THE RISK OF CHANGE IN THE THICKNESS, SAND AND OIL-GAS CONTENT OF THE PRODUCTIVE SERİES SEDIMENTS ON THE NORTHERN SLOPE OF THE SOUTH CASPIAN DEPRESSİON

Shura Ganbarova, Sevil Zeynalova, Tamella Zahidova
•
Azerbaijan State Oil and Industry University
qanbarovanicat@mail.ru
z7sevil@mail.ru
tamellazahidova@gmail.com

Absract

Studies were carried out on Pirallahi, Gurgan-deniz, Khali, Chilov, Janub, Janub-2, Azi Aslanov, Palchig-Pilpilesi, Neft Dashlari, Gunashli, Chirag, Azeri and Kapaz structures in the Absheron-Balkan oil and gas-bearing zone. Paleogene-Quaternary sediments are represented in the section of the sedimentary cover of the Absheron-Balkan zone. The industrially productive oil and gas deposits discovered in this zone are related to the suites of the lower and upper stages of the Productive series (Pliocene).

The changes risk of the total thicknesses and sand content of the suites of Productive series in the structures of the study area were analyzed in the direction of four anticlinal zones.

To determine the change risk of thickness and sand content of individual suites of the PS and the phase zonation of hydrocarbons corresponding graphs were constructed and analyzed. The graphs are constructed based on average values of thickness and sand content.

According to the conducted analyses, the thickness and sand content of the suites of the lower and upper stages of the PS on the Pirallahi-Janub-2, Khali-Neft Dashlari, Gunashli-Kapaz anticlinal zones are increas from the northwest to the southeast along the northeast and southwest limbs. The characteristics of the thickness changes risk of the PS suites show that the tectonic movements and the relief of the basin bottom play a key role in the thickness distribution. Based on the change of sand content in the study area, it can be noted that the paleogeographical conditions in the basin during the formation of PS sediments were quite favorable.

The Kapaz structure, located at the southeastern end of the Gunashli-Kapaz anticlinal zone, is similar in geological structure with other folds of the anticlinal zone where it is located. It can be noted that the GaS, PK, PKS, Balakhani suites with gas-condensate-oil bearing in the adjacent fields are also highly promising here. In the Azeri field, which is located in this anticlinal zone, the PKS suite of the Productive series is gas-condensate bearing. The PK and GaS are oil-gas-condensate-bearing in the neighboring Chirag and Gunashli fields, so, they are also can be promising here.

The complexity level of the folds noted here is different. İt is play a fundamental role in the distribution of oil and gas fields. İt should be noted that longitudinal faults play a key role in the distribution of hydrocarbon accumulations in the fields of Absheron oil and gas region. Due to influence of the transverse faults folds are placed in a stepped form. İt is lead to reshape the oil fields in Pliocene sediments. Regarding the formation of oil and gas deposits, it should be noted that this process is formed as a result of the alternating activity of vertical and lateral migrations. Therefore, in the chain-arranged ascents within the mentioned zone, in the southeast-northwest direction, so, the differential entrapment of oil and gas along up dip is justified. That is, along the Pirallahi-Janub-2 anticlinal zone, gas-condensate deposits are replaced by oil-gas, in turn, the oil-gas deposits are replaced by oil deposits in the southeast-northwest direction. The lower suites of the PS on the Gunashli-Kapaz anticlinal zone are mainly characterized by gas-condensate, and the upper suites are mainly characterized by the presence of oil-gas accumulations.

Keywords: deposits, gas-condensate, suites, anticlinal zone, fault, vertical and lateral migrations, subduction zone, differential entrapment

I. İntroduction

The Absheron-Balkan structural megasaddle, which is a structural element of the South Caspian depression, geodynamically is a structural-tectonic expression of a non-classical subduction zone, as well as at the same time forms the north-northeast slope of the South Caspian depression [9, 10]. The Absheron-Balkan oil and gas-bearing zone includes Pirallahi, Gurgan-deniz, Janub, Janub-2, Khali, Chilov Island, A. Aslanov, Palchig Pilpilesi, Neft Dashlari, Oguz, Gunashli, Chirag, Azeri and Kapaz fields (Fig. 1) [3].

12 of the 14 structures located in the Absheron-Balkan folding zone are considered deposits that they are being developed. Oil, gas and gas-condensate system deposits here belong to both the upper (Surakhani-Fasila suites) and lower (PKC, PKS, KS, PK, GaS) stages of the Productive series (PS) sediments.

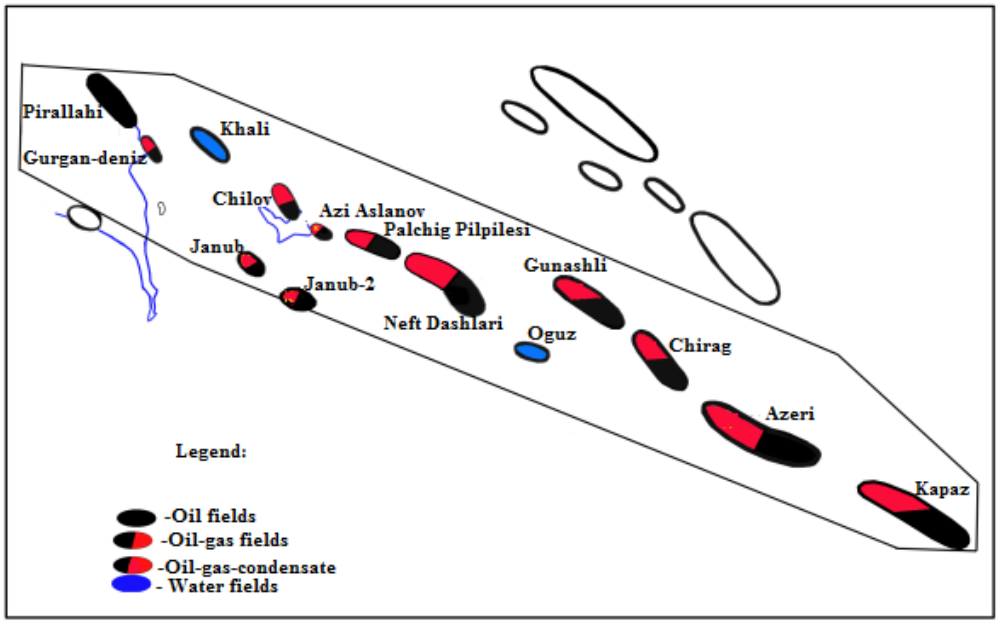

Figure 1: *Overview map of the structures*

Since the 80s of the last century, complex geological (drilling, seismoacoustic profiling, engineering-geological studies) work has been started in the abyssal exploration areas of the Caspian Sea, including the Gunashli, Chirag, Azeri, and Kapaz areas. As a result of structural-prospecting and prospecting-reconnaissance drilling, the Pirallahi Island, Gurgan, Palchiğ Pilpilesi and Neft dashlari fields were discovered.

