstrates that, all of them are related to distortion dislocations (Fig.2). Geological and geophysical researches conducted in Caspian-Guba NGR allowed to distinguish several large structural-tectonic zones in this region. Tengi-Beshbarmag anticlinorium and Khizi zone are notable by the complexity of tectonic structure.

Available deep faults and epicenters of recorded earthquakes in Caspian-Guba NQR are depicted in Fig.2. Earthquake epicenters are mostly observed on the deep fault lines.

Conclusion

Results of geological-geophysical researches

Tectonics of the field have been analyzed in detail as a result of seismic exploration conducted in 2014. Numerous faults have been detected as a result of geological activity in the structure. The I-I fault mentioned as Germian fault in geological literature and the other parallel faults (Fig.3), as well as the north-east flanks of structures with the high dip angle leads us to speak about the dynamic activity of the field in the south-west-north-east direction.

The Sitalchay structure is demonstrated as different tectonic blocks that have become much more complex by longitudinal faults along the hinge. The weakening of correlation properties of the

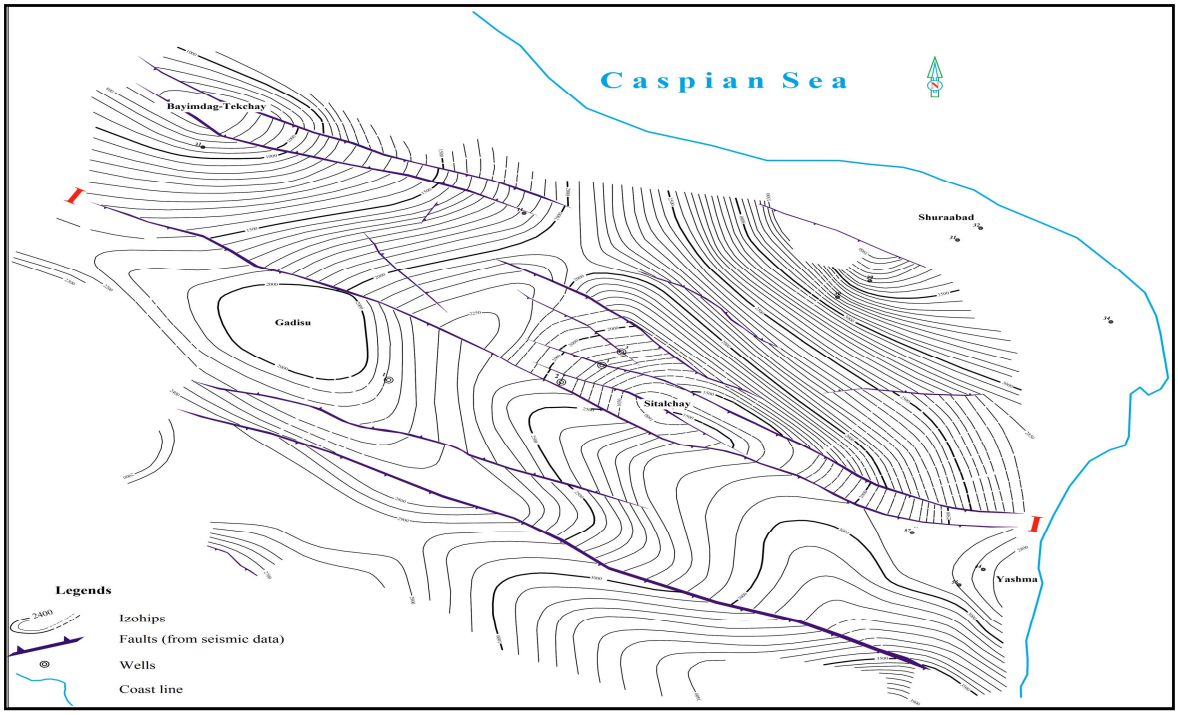

Figure 3. Structural map on Valanginian stage [5]

reflections has been observed in the seismic cross sections that characterizes the part of the structure between faults. As mentioned earlier, macroseismic field anomalies are associated with the seismic wave absorption occuring in tectonic fault zones.

According to this approach, it is assumed that these zones are also seismically active. Germian fault is recorded in the south of the structure that in the center of this fault an earthquake epicenter with >5 points (Fig.2).

In order to clarify the geological-tectonic structure towards the research area and in the sea

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and also for clarifaction of the geological nature of observed gravity force anomalies a joint analysis of seismic and gravimetric data, continuation of three-dimensional (3D) seismic works, as well as other research works, construction of three-dimensional geological models, tectonic structure of Mesozoic sediments would be expedient.

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