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GEOLOGICAL STRUCTURE OF THE UCHTEPA FIELD AND PROSPECTS

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The Fergana Valley is one of Uzbekistan's most important oil and gas basins, with its southern part characterized by the extensive distribution of hydrocarbon deposits. Specifically, the areas within the Southern Fergana Basin, including the Uchtepa area, are of particular scientific and practical importance in the formation of oil and gas deposits associated with Paleogene and Cretaceous deposits [1].

To date, many promising oil and gas fields have been identified in the Fergana region, about half of which are located within the Southern Depression. At the same time, although the geological structure and oil and gas characteristics of the region have been thoroughly studied, there are some unresolved issues [1, p. 16]. A comprehensive study of the geological structure (deepness system) of the Uchtepa area allows for the scientific substantiation and improvement of oil and gas exploration work.

The Uchtepa area is located in the southern part of the Fergana Intermontane Basin, which is one of the major geotectonic elements within the Tien Shan orogeny and is bounded to the north by the Kurama and Chatkal ranges, and to the south by the Turkestan and Alay ranges [2-4].

According to the modern structural state of the region, five structural-tectonic elements are identified in the Mesozoic-Cenozoic deposits: the Southern depression, the Southern transition layer, the Central Fergana megasyncline, the Maylisu-Karakonday, and the Northern uplift [1, p. 12]. The Uchtepa area is located within the Southern depression, which is hypsometrically elevated along the surface of Paleogene deposits from –3.2 to +1.2 km and is characterized by its complex structure.

The main tectonic structures of the area are linearly elongated anticlinal folds, often complicated by landslides and uplifts. Two sublatitudinal faults widespread in the southern depression divide the area into three macroblocks: southern, central, and northern [1, p. 12].

The Paleozoic foundation is located at a depth of 10–11 km in the central part, and the geological section of the area consists of three structural layers corresponding to three stages of tectonic development: the lower layer consists of intensively dislocated terrigenous deposits of the Upper Permian, Triassic, and Jurassic periods (over 3 km thick); the middle layer consists of terrigenous-carbonate deposits of the Cretaceous and Paleogene periods (up to 1.8 km thick); and the upper layer consists of Neogene-Quaternary deposits (up to 6 km thick) (Table 1).

Displacements of various amplitudes are observed along the faults, which played an important role in the formation of hydrocarbon traps [1-4].

Representation of deposits from different periods in the Uchtepa area

Table 1

Sistema	Section	Suite / Layer	Lithological composition	Width (m)
Q	—	—	Conglomerate, gravel, coarse-grained sandstone	600–1000
N	Miocene	Red-brown suite	Clay, sandstone, aleurolite (red-brown)	400–3000
P	Oligocene	—	Red clays, fine-grained sandstones	35–130
	Eocene	Turkeston, Alay, and Suzak strata	Green clays, limestone, dolomite, marl	10–160
K	Upper	Yalovach and Karachin formations	variegated sandstone, conglomerate, marl	15–530
	Lower	Muyan Formation (Neokom-apt)	Red-brown clay, sandstone, basal conglomerate	5–300
J	Upper	—	Clay, gravel, conglomerate, sandstone	50–110
	Middle	—	Layers of sandstone, aleurolite, clay, and coal	70–240

The complete geological-lithological section of the Uchtepa area, as noted in the table, includes deposits from the Paleozoic to the Quaternary period.

Paleozoic deposits form the folded foundation of the area, reaching the surface in mountain ranges and being drilled in the coastal parts of the Southern depression. It consists of limestone, sandstone, aleurolite, and shale.

Jurassic deposits are represented by three sections. Lower Jurassic consists of coarse-grained rocks—gravel, sandstone, and clays. The Middle Jurassic section is primarily represented by sandstone, aleurolite, clay and argillite, and coal deposits.

Cretaceous deposits are represented by lower and upper sections. The Lower Cretaceous begins with the Muyan Formation (Neocom-Apt) and lies transgressively over Paleozoic and Jurassic rocks; at the base, there is a basal conglomerate, with red-brown clays and sandstones alternating upward. Alpine deposits are divided into two groups: the Lyakan group (lower Alps) consists of gray and pink limestones, clays, and sandstones; the Kyzylpyllian group (upper Alps) consists of red sandstones, clayey rocks, and conglomerate layers.

Paleogene deposits are represented by the paleocene, eocene, and oligocene divisions. The Paleocene is based on white gypsums—the Goznav Formation. Paleogene deposits are considered the primary productive complex of the region.

Neogene deposits are represented by Miocene and Pliocene divisions. The Miocene section is divided into two suites consisting of a red-brown clay, sandstone, and aleurolite interchange.

Quaternary deposits primarily consist of gray conglomerates, gravel, and coarse-grained sandstones.

In terms of oil and gas potential, the stratigraphic distribution of oil and gas fields in the Fergana region, where the Uchtepa area is located, covers a wide range from the Paleozoic to the Neogene. Currently, numerous oil and gas fields have been identified in the region, 25 of which are located within the Southern Depression [1, p. 14].

According to the stratigraphic location of oil and gas deposits, it includes 2 hydrocarbon deposits of industrial significance in Paleozoic deposits, 6 in Jurassic deposits, 12 in Cretaceous deposits, and 20 in Paleogene deposits [1, p. 14]. Eleven productive horizons have been identified in the Cretaceous deposits, consisting primarily of sandstones, and to a lesser extent of sandstone-limestone and limestone [2, p. 99]. There are 9 productive horizons in the Paleogene deposits, consisting of limestone, dolomite, sandstone, and aleurolites.

Hydrocarbon traps primarily have a tectonic screen-like appearance of the cover type and are directly associated with anticlinal folds and faults. Paleogene deposits are considered the primary productive complex in the region, accounting for 61.1% of the total forecast resources [1, p. 16]. The main directions of future geological exploration are inextricably linked to paleogene and deeper deposits [1, p. 16].

In conclusion, it should be noted that the Uchtepa area is located in the southern part of the Fergana Intermontane Basin and is characterized by a complex anticlinal structure and a multi-layered geological section. Lower Cretaceous sandstone layers are the primary collectors, while Paleogene deposits are considered the most productive stratigraphic complex of the region. Further geological exploration in the region within these deposits using detailed modern methods will increase the efficiency of exploration work.

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