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THE GEOLOGICAL PREREQUISITES FOR INCREASING OIL PRODUCTION AT THE NORTH KARAMANDYBAS FIELD

Abstract. In this research the geological structure of the North Karamandybas oil field, its oil-bearing deposits, their association with the age groups of the sedimentary strata are considered. According to the structural plan of the local uplift of Northern Karamandybas structur, it is found that the lower Triassic rocks under the Jurassic deposit surface have moved 1 km to north-east comparatively. The risk of discovery of new hydrocarbon deposits in the Triassic and Paleozoic deposits is excluded. The risk has been taken to discover the new hydrocarbon deposits.

Keywords: North Karamandybas field, deposits, oil, sedimentary basins, Jurassic, Triassic, isohypses, reflecting horizons, discovery, brachianticlinal, hydrocarbons.

Implementation of the decisions of the President of the country N. A. Nazarbayev on the development of the oil and gas extraction industry can not be carried out without replenishing hydrocarbon reserves and increasing their production. At this time, the main reserves and their extraction are centralized in the territory of Western Kazakhstan. Investigators of oil and gas geology associate discovery of new fields with the shelf zone of the Caspian Sea, which is associated with significant costs.

Exploration work in the sedimentary basins of East Kazakhstan has been poorly studied except for South Turgai and requires substantial capital expenditures. Therefore, the use of potential opportunities for old fields with developed infrastructure is economically viable and deserves special attention. For example, the largest deposits Zhetybai and Uzen in Mangystau province have been in operation for sixty years, the recoverable reserves are not infinite. The need for advanced work - scientific research and exploratory drilling has arisen to increase the reserves of hydrocarbon raw materials and to provide employment for the near and far future of highly qualified specialists in the oil and gas extraction industry.

Oil and gas deposits of the Mangystau region are mainly associated with structures characterized by a complex geological structure. Reserves of oil and gas are installed mainly in the Jurassic deposits and in the Cretaceous and Triassic rocks and are confined to the arched parts of local structures [1, 2].

In all sedimentary basins of Kazakhstan Jurassic deposits according to geochemical data are the generators of oil and gas. Proceeding from this, the prospecting works in the Soviet Union were aimed at the discovery of a deposit of oil and gas in the Jurassic deposits. As a consequence, they are most well studied. Lower lying pre-Jurassic layers have been studied much worse and have been opened with rare wells. Nevertheless, for the time being, 17 hydrocarbon deposits have been discovered in the Triassic layers of Mangystau oblast. Three of these are in the lower Triassic: North-West Zhetybai, Tasbulat, Oymash; Seven are in the middle layer : Atambay, South Zhetybai, Pionerskoe, Ashiagar, Severnoye Pridorozhnoye, Araltyube, Rakushechnoe and seven are in the upper layer: Kamenistoye, Normal East, Western Aktas, Pridorozhnoe, Severnaya Karagie, Mahat, Zharty, thus proving their high prospects for discovery New oil and gas fields.

One of the promising structures with an established oil content in the Jurassic sediments and the prospect of incrementing reserves by discovering new oil deposits in the Triassic rocks is the North Karamandybas deposit, located in Mangystau province, 39 km from Zhanauzen to north-west [3].

On the structure of the Northern Karamandybas on the surface of the Jurassic deposits (III horizon), the contour of the brachianticline is enclosed by a 960 m with isohypsum and measures 4.0x2.0 km (Figure 1), where the nine main productive horizons are found in the Middle Upper Jurassic layer. Deposits are identified in 6 horizons, 5 of them are in the Bayosian tier of the Middle Jurassic, and 2 of them are in the Bathonian Stage and 2 of them are deposits in the Callovian Tier in the Upper Jurassic (Figure 2).

The diagram of the drilled wells on the North Karamandybas structure shows that on the structural map along the reflecting horizon III (the roof of the Jurassic) to the arch of the local uplift, the wells №10, №3 and №11 are closest to each other and they have opened oil reservoirs. Well №1 drilled in the north-west is at a distance of 2 km from the local uplift, well №2 at a distance of 3.2 km to the east and № 13 well is located in the north-east of the center of the local uplift at a distance of 1 km. All three wells №1, №2 and №13 are located out of the oil-bearing contour (Figure 1).