The sediments involved in the geological structure of the areas belonging to the Absheron-Balkan zone cover a wide stratigraphic interval (from the Paleogene (Ꝑ) to the Quaternary (Q)).

Rich oil and gas deposits discovered in the Apsheron zone are associated with Pliocene sediments. In the Apsheron-Balkan oil-gas-bearing zone, studies were carried out on the Pirallahi, Gurgan-deniz, Khali, Chilov, Janub, Janub-2, Azi Aslanov, Palchig-Pilpilesi, Oguz, Neft Dashlari, Gunashli, Chirag, Azeri and Kapaz structures [12-14].

In general, in certain periods in the study area, mainly at the end of the Lower Pliocene, the occurrence of uplift affected either partial or complete washing out of the upper PS sediments, as well as the change of their lithological composition, leading to pinching out of a number of layers and, therefore, restrictions in terms of oil and gas prospects.

II. Method

The changes of total thickness and sand content of PS sediments in the structures of the study 244 wells were included in the interpretation project. 5 in Pirallahi, 7 in Gurgan-deniz, 5 in Khali, 6 in Chilov, 9 in Janub and 3 in Janub-2 fields, 5 in A. Aslanov, 4 in Palchig-Pilpilesi, 19 in Neft Dashlari, 2 in Oguz areas, 17 wells in the Gunashli, 4 in the Chirag, 3 in the Azeri, as well as 5 in the Kapaz field were studies. The results of the geophysical studies conducted in the wells were investigated [13].

In the study area, models characterizing the thickness and sand content of individual anticlinal zones were drawn up. The models are constructed by using of Surfer program.

III. Discussion

The thickness and sand content of the horizons and suites of the PS sediments in separate anticlinal zones are traced in the study area. As is known, the analysis of changes in the petrophysical properties of rocks along the area and depth allows to determine their reservoir properties change in that direction and to relatively objectively assess both the fluid capacity and oil-gas prospects of natural reservoirs [8]. For this purpose, in order to determine the thickness and sand content of the individual suites of the PS in the Pirallahi, Gurgan-deniz, Janub, Janub-2, Chilov, Palchig Pilpilesi, Neft Dashlari, Gunashli, Azeri, Chirag, Kapaz fields and to determine the phase zonation of hydrocarbons, the corresponding graphs were constructed and analyzed. The graphs are constructed based on average values of thickness and sand content values (Fig.2).

According to the graph the thickness of the Pre-Kirmaki sandy (PKS) suite is fluctate between 41-54 m in the Pirallahi, 34-54 m in the Gurgan-deniz, while 57-60 m in the Janub fields. It varies up to 52 m in the Janub-2 field located along the Pirallahi-Gurgan-deniz-Janub-Janub-2 anticlinal zone. The sand content of PKS varies between 27-58% in the Pirallahi, 25-78% in the Gurgan-deniz, 33-35% in the Janub and up to 31% in the Janub-2 fields.

The thickness of the Kirmaki suite (KS) varies between 234-292 m in the Pirallahi, 285-566 m in the Gurgan-deniz, 226-243 m in the Janub fields, while up to 230 m in the Janub-2 area. The sand content of the KS varies between 14-32% in the Pirallahi, 16-31% in the Gurgan-deniz, 9-15% in the Janub areas, and up to 38% in the Janub-2 area.

The thickness of the Pre-Kirmaki (PK) suite ranges from 22 to 90 m in the Pirallahi, from 130 to 173 m in the Gurgan-deniz, from 127 to 133 m in the Janub areas, while up to 128 m in the Janub-2 area. The sand content of the PK suite varies between 36-62% in the Pirallahi, 27-65% in the Gurgan-deniz, 60-92% in the Janub areas, and up to 94% in the Janub-2 area. The uncovered thickness of the Gala suite (GaS) varies between 135-333 m in the Gurgan-deniz, 143-379 m in the Janub areas, while up to 120 m in the Janub-2 area. The sand content of GaS varies between 8-19% in the Gurgan-deniz, 8-10% in the Janub, and up to 75% in the Janub-2 areas.

According to the graph constructed along the Chilov-A.Aslanov-Palchig Pilpilesi-Neft Dashlari anticlinal zone [12], the thickness of the PKS suite in the southwest limb of the structures is noted as following: 26-45 m in the Chilov area, up to 38 m in the A.Aslanov area, and between 28-38 m in the Palchig Pilpilesi, it varies between 26-30 m in the Neft Dashlari, and up to 49 m in the Oguz areas. The sand content of the suite is consists 16-50% in the Chilov, 24% in the A. Aslanov areas, between 16-29% in the Palchiq Pilpilesi, 23-75% in the Neft Dashlari, and 55% in the Oguz areas is observed (Fig. 3).

The thickness of the KS varies between 223-504 m in the Chilov, up to 364 m in the H. Aslanov, 276-372 m in the Palchig Pilpilesi, 280-379 m in the Neft Dashlari, and up to 258 m in the Oguz areas. The sand content of KS varies between 4-20% in the Chilov, 3% in the A.Aslanov areas. İt is fluctate between 3-8% in the Palchig Pilpilasi, 2-3% in the Neft Dashlari areas, while up to 2% in the Oguz area.

