Features of the Development of Local Structures and Formation of Gas and Oil Pools of the Gazli Oil-Gas Region

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To the Gazli gas-oil region are referred the Gazli gas-oil field (the largest in the U. S. R.), the Tash-Kuduk gas field, and the somewhat interrelated local structures: Karakyr, Kukhna-Gambas, Kurban-Ali, and Atbakor. In the regional geotectonic plan the region under consideration is referred to the eastern part of the Karakum platform and is related genetically with the large interior Gazli uplift (1), which is located on the Bukharo-Gazli swell.

In the Gazli gas-oil region a complex of Mesozoic and Cenozoic sediments (Fig. 1) rests with a sharp angular discordance on the eroded surface of the Paleozoic folded basement and constitutes a single structural-tectonic stage of covering sediments (6).

The main oil-gas units are Cretaceous sediments, in the section of which from the bottom upward are distinguished the following sandy horizons: XIII (Neocomian-Aptian), XII, XIa, XI (Albian), X, and IX (Cenomanian). In the Gazli field the commercial gas and condensate pools occur in horizons IX, X, XIa, and XII; and a gas-oil pool occurs in horizon XIII. In the Tash-Kuduk field, commercial gas pools occur in sandy horizons IX and XII. Testing carried out on the Kurban-Ali, Karakyr, Kukhna-Gumbas, and Atbakor anticlinal structures has not yet yielded positive results.

The geology of individual folds of the Gazli region is now sufficiently known (3, 4, and others), whereas problems related to the history of development of structures of this region and conditions and times of formation of traps and oil and gas pools remain not studied.

For clarification of features of the formation of local structures and times of formation of traps within the Gazli region, paleostructural maps and paleotectonic profiles were constructed that show the process of development of the structures at different stages of geologic time. See Fig’s. 2 and 3. As marker horizons were chosen the most characteristic, clearly expressed marker surfaces in all the sections, and the thicknesses of individual segments of a section included between them were regarded as derived values of the total of the tectonic movements taking place during the time of their accumulation.

As a result of the paleostructural analysis, the process of formation of local structures of the Gazli gas-oil region can be represented as follows.

At the end of Jurassic time the Paleozoic folded foundation of this region was a relatively weakly dissected peneplaned erosion surface. Variations in the thickness of the Jurassic sediments indicate that at this time there were two very large projections in the basement here (western and eastern) with the most raised areas in the region of the eastern part of the Gazli structure and central part of the Kurban-Ali structure (IV on Fig. 2). The projections of the Paleozoic basement in the Kukhna-Gumbass and Tash-Kuduk areas are expressed in the form of the complications of the Kuban-Ali projection. In the Karakyr, Atbakor, and Romentan areas the folded basement dips monoclinally to the north, south, and southeast, respectively.

During the process of accumulation of the Jurassic and partly the Neocomian-Aptian sediments, these projections of the basement were overlapped completely by sedimentary rocks, and the further geological development of the Gazli area was toward monoclines that dip to the southwest (VI, VII in Fig. 2). All the subsequent stages of geologic time (to the late Turonian) were characterized by relatively calm, even tectonic movements. The projections in the folded basement became gradually more complicated due apparently to vertical movements along disjunctive faults; structural noses developed in the sedimentary cover above the most raised parts (Kurban-Ali, east part of Gazli, Tash-Kuduk). Some variations in the process of development of the region have been noted in the upper Turonian. Detailed analysis of the growth of the Tash-Kuduk structure shows that within this area at the end of the Turonian there were differentiations in the movements within the projection of the basement which had remained almost unchanged in form. This projection was cut by a fault into two blocks, each of which experienced different relative flattening in amplitude. See II in Fig. 2. As a result of this, a flexural warp developed in the sedimentary cover above the fault in the basement, and an independent anticlinal trap formed at the location of the present south block of the Tash-Kuduk fold. During the course of Senonian and early Paleogene time the structure of the Gazli region on the whole continued to develop according to the plan initiated back in the Jurassic, and only the development of the Tash-Kuduk anticline took place according to the structural plan that started in the Turonian. See Fig’s 2 and 3.

The structural plan of the Gazli gas-oil region began to become more complicated in the late Paleogene when the powerful