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Tectono-stratigraphic evolution of the northern margin of the Amu Darya basin in Uzbekistan (Bukhara-Khiva and South-West Gissar regions)

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The main purpose of this work is the reconstruction of the geological, tectonic and stratigraphic evolution of the northern margin of the Amu Darya basin in Uzbekistan, especially during the Mesozoic time. The area considered is running from the Bukhara-Khiva region in the North-West (studied by subsurface data) to the mountains of South-Western Gissar in the South-East. To reach this objective we aim at studying and comparing these areas. The Bukhara-Khiva area consists of two NW-elongated steps – Bukhara and Chardzhou, divided by a main fault-flexural zone, called Uchbash-Karshi flexure-fault zone.

Eight geological-geophysical sections have been reconstructed in the Bukhara-Khiva area by using seismic, well and map data. Six of them, roughly N-S trending, are almost perpendicular to the trend of the steps, while the two others, running along the Bukhara and Chardzhou steps are NW-oriented. All of these sections show the lateral distributions, thickness variations and unconformities between the main stratigraphic horizons. These horizons are the tops of: 1. the pre-Jurassic formations (Paleozoic - Permo-Triassic), 2. the Lower-Middle Jurassic clastics, 3. the Middle-Upper Jurassic carbonates, 4. the Upper Jurassic evaporites, 5. the Lower Cretaceous and 6. the Upper Cretaceous beds.

The Bukhara step constitutes the northern part of the area. It is characterized by very thin Jurassic deposits (sometimes missing as the evaporites) no more than 300 m thick. The distribution of the different Jurassic formations is intermitted; the most extended one is the carbonate layer. Most of the Jurassic sediments are concentrated in the Chardzhou step, the southern part of the investigated area, where their thickness reaches more than 2 km. All formations are well-developed and rather thick in comparison with the Bukhara step. The Jurassic beds display different morphological-structural features. In the Bukhara step most of the surfaces exhibit a very rough relief with abundant faults. However, the same horizons in the Chardzhou step are flat, and the faults only exist in the western area.

The Cretaceous beds disconformably cover the Jurassic series and have a similar thickness (800-1500 m) on both steps.

Another part of the study is the tectonic subsidence analysis, performed through a dozen of wells in the Bukhara-Khiva region, and three in South-Western Gissar. The preliminary results show an active tectonic subsidence during the late Early Jurassic to Middle Jurassic, and a minor event during the Early Cretaceous.

The third part of the study concerns the paleostress reconstruction and fault tectonic analysis. Such an approach has been performed in the Gissar Mountains where the Mesozoic-Cenozoic sequence is well exposed. The first results indicate that normal faulting developed during the Mid-Late Jurassic associated with the NE-trending extension that developed in the northern Amu Darya margin