*International Journal of Geology, Earth & Environmental Sciences ISSN: 2277-2081*
*An Open Access, Online International Journal Available at http://www.cibtech.org/jgee.htm*
*2019 Vol. 9 (3) September-December, pp. 31-34/Marina*
***Research Article***

# DEPENDENCE OF STRUCTURE OF LOWER JURASSIC SEDIMENTS OF THE NORTH USTYURT DEPRESSION

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## ABSTRACT
The article studies the structural features of the Lower Jurassic deposits for various tectonic elements of the North Ustyurt Depression based on deep drilling and seismic data in various modifications. The conditions of sedimentation, thickness, and the number of productive horizons within the given territory are considered.

***Keywords:*** *Lower Jurassic, Sandstones, Thickness, Trough, Shaft, Productive Horizon*

## INTRODUCTION
In the Ustyurt oil and gas region in the Lower Jurassic sediments, industrial and non-industrial gas and condensate inflows were obtained. The results of geological exploration in recent years have shown that they are highly promising, but not sufficiently studied. Lower Jurassic sediments with erosion and angular disagreement lie on sediments of various ages (from the Early Paleozoic to the Late Paleozoic – Early Mesozoic), filling the sharply dissected relief of the Jurassic surface, which led to the formation of strata of different thickness and lithological composition. The area and vertical unevenness of the Lower Jurassic deposits within the North Ustyurt Depression is explained by the fact that at the beginning of the Jurassic time, when the territory was completely submerged, the foundation blocks were raised in the regions of Central Ustyurt and others. Granite massifs and volcanic sedimentary coverings were intensively destroyed with the formation arkose plumes around them, which led to the formation of sandstone layers adjacent to the protrusions of the pre-Jurassic relief and the formation of series of successively wedged horizons. The basis for the identification of the Lower Jurassic was the presence of spore-pollen complexes in the rocks, which made it possible to date them from the Late Sinemur-Early Plinsbach and Toar age. The greatest thickness was established on the Berdakh shaft according to deep drilling data of more than 1700 m (Mukhutdinov *et al*., 2019). The described stratum is represented by terrigenous continental, mainly sandy rocks, passing in places into gravelites and thin-layered mudstones of dark gray color, to black ones with charred plant fragmentary residues and lenticular interlayers coal.

## MATERIALS AND METHODS
For this study, we used a comprehensive analysis and systematization of materials of geophysical work, deep drilling and laboratory studies of core material, a synthesis of data highlighted in stock and published works.

## RESULTS AND DISCUSSION
The Lower Jurassic deposits of the Ustyurt region, according to the results of geological exploration, deserve closer attention and study, in connection with the receipt of industrial and non-industrial inflows of hydrocarbons. The presence of oil and gas producing rocks in areas of increased thickness of this stratum, such as the Berdakh shaft, the northern (Kulbay trough) and the southern parts (Allan syncline) of the Barsakelmes trough, and the Kosbulak trough (Fig. 1), is not ruled out.
On the territory of the North Ustyurt Depression, the Lower Jurassic deposits have thicknesses from 300-2000 m to the first tens of meters, up to full wedging out within the Aktumsuk and Central Ustyurt system of uplifts. Lithologically, the stratum is composed mainly of sandstones with interlayers of gravelites,

conglomerates, siltstones and mudstones. The sandstones are gray, fine-grained, with gravel grains, including carbonized plant detritus and imprints of large fragments of carbonized plant organics by bedding, dense, strong.