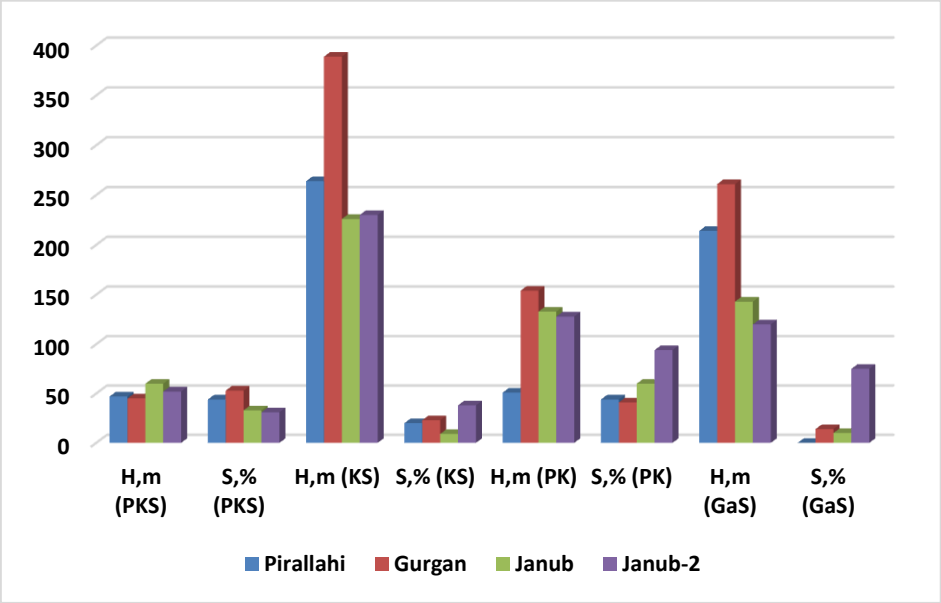

Figure 2: *The thickness and sand content of suites of the PS sediments along the Pirallahi-Gurgan-deniz-Janub-Janub-2 anticlinal zone*

The thickness of PK suite varies between 93-114 m in the Cilov area, while up to 92 m in the A.Aslanov area. It represented by 80-117 m section in the Palchig Pilpilesi area, while 35-89 m in the Neft Dashlari field, and up to 116 m in the Oguz area. Sand content of PK 24-27% along the Chilov area is observed, while 35% along the A.Aslanov area. İt is consists of 25-39% in the Palchig Pilpilesi, 34-53% in the Neft Dashlari areas, and 94% along the Oguz area is noted.

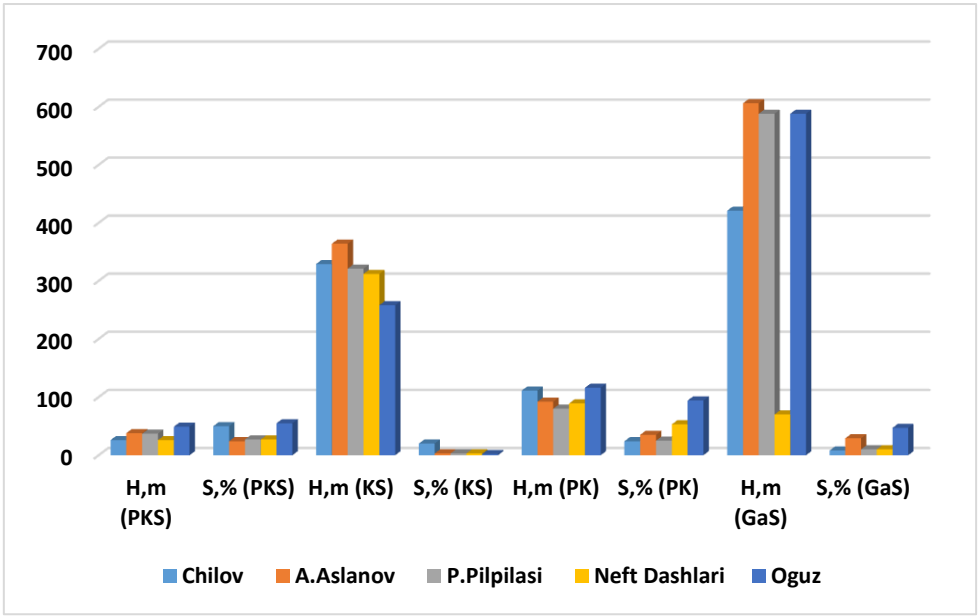

Figure 3: *The thickness and sand content of suites of the PS sediments along the Chilov-A.Aslanov-Palchig Pilpilesi-Neft Dashlari*

The exposed thickness of GaS ranges from 187-498 m in the Chilov area, while up to 606 m in the A.Aslanov field. İt is 394-588 m in the Palchiq Pilpilesi area, and up to 70 m in the Neft Dashlari area. The Oguz area is represented up to 588 m by the GaS sediments. The sand content of GaS ranges from 8-16% in the Chilov area, it is 29% in the A.Aslanov field. The Palchiq Pilpilesi

and Neft Dashlari field sections are represented by 10-27% and 10% respectivly. İt is up to 47% in the Oguz area.

According to the longitudinal correlation scheme in the northwest limb direction, the thickness of the PKS is up to 38 m in the Khali area, while 26-38 m in the Chilov area. İt is up to 29 m in the A. Aslanov area. The Palchiq Pilpilesi and the Neft Dashlari areas are represented by the PKS sediments of 27-39 m and 25-46 m correspondingly. The sand content of PKS suite is 42% in the Khali area, 27-42% in the Chilov area, 83% in the A. Aslanov area, 12-22% in the Palchig Pilpilesi area, while 88-100% in the Neft Darshali [11, 12].

The thickness of KS ranges up to 274 m in the Khali area, between 325-351 m in the Chilov, while up to 329 m in the A. Aslanov area. İt is 271-357 m in the Palchig Pilpilesi and 250-372 m in the Neft Dashlari areas. Sand content of PK suite is 24% alomg the Khali, between 2-8% in the Chilov, 22% in the A. Aslanov areas is observed. 2-13% and 2-3% along the P. Pilpilesi and the Neft Dashlari areas is noted, respectivly.

The thickness of PK suite varies up to 72 m in the Khali area, between 112-131 m in the Chilov area, while up to 72 m in the A. Aslanov area is observed. Between 78-133 m and 69-99 m in the Palchig Pilpilesi and the Neft Dashlari areas is noted, correspondingly. The sand content of the PK suite is noted as following: 69% in the Khali, 19-55% in the Chilov, 50% in the A. Aslanov, 7-13% on the P. Pilpilesi area, 33-56% along the Neft Dashlari (Fig.4).