The fact is that according to the data of the isolines of depths on the structural map on the roof of the Indian layer of the Lower Triassic sediments on the site of a local uplift along the roof of all the productive horizons of the Jurassic deposits, along the surface of the complicated relief by faulty tectonics, a deflection of the sublatitudinal strike from northwest to southeast With depth marks - from 2.6 to 2.9 km (Figure 3).

The inversion Triassic structure with a biconvex lenticular form due to its formation is due to regional tangential tectonic movements on the Turan plate, where the bifurcation of the sedimentary strata occurred approximately in the Middle Triassic time.

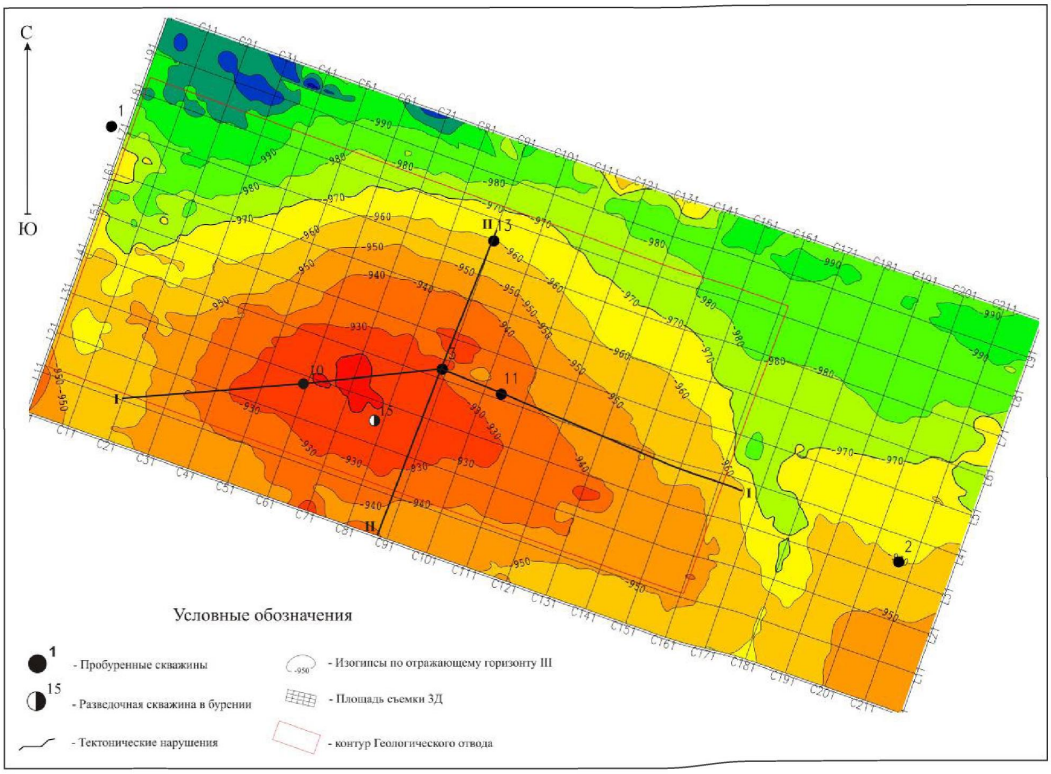

Figure 1 – Structural map of the III reflecting horizon of the North Karamandybas deposit (based on PGD services)