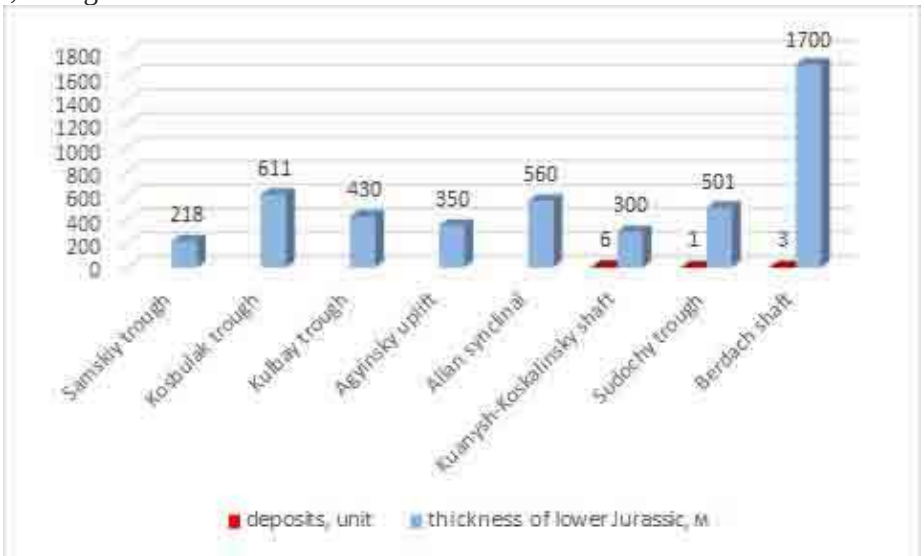


**Figure 1: Power distribution of Lower Jurassic sediments by tectonic elements (Yuldasheva, 2019.)**

In areas where thicknesses of Lower Jurassic sediments vary within 250-400 m (Kuanysh-Koskalinsky shaft, Aghyinsky Uplift, Sudochy Depression, etc.) and the stratum is represented by two or three sandy layers, isolated by clay and mudstones (Fig. 2). The conditions of their accumulation exclude the possibility of the formation of a primary oil and gas deposit in them, which is confirmed by the results of geochemical studies of core material. Oil and gas occurrences are due to the vertical migration of hydrocarbons from the underlying Upper Paleozoic sedimentary complexes, where hydrocarbon deposits were found in anticlinal structures, often tectonically shielded.