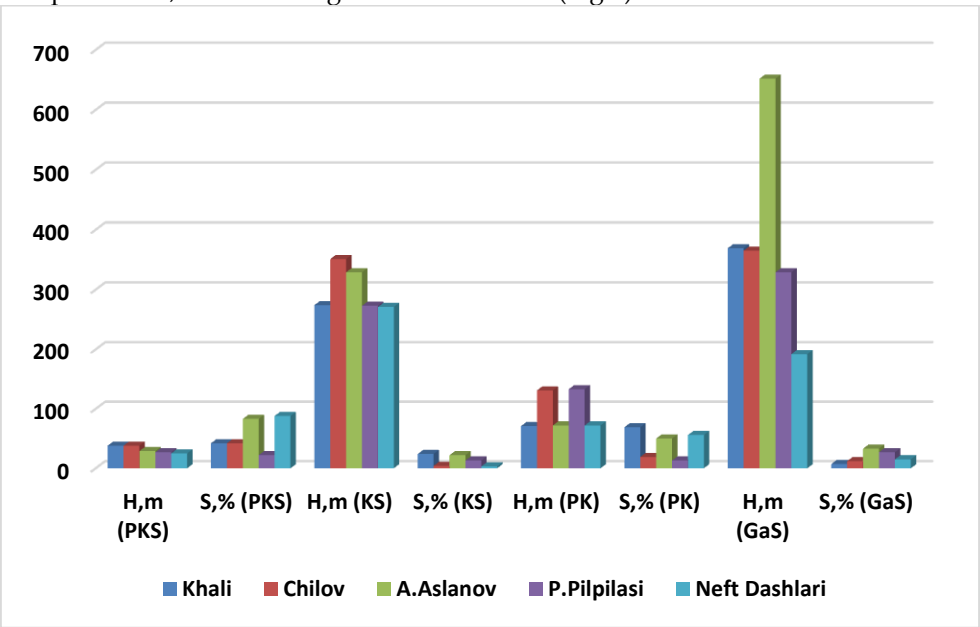

Figure 4: *The thickness and sand content of suites of the PS sediments along fields*

The uncovered thickness of GaS varies up to 369 m in the Khali, between 282-445 m in the Chilov, up to 652 m in the A. Aslanov, between 329-470 m in the Palchig Pilpilesi areas, and between 134-192 m in the Neft Dashlari field. The sand content of GaS suite is 7% in the Khali, 12-15% in the Chilov, 33% in the A. Aslanov, 13-29% in the P. Pilpilesi areas, while 15-28% in the Neft Dashlari area.

According to the longitudinal correlation scheme (Fig. 5) in the direction of the northeast limbs of the Guneshli, Chirag, Azeri, Kapaz structures according to the top of PKC suite the thickness of SuS varies between 1105-1385 m in the Gunashli, 888-968 m in the Chirag, 920-1028 m in the Azeri, and up to 1430 m in the Kapaz areas. The sand content of SuS varies up to 1-2% along the Gunashli, 3% - Chirag, 2-4% - Azeri, and up to 2% in the Kapaz areas is noted.

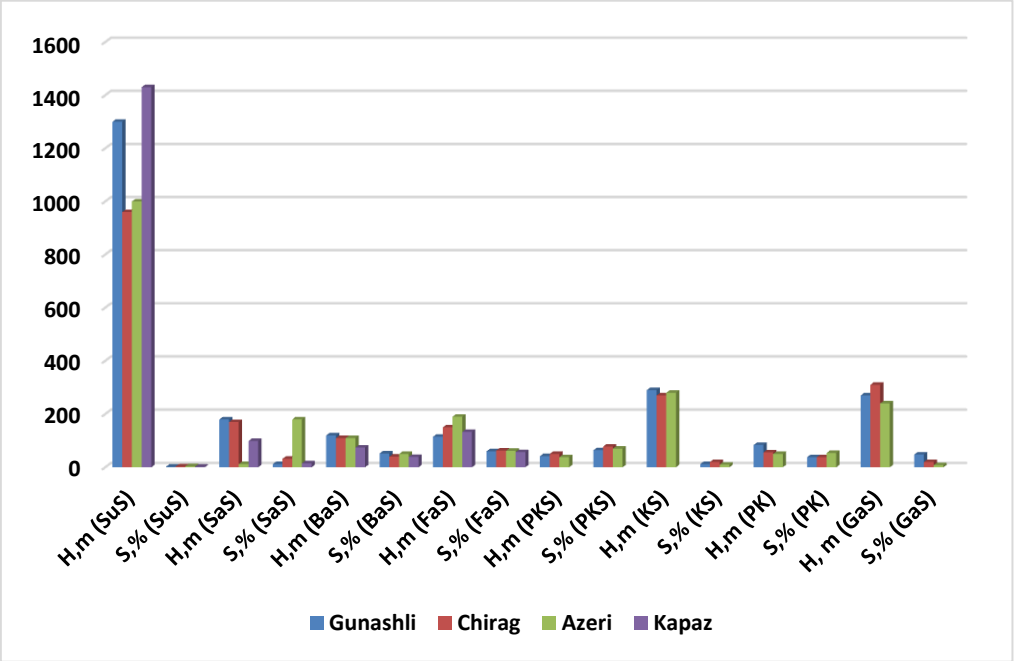

Figure 5: *The thickness and sand content of suites of the PS sediments along the northeast limbs of the structures*

The thickness of the horizon IV of SaS varies between 143-181 m in the Gunashli area. İt is 118-174 m in the Chirag, 98-99 m in the Azeri, and up to 99 m in the Kapaz areas. The sand content of the horizon IV of SuS varies as following: between 7-13% in the Guneshli area, 19-33% -in the Chirag, 8-13%- in the Azeri, and up to 15% in the Kapaz areas.

The thickness of the horizon V of the BaS ranges 74-148 m in the Gunashli, up to 100 m in the Chirag, 180-185 m in the Azeri, and up to 92 m in the Kapaz areas. The sand content ranges as following: 16% -in the Guneshli, 17-18% -in the Chirag, 21-23% -in the Azeri, and up to 17% in the Kapaz areas is observed.