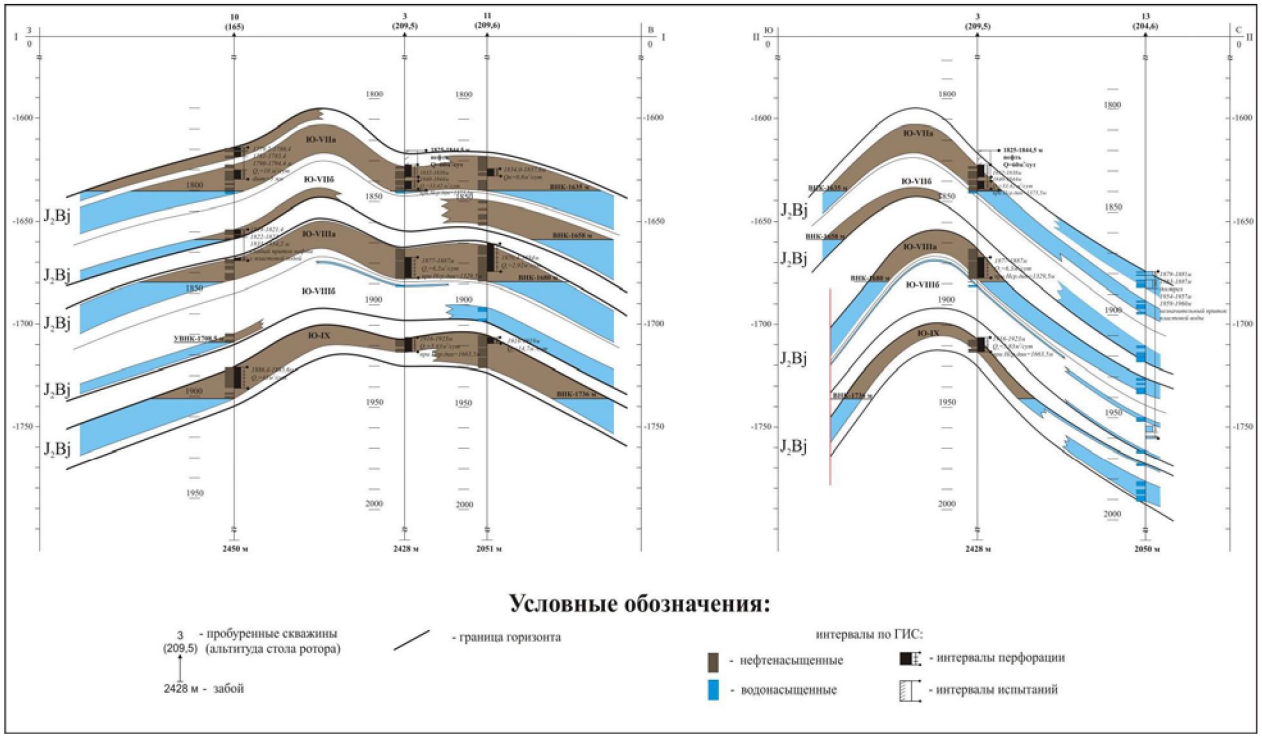

Figure 2 – Geological profiles along the I-I, II-II line of the North Karamandybas field.
Scale: horizontal: 1: 10000, vertical: 1: 10,000

