Deep Subsurface Geology of the Bayram-Ali-Repetek Zone of Uplifts
According to Data of Detailed Seismic Work

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During recent years the Zeagli-Darvaza, Kara-Chop, and Bayram-Ali gas fields have been discovered in the southeast of Turkmenia. As a result of these discoveries, southeastern Turkmenia became one of the most favorable regions of western Central Asia with respect to oil and gas.

The Bayram-Ali-Repetek zone, which includes the Cheshminako-Repetek tectonic line, the Bayram-Ali swell, and several local uplifts, is located on the south margin of the Kara Kum platform. The thickness of the sedimentary section here is estimated at 5-6 km. The structure of this zone contrasts greatly from that of the known platform areas and is of considerable interest.

The territory is covered by a thick layer of weakly deformed Neogene-Quaternary sediments which hamper the study of the geology by means of geological surveys and structural drilling; investigations have shown that these methods cannot independently solve the structural problems here for the Paleogene, Cretaceous, and Jurassic sediments.

The method of reflected waves (MOV) has had a prominent place in the study of the deep subsurface. This method has been used to solve many problems, the principal one of which is the exploration for buried local structures favorable for the accumulation of oil and gas.

The favorable deep seismo-geologic conditions of the region govern the high geological effectiveness of seismic surveying. The Meso-Cenozoic sediments have from 8 to 25 reflecting boundaries within the three structural stages: Neogene-Quaternary, Cretaceous and Upper Jurassic, and also the Jurassic sub-salt. The last two are of great interest for oil and gas exploration. Based on dynamic features and persistence within the sediments, two marker oscillations are distinguished that are related to the top of limestones of the Bukhara beds and with the top of the Upper Jurassic rocks. Extensive reflecting horizons are associated with boundaries that characterize various stages of sediment accumulation with the same physical geological conditions of the tectonic regimen.

In recent years in the Bayram-Ali-Repetek zone a total of 19 buried local uplifts have been found; 14 of these have been drilled and 5 are being drilled. In the Bayram-Ali area testing of well 5 in the 2818-2816 m interval in the Karabil formation yielded a flow of gas at about 1 million m$^3$ per day.

The present structural plan of the sedimentary cover of the region depend directly on the structure of the Paleozoic basement. Analysis of the geophysical material indicates that the basement has an intermediate stage which consists of weakly metamorphosed sedimentary rocks of the Permo-Triassic that rest on older, strongly metamorphosed rocks.

The Murgab and Repetek faults, which divide the basement into individual blocks, are characteristic for the Bayram-Ali–Repetek zone of uplifts. This zone in turn has determined the structure of this territory and the history of its development. See Fig. 1.

The Repetek fault has a northwest trend, and in some places it is nearly east-west. The segment of the fault from Cheshme to Repetek has been studied in the greatest detail; however, this feature extends much farther to the southeast to the plunge of the Gissar folds. The zone of the fault is characterized by belt-like magnetic and gravity anomalies. In the region of Repetek it is traced on a refraction profile in the form of an upthrust on a horizon which is related to the surface of the pre-Jurassic basement.

The Murgab fault cuts across the territory in a north-south direction and is indicated by a close spacing of the gravity isoanomaly lines and by geomorphic data. Its continuation to the north after intersection with the Repetek fault has not been established. Thus, relatively stable areas are distinguished that correspond to blocks of the Paleozoic basement, and between them are folded sectors (mobile areas) where dislocation has been very active. On a basis of synthesis of the available material, three blocks can be distinguished, separated by the Repetek and Murgab faults; these are the Maryy, Uchadzhin, and Severnyy. The structure of the sedimentary section within the area of the blocks bears a clearly expressed platform character.

The gravity field in the area of the Maryy and Uchadzhin blocks has a mosaic character with some tendency for the gravity isoanomaly lines to have a northwest trend, which corresponds to the trend of the rocks of the sedimentary cover. This circumstance indicates that both blocks developed over a long period under the same geotectonic conditions.

Within the area of the Maryy block is distinguished a single gravity maximum which coincides with a magnetic maximum; these correspond with a gentle uplift in the sedimentary cover. The coincidence of the magnetic and gravity anomalies is governed by the