The thickness of the BaS (VI horizon) varies between 101-141 m in the Gunashli, 101-125 m in the Chirag, 109-117 m in the Azeri areas, and up to 137 m in the Kapaz field. The sand content of the BaS horizon VI is 24% in the Gunashli, 22% in the Chirag, 18-20% in the Azeri, and up to 17% in the Kepaz areas.

The thickness of the horizon VII BaS varies along following: 109-123 m, 99-117 m, 103-112 m and up to 74 m in the Gunashli area, Chirag Azeri and Kapaz areas, correspodingly. The sand content between 52-53%, 30-40%, 31-50% and up to 39% in the Gunashli, Chirag, Azeri, Kapaz areas is observed.

The thickness of the BaS (horizon VIII) varies between 109-119 m in the Gunashli area. İs 146-165 m in the Chirag, 118-127 m in the Azeri, and up to 73 m in the Kapaz areas. The sand content of horizon VIII varies between 18-30%, 18-35%, 26-43% and up to 28% in the Gunashli, Chirag, Azeri and Kapaz area, respectively.

The thickness of the BaS IX horizon section ranges from 120-148 m in the Gunashli field. 112-113 m in the Chirag, 111-130 m in the Azeri, and up to 90 m in the Kapaz areas. The sand content of the horizon IX consists 16-50%,14-34%, 18-22%, and up to 18% along the Guneshli, Chirag, Azeri, and Kapaz areas, respectively.

The thickness of the X horizon of BaS is identifid of 46-104 m in the Guneshli area, 92-95 m in the Chira, 97-105 m in the Azeri, and up to 68 m in the Kapaz areas. The amount of sand along the section of horizon X varies between 18-34% in the Guneshli, 27-48% -in the Chirag, 30-44% -in the Azeri, and up to 33% in the Kapaz areas is identified.

The thickness of Fasila suite is concidered as following sequentially: in Gunashli area -110-115 m, in Chirag- 132-153 m, in Azeri area- 135-196 m, up to 133m in Kepaz. The sand content of suite

varies between 53-63%, 63%, 61-63% and up to 57% in the Gunashli, in the Chirag, in the Azeri, in the Kapaz areas, respectively.

The thickness of the sediment of PKS suite varies from 34 to 43 m in the Gunashli area. İt is consists 45-50 m in the Chirag, and varies from 37 to 38 m in the Azeri field. The sand content of the suite varies 62-65%- in the Guneshli, 68-78% -in the Chirag, while between 46-71% in the Azeri areas.

The thickness of KS varies between 268-293 m in the Guneshli area, between 242-271 m in the Chirag area, and between 263-283 m in the Azeri area. The sand content of the suite varies from 12% in the Gunashli, 16-20% in the Chirag, and 9-12% in the Azeri areas.

The thickness of PK suite ranges from 69 to 85 m in the Guneshli area. İn the Chirag and in the Azeri areas is represented by 45-57 m and 36-53 m thick section. The sand content of the suite is 33-38%, 35-39%, 40-54% in Guneshli, in Chirag, and in Azeri areas, correspondingly.

The thickness of the GaS varies between 252-279 m in the Gunashli, 291-316 m in the Chirag, and 240-318 m (opened) in the Azeri fields. The sand content of GaS about 28-49% in the Gunashli area is noted. İt is 4-23% in the Chirag, and 5-8% in the Azeri areas.

According to the longitudinal correlation scheme (Fig.6) in the SW limb direction in the Gunashli, Chirag, Azeri, Kapaz areas according to the top of FaS the thickness of SuS 950-1158 m in the Gunashli, 1074-1108 m in the Chirag, up to 951 m in the Azeri, and up to 1397 m in the Kapaz areas is found. Sand content of section 1-4%, 2-3%, 3% and 2% in Guneshli, in Chirag, in Azeri, in Kapaz areas is noted, relatively.

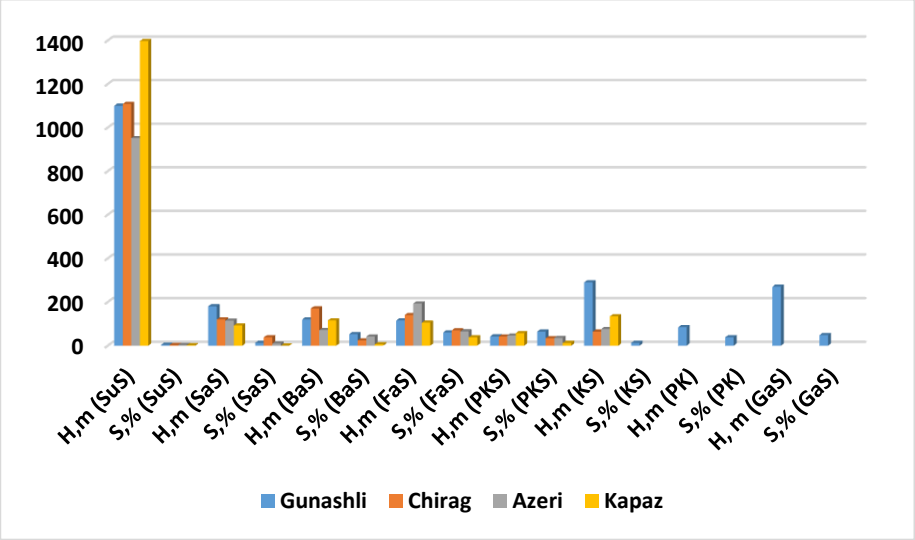

Figure 6: *The thickness and sand content of suites of the PS sediments along the southwest limbs of the structures*

The thickness of the IV horizon of SaS varies as following: in the Gunashli area- 155-173 m, in the Chirag area -between 90-122 m, in the Azeri area- up to 114 m, while up to 92 m in the Kepaz area. The sand content of the this horizon of 6-9% in the Gunashli, 14-39% in the Chirag, and up to 9% in the Azeri areas is found.