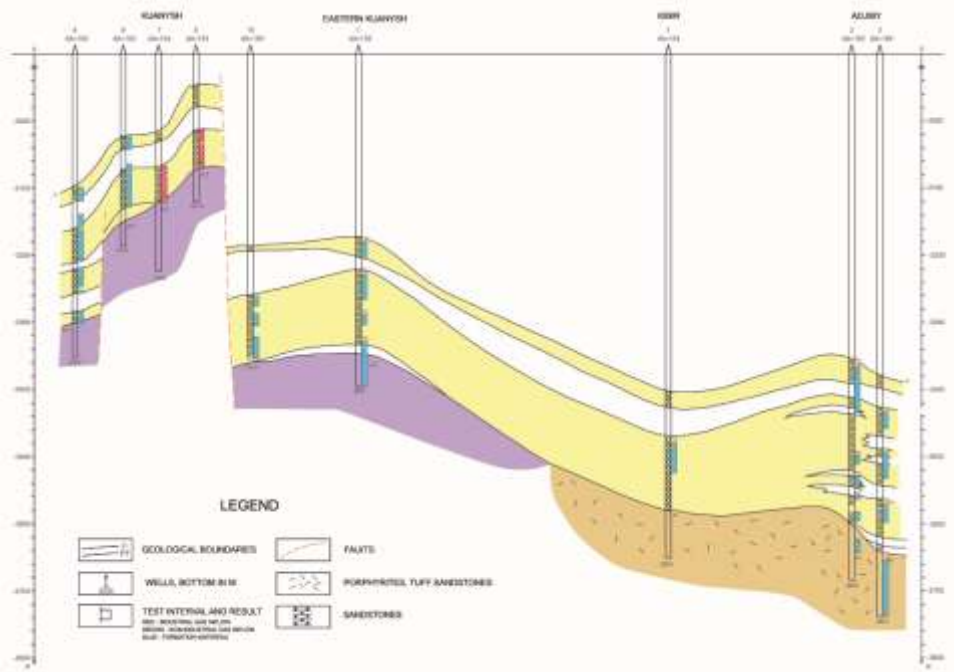


**Figure 2: Structure of Lower Jurassic sediments on Kuanysh-Koskalinsky shaft (Yuldasheva, 2019.)**

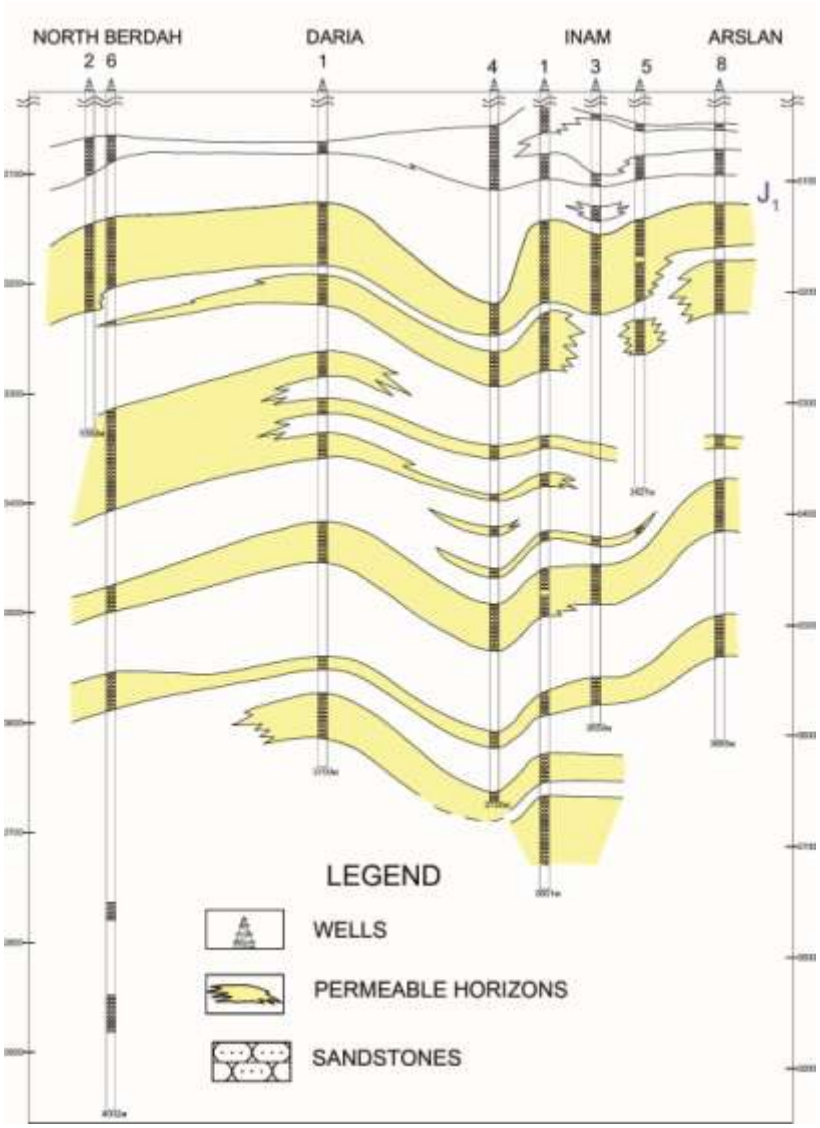


**Figure 3: Structure of Lower Jurassic sediments on Berdahsky shaft (Yuldasheva, 2019.)**

Within the side parts of large troughs (Kosbulaksky, Barsakelmessky), where increased thicknesses of the Lower Jurassic deposits are predicted and partially confirmed, which will be confined to regional faults, where a sharp change in the facies composition of the deposits occurs. Overlapping them with younger clay sediments creates very favorable conditions for the formation of lithological and stratigraphic traps of non-anticlinal type. The Lower Jurassic deposits, especially in the southern part of the Barsakelmes trough and other submerged sections of the troughs, occur at significant depths (2-3 km), have significant thicknesses, and are characterized by geothermal gradients of 3.4 - 3.60 ° C / 100 m. All this can provide significant scale of hydrocarbon generation (Akramkhodzhaev, 1982). This factor is supported by deep drilling data, according to which the Lower Jurassic deposits represented by sand-aleuritic deposits accumulated under reducing and poorly reducing sedimentation conditions, which is confirmed by the presence of inclusions of pyrite and siderite (Gafarov *et al*., 2010). Chemical and bituminological studies have established an increased content of organic matter in clays of 0.77%, siltstones and sandstones of up to 3.17%, chloroform bitumen "A" in thickness is 3.9-12.7%, which is autochthonous in nature. It can be concluded that in the southerly direction, within the Barsakelmes trough, the possibility of productivity of

the Lower Jurassic is not excluded, where the thickness of these deposits according to seismic data will increase to 700-800 m.

The structure of the Lower Jurassic deposits within the Berdakh shaft has its own characteristics. This is due to the increased thickness of the sediments, as evidenced by the results of drilling wells No. 1 of Kyzylshaly, No. 12, 14 Berdah, where open thicknesses of rocks in the range of 1300-1700 m are noted. Lithologically, the stratum is an intercalation of clay and sand rocks, in which up to 7 productive horizons at the Arslan and Kuyi Surgil deposits (Fig. 3). The reservoirs are represented by sandstones and gravelites, which have good filtration and capacity properties (porosity ≈10-16%) while forming both thin and fairly massive sand bodies (up to 50-100 m).

Clay rocks (mudstones and siltstones) have good insulating properties, in addition, they have generation properties, having in their composition a sufficient amount of dispersed organic matter Corg, which at depths of 3020 m ... 4027 m varies from 0.25 to 1.43% (Mukhutdinov *et al*., 2019). The highest values of Corg (3.93-5.74%) were noted in black mudstones at the Arslan deposit at depths of 3470 m. 3472 m. In addition, from a depth of 3500 m, rocks of the Lower Jurassic are enriched with organic matter and micro-bitumen occurrences (CBA above 0.065 %).

Thus, in areas where the thickness of the Lower Jurassic deposits does not exceed 400 m, hydrocarbon deposits will be located in 2-3 sand horizons, the source of generation of which will be in the Upper Paleozoic. In areas where the thickness of Lower Jurassic sediments is more than 700 m and higher, the number of productive horizons increases to seven or more, in addition, syngenetic deposits will occur here.

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