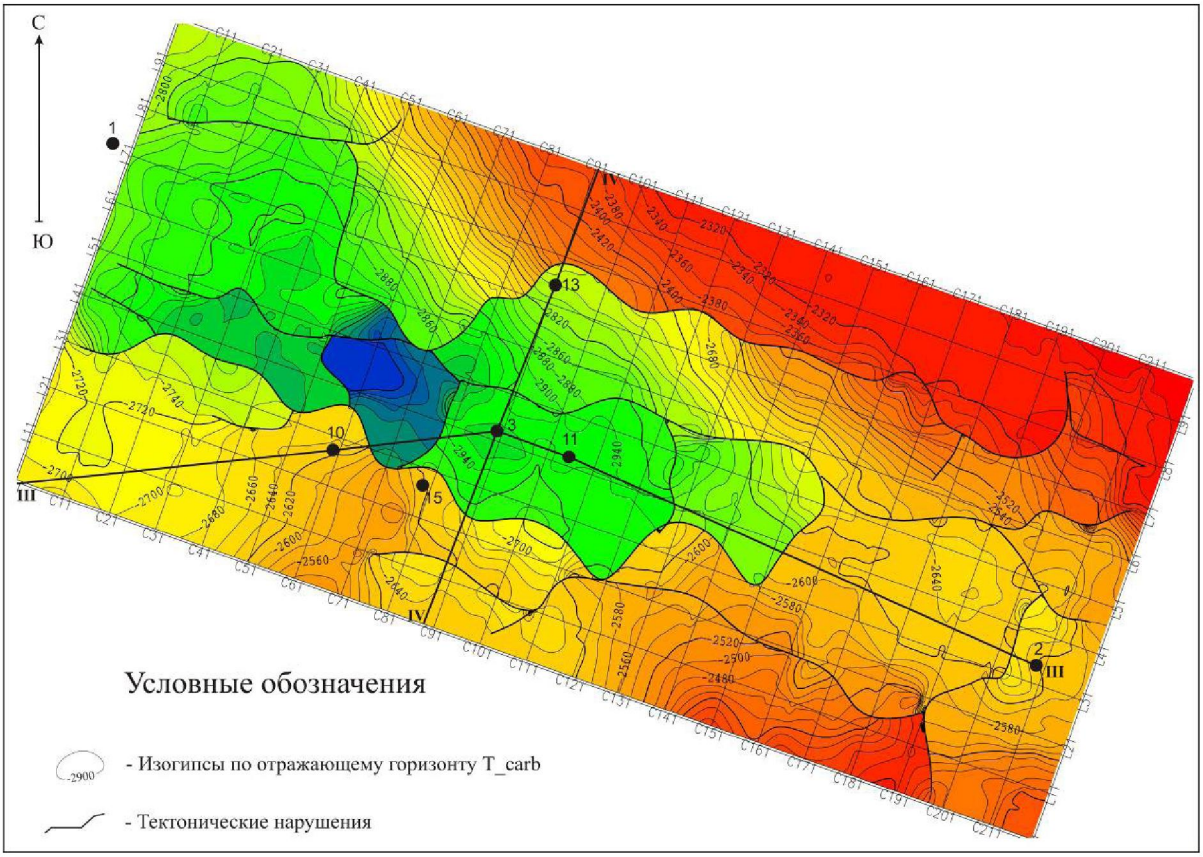

Figure 3 – Structural map on the roof of the reflecting horizon of the Lower Triassic deposits of the North Karamandybas deposit (based on PGD services)

The inherited structure of the geological structural plan of the Northern Karamandybas area is observed from the Upper Triassic time. This is evidenced by all maps of reflecting horizons and a map constructed according to V_1 reflecting horizon stratigraphically related to the roof of Triassic deposits, isohypses contour is 2250 m, the brachianticlinal has dimensions 4.1 × 1.8 km with an amplitude of 70 m [3].

On the seismic profile compiled according to the materials of PGD Services, the structure of the North Karamandybas area structure along the surface of the Triassic sediments moved to the northeast closer to the well No. 13 by more than 1 km (Figure 4). This suggests that, at least from the Middle Triassic, tangential movements on the Turan plate with a general northward direction have made adjustments to restructure the structural plan not only of the Lower Triassic complex of the North Karamandybas area but also in the structure of the deeper rocks of the Triassic and Paleozoic Sediments [4].

A thorough analysis of the available geological and geophysical data and a conclusion on the displacement of the structural plan of the local arch of elevation along the lower-lying Triassic surface of the lower stratum by geophysical materials, and at the North Karamandybas deposit, promising opportunities to build up additional hydrocarbon reserves.

Based on the available materials about the depth of the drilled well № 13-2050 m, which is located closer to the elevated elevation and to the lower deep Triassic and Paleozoic horizons, it is recommended to drill its depression to a mark of 3300 m (Figure 4). When carrying out relevant prospecting works, it is possible to discover new hydrocarbon deposits in the Lower Triassic and Paleozoic deposits. The discovery of deposits should be expected within the depths of 2300-3300 m to increase the volumes of the already explored reserves of Jurassic rocks.

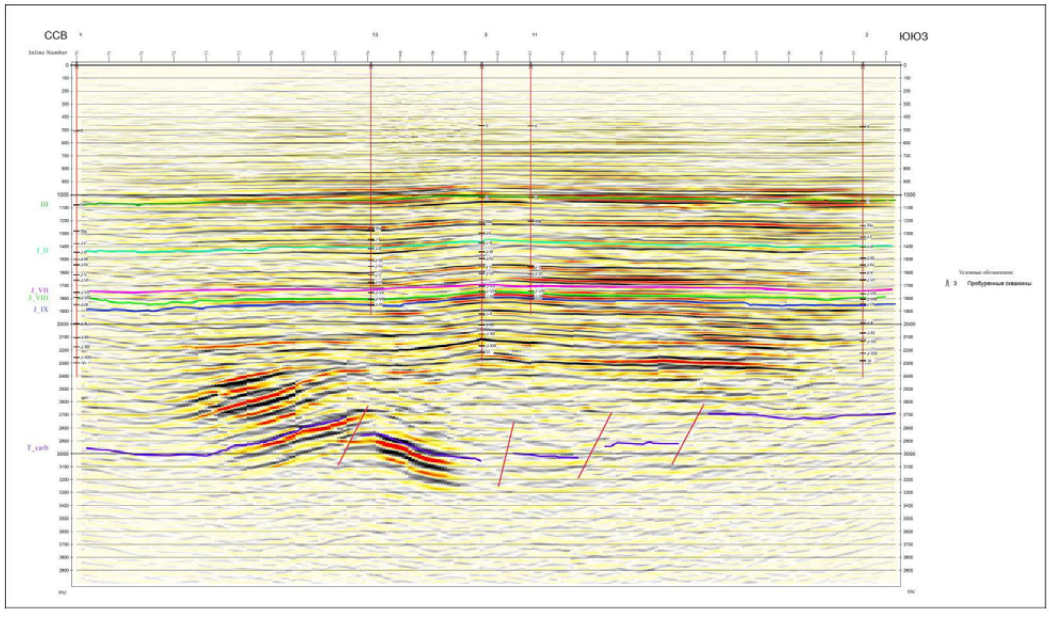

Figure 4 – Seismic profile along the line of wells 1, 13, 3, 11, 2 of the North Karamandybas field.

Scale: 100 0 200 1:10 000

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СОЛТҮСТІК ҚАРАМАНДЫБАС КЕНОРНЫНЫҢ МҰНАЙ ӨНДІРІСІ ҚОРЫН АРТТЫРУДЫҢ ГЕОЛОГИЯЛЫҚ АЛҒЫШАРТЫ

Аннотация. Солтүстік Қарамандыбас мұнай кенорнының геологиялық құрылысы, оның мұнайлы шоғырлары, олардың шөгінді қабаттардың жас тобына орайластырылуы көрсетілген. Солтүстік Қарамандыбас күмбезді құрылымының жергілікті дөңесі құрылымдық планының қозғалысы шамамен юра қабатының үсті, төмен жатқан төменгі триас жыныстарынан солтүстік-шығысқа қарай 1 км қозғалғандығы айқындалды. Триас және палеозой қабаттарынан көмірсутектің жаңа шоғырын ашу тәуекелі жасалынды.

Түйін сөздер: Солтүстік Қарамандыбас кенорны, шоғырлар, мұнай, шөгінді бассейндер, юра, триас, изогипстер, шағылдырушы горизонт, ашу, брахиантиклиналь, көмірсутектер.

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ГЕОЛОГИЧЕСКИЕ ПРЕДПОСЫЛКИ УВЕЛИЧЕНИЯ ЗАПАСОВ НЕФТЕДОБЫЧИ НА МЕСТОРОЖДЕНИИ СЕВЕРНЫЙ КАРАМАНДЫБАС

Аннотация. Рассмотрено геологическое строение нефтяного месторождения Северный Карамандыбас, его нефтеносные залежи, их приуроченность к возрастным группам осадочных толщ. Выяснено смещение структурного плана локального поднятия купола структуры Северный Карамандыбас относительно поверхности юрских отложений по ниже залегающим породам нижнего триаса на 1 км к Северо-Востоку. Исключен риск открытия новых залежей углеводородов в триасовых и палеозойских отложениях.

Ключевые слова: месторождение Северный Карамандыбас, залежи, нефть, осадочные бассейны, юра, триас, изогипсы, отражающие горизонты, открытие, брахиантиклиналь, углеводороды.