The thickness of the V horizon of BaS varies between 69-79 m in the Gunashli, 131-140 m in the Chirag, up to 148 m in the Azeri, and up to 83 m in the Kepaz areas. Amount of the sand along horizon ranges 14% in the Gunashli area. 13-20% in the Chirag, 12% in the Azeri, and up to 12% in the Kapaz areas is identified.

The thickness of the horizon VI of BaS 104-145 m, 100-175 m, up to 71 m and 115 m in the Gunashli, Chirag, Azeri, Kapaz areas is abserved. The sand content 10-29% -in the Gunashli, 24% -in the Chirag, 41% -in the Azeri, and up to 6% -in the Kapaz area is noted.

The thickness of the BaS (VII horizon) varies as following: in the Guneshli area- 126-136 m, in the Chirag area- 110-118 m, in the Azeri field- up to 107 m, while up to 86 m in the Kapaz. The

sand content of the horizon 27% in the Guneshli, 1-32% in the Chirag, 13% in the Azeri, and 17% in the Kapaz areas is considered.

The thickness of the horizon VIII section 114-131 m in the Gunashli, 145-166 m in the Chirag, up to 140 m in the Azeri, and up to 98 m in the Kapaz fields is found. The sandiness its up to 12% in the Chirag, 74% in the Azeri, and 8% in the Kapaz areas is observed.

The thickness of the BaS horizon IX varies between 125-147 m in the Gunashli field, between 86-133 m in the Chirag field, up to 150 m in the Azeri field, and up to 100 m in the Kapaz field. The sand content of the BaS IX horizon is between 11-23% in the Gunashli area, 24% in the Chirag area, 28% in the Azeri area, and 18% in the Kapaz area.

The thickness of the X horizon is 64-111 m thick in the Gunashli area. İn the Chirag area it is 105-110 m, up to 110 m in the Azeri, and up to 84 m in the Kapaz area. The sand content its changes 25-40% -in the Gunashli, 28-31% -in the Chirag, 39% in the Azeri, and up to 20% in the Kapaz areas.

FaS thickness fluctate in 107-119 m in the Gunashli field section, however, 110-149 m in the Chirag, up to 193 m in the Azeri, and up to 105 m in the Kapaz areas sections. Amount of sand 48-55%, 65-72%, 65%, and up to 39% along the section of the fields.

The thickness of the PKS suite rocks varies up to 44 m, 41m, 46m and up to 57m in the Gunashli, Chirag, Azeri, and in the Kapaz fields, respectively. The sand content of the suite reches up to 30% in the Guneshli, 34% in the Chirag, 35% in the Azeri, and 12% in the Kapaz areas.

The thickness of KS varies up to 371 m in the Gunashli area, up to 64 m (uncovered) in the Chirag area, up to 76 m (uncovered) in the Azeri area, up to 134 m (uncovered) in the Kapaz area. The sand content up to 8% in the Gunashli area is found.

The thickness of PK suite is 78 m, and the sand content up to 49% in the Gunashli area is observed.

The thickness of GaS is 315 m in the Gunashli area, and the sand content varies up to 23%.

Based on the thickness correlation scheme along the Pirallahi-Janub-2 anticline line the thickness of individual layers increases from northwest to southeast (see, fig.2).

The thickness of the PS suites of the Chilov-Neft Dashlari anticlinal zone is greater in the southwestern limb than in the northeastern one. This shows that there is no influence of tectonic movements in the accumulation of those sediments in the southwestern limb.

In the Gunashli-Kapaz anticlinal zone, the thickness of the sediments increases in the direction of the Azeri field, and relatively decreases towards the Kapaz area. A sharp increase in thickness (1430 m) in the Kapaz area is observed in the VI horizon (137 m) of the Surakhani and the Balakhani suites. Accordingly, it can be noted that the rate of descent of the basin floor increased from the Azeri area to Kapaz during the deposition of Surakhani suite sediments. During the accumulation of the remaining suites of the PS, the regime of tectonic movements in the basin was the same.

The characteristics of the thickness changes of the PS suites show that the tectonic movements and the relief of the basin bottom play a key role in the thickness distribution.

The obtained results indicate that along the Pirallahi-Janub-2 anticline, the sand content increases from the Pirallahi area to the NE, from the Khali area to the NE in the Khali-Kapaz anticline line, reaches its maximum in the Gunashli-Chirag-Azeri areas, and decreases relatively towards the Kapaz area.

In many cases, the occurrence and distribution of hydrocarbons in sediments of the same stratigraphic age do not follow a clearly explained pattern. Therefore, in order to clarify the presence of any regularity sought in different structures, the obtained complex geological-geophysical data must first be analyzed within a specific structure. The increase in hypsometric depth in the western part of the South Caspian basin and the high gas saturation of the PS prove that the productive areas in this region have spread over a large area.

Except of the A.Aslanov and the Janub anticlinal structures, the arch parts of all deposits are of brachyanticlinal type, subjected to disjunctive dislocation to varying degrees.

Depending on the depth, while the Balakhani and Fasila suites in the Neft Dashlari (260-1300 m depth range) and Gunashli structures (2460-2710 m depth range) are oil fields, the continuation of these suites to the Janub-1,2 fields (2575-4690 m depth range)) are gas condensate.

The KS is oil-bearing in all known fields of the archipelago (depth intervals 480-1800 m), except of Janub-1 gas condensate field. The PK suite is oil-bearing in the Pirallahi, Gurgan-deniz, Chilov Island, A.Aslanov, Palchig Pilpilesi, Neft Dashlari fields (depth interval 650-2600 m), while is gas-condensate-bearing in the Janub-1, Gunashli fields (at a depth of 3260-5200 m) [7]. Variations are also observed due to stratigraphic distribution in individual deposits. So, if all the intermediate layers, from the Sabunchi suite to the PK suite including, layer in the structures of Neft Dashlari, Chilov Island are characterized by oil deposits, then oil and gas deposits are known in the Gala suite (GaS), which is involved in the geological structure of these areas.

The Western Absheron field, including Chilov Island (Western Absheron, Absheron bank, Darwin bank, Pirallahi Island, Gurgan-deniz, and Chilov Island), oil deposits are assossated with PKS, KS and PK suite sediments [14].

The oil-gas-bearing deposits are found in the GaS sediments which lie deeper than these formations in the Garbi Apsheron, Chilov Island and Neft Dashlari structures of the area. It is a special case that the "Fasila" suite in the Kapaz structure, which is located in the continuation of this zone, is oil and gas-bearing. So, in known fields (Neft Dashlari, Gunashli, Chirag, Azeri) "Fasila" suite is oil saturated.

During the test of well 1 drilled in the north-east limb of the Kapaz field (3527-3491 m), 286 t of oil and 20 thousand m^3 of gas per day were obtained from the FaS by the open flow method. 375 t of oil and 35 m^3 of gas per day were obtained from the 3725-3682 m interval of well 3 in the southwest limb. During the test of well 5 dug in the southwest limb, a gas flow with a daily output of 100,000 m^3 was obtained from a depth of 3684-3640 m. If we take into acount that the KS (Gunashli), PK (Gunashli, Chirag), PKC (Gunashli, Chirag, Azeri), Balakhani (Gunashli X horizon) suites are gas-condensate-oil-bearing in the neighboring fields, and the similarity of the geological structure and geological development history, hydrogeological conditions, etc. of the Kapaz field with these fields , it can be assumed here the high prospectivity of the suites of the same name of the PS (Fig.7).

If you follow the productive horizon of the same name along a certain area, it is observed that there are different products in them. For example, the PKS suite is oil-bearing in the Chilov Island, the Janub, the Palchig Pilpilesi, and the Neft Dashlari fields, while it is gas-condensate-bearing in the Gunashli, Chirag, Azeri fields. There can be two explanations for the observation of such a situation in this structure. First of all, it can be explained by the free diffusion of gas dissolved in oil through geotectonic dislocations that occurred in the long geological period as a result of low formation pressure and temperature in shallow deposits. On the other hand, oil-gas, oil, gas condensate deposits form a strip of independent deposits located in different zones in the same region.

If the latest actual data is taken as the basis, in the direction of the Gum-deniz, Janub-1, Janub-2, Gunashli and Bahar-Azeri-Kapaz fields, there are rich underground (buried) intermediate structures, where productivity of Fasila, PKS, KS, PK and GaS are possible. In addition, based on new seismological and geophysical studies of wells, it is shown that the continuation of the oil-gas-bearing deposit of the Fasila suite in the Kapaz structure corresponds to the top of the VII oil-gas-bearing horizon of the Red series in the Turkmenistan sector [1, 2].

In this regard, the study of the regularity of the location and distribution of hydrocarbon deposits in the Absheron-Balkan archipelago plays a key role.

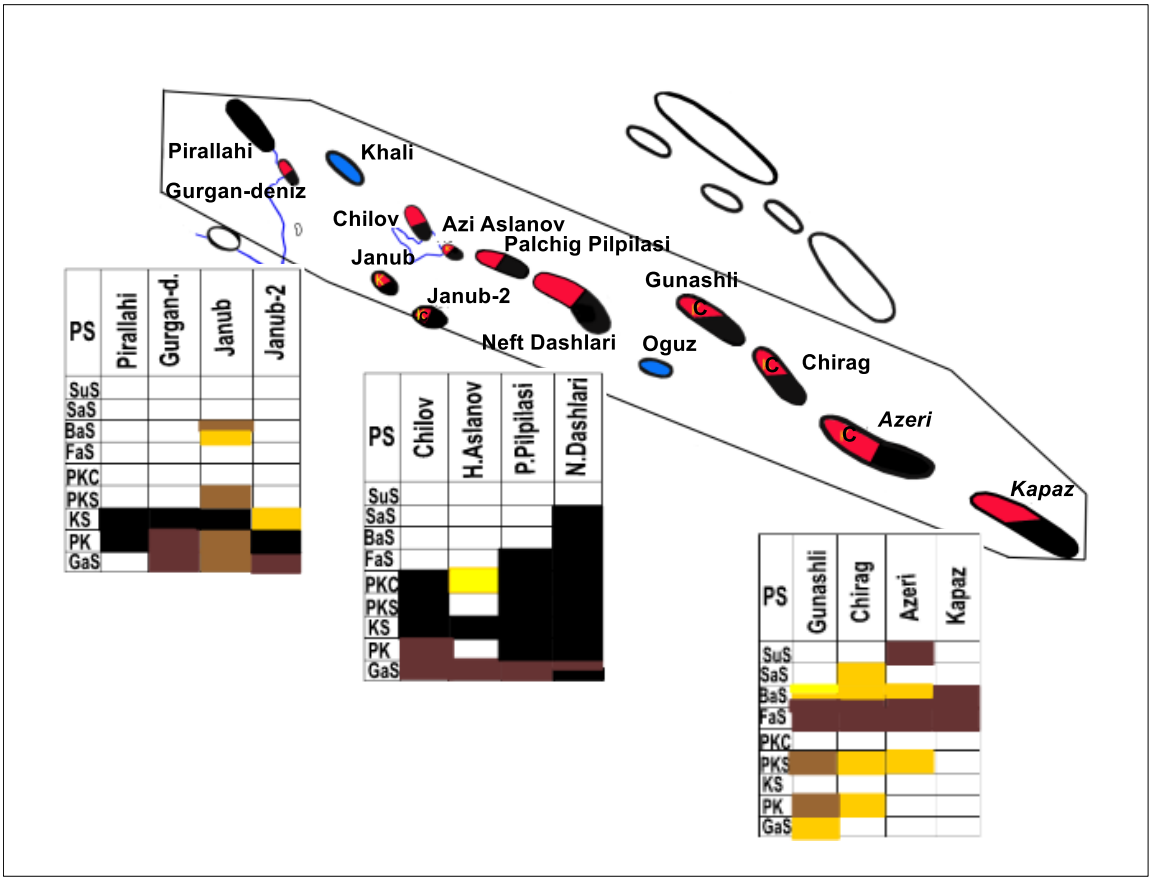

Figure 7: *Oil and gas deposits distrubution within fields*

The level of complexity of the folds with faults mentioned here is different and play a fundamental role in the distribution of oil and gas fields [4]. It is known that, in one case, longitudinal faults play a role as oil and gas migration paths, both in their formation and in the destruction of deposits in Pliocene, Miocene-Paleogene, Upper Cretaceous and older sediments, and in the other case, as a screen in separate tectonic blocks and near-faulted zones prevents the displacement of oil and gas and form conditions to the accumulation of hydrocarbons. In the process of development of regional faults, transverse faults formed at separate stages create conditions for the formation of tectonic screened microblocks and its prevent the destruction of deposits in these microblocks [6]. Longitudinal faults play a key role in the distribution of hydrocarbon accumulations in the fields of Absheron oil and gas-bearing region. Transverse faults reshape the oil fields in Pliocene sediments by giving a stepped shape to the folds. It should be noted that here longitudinal faults are developed in the lower stage of the PS, and transverse faults often developed in the upper stage. The Janub, Janub-2 folds are complicated by normal faults. The formation of deposits through vertical migration along faults caused by tensile stress leads to the formation of a zone of deep oil and gas accumulation in the basin. This zone can be distinguished as the main oil and gas zone of the basin, which is located above the oil and gas formation sourses. Within it, the deposits are grouped along the main tensile zones and the faults branching from them. Regarding the formation of oil and gas deposits, it should be noted that this

process is usually stepwise, that is, they are formed as a result of the alternating activity of vertical and lateral migrations. Therefore, in the chain-arranged ascents within the mentioned zone, in the southeast-northwest direction, so, in the direction of ascent of the layers, the differential entrapment of oil and gas is justified [5]. That is, along the Pirallahi-Janub-2 anticlinal zone, gas-condensate deposits are replaced by oil-gas and oil deposits in the southeast-northwest direction. The suites of the lower stage of the PS in the Gunashli-Kapaz anticlinal zone are mainly characterized by gas-condensate deposits, and the suites of the upper stage are mainly characterized by the presence of oil-gas accumulations.

IV. Conclusion

1. According to the results of the analyzes conducted in the Pirallahi-Janub-2, Khali-Neft Dashlari, Gunashli-Kapaz anticlinal zones, the thickness and sand content of the suites of the lower and upper stages of the PS are increas from northwest to southeast along of the northeast and southwest limbs of the structures.

2. The characteristics of the thickness changes in the PS suites show that the tectonic movements and the relief of the basin bottom play a key role in the distribution of thicknesses.

3. The GaS, PK, PKS, Balakhani suites are gas-condensate-oil-bearing in the adjacent fields. Taking into account this factor it is possible to note the high prospects of the suites of the same name of PS in the Kapaz field, due to the similarity of geological structure with these fields.

4. Faults that complicate structures play a key role in the formation of hydrocarbon deposits.

References

[1] Ali-zadeh, A.A. (2011). Selected works. Nafta-Press, 530 p.

[2] Aliyev, G.I., Aliyev, E.A. (2011). Oil and gas potential of great depths. Baku, 419 p.

[3] Bagir-zadeh, F.M., Karimov, K.M., Salayev, S.G. (1987). Deep structure and oil and gas potential of the South Caspian megadepression. AN Publishing House, 302 p.

[4] Narimanov, N.R., Rzayeva, S.M., Nasibova, G.J., Mansurova, S.I. (2014). Influence of the geodynamic regime on folding in the Absheron and Baku archipelagos of the South Caspian depression and on the Turkmen shelf. Geophysics innovations in Azerbaijan, 3-4, 26-33.

[5] Narimanov, N.R. (2005). Geodynamic aspects of formation structures in the South Caspian depression. Baku, ANE, 9, 14-21.

[6] Nasibova, G.J., Mukhtarova, Kh.Z., Ganbarova, Sh.A., . Ismayilova, M.M., Zeynalova, S.A. (2023). The influence of compressive stresses on folding in the Middle Kura depression and the Turkmen shelf. // Journal of Geology, Geography and Geoecology, 32(2), 352-359.

[7] Mukhtarova, Kh.Z., Nasibova, G.J. Estimation of oil and gas carrying capacity of local uplifts of the North-Absheron zone based on petrophysical parameters (on the basis of local uplifts of Goshadash-Agburun-deniz-Darwin bank-Gurgan-deniz). // Engineering of georesources. 2021, V. 332, 7, 7-19; DOI https://doi.org/10.18799/24131830/2021/7/3259.

[8] Nasibova, G.J.Oil and gas perspectives of the Umid structure in connection with its history of geological development . // "Reliability: Theory and Applications" (RT&A), Special Issue № 3 (66) Volume 17, January 2022c. 133-137. DOI: **https://doi.org/10.24412/1932-2321-2022-366-186-192**

[9] Senin, B.V., Kerimov, V.Yu., Mustaev, R.N.,Алиева, С.А. Lithological and paleo-geographic conditions for the formation and location of sedimentary basins of the Caspian region. // ANAS Transactions Earth Sciences. 1 / 2021. Geology and geophysics. p.16-27. 10.33677/ggianas20210100051

[10] Kerimov V. Yu., Mustayev R. N., Senin B. V., Aliyeva S.A. Modern structural and tectonic model of the Caspian region. // International Journal of the Federal Educational and Methodical Association on Applied Geology, Mining, Oil and Gas Activities and Geodesy EURASIAN MINING, 1 (37). 2022. p.27-33. https://www.rudmet.ru/catalog/journals/details/8/

[11] Gurbanov V.Sh., Galkin S.V., Narimanov N.R., Sultanov L.A., Abbasova G.G.. Petrophysical characteristics of Meso-Cenozoic sediments of the southeastern subsidence of the Greater Caucasus in connection with their oil and gas potential. SOCAR Proceedings, Bakı.2021. DOI:10.5510/OGP20210300524

[12] Mukhtarova, Kh.Z., Nasibova, G.J. Prospects for the oil and gas potential of the Khali-Neft Dashlar anticlinal zone in connection with its paleotectonic conditions. // News of Tomsk Polytechnic University. Georesources Engineering. V. 331, № 7 (2020) 176-185 p. 2020.

[13] Huseyinova A.N., Khuduyeva G.M. Comparative characteristics of the lithological composition and reservoir properties of rocks from the Gunashli and Kapaz fields. // Azerbaijan Oil Economy. 07-08.2016, p.11-14.

[14] Khuduzade A.I. Formation of uplift structures and oil-gas content in the northwestern part of the Apsheron archipelago. // Azerbaijan Oil Economy. 04.2016, p.13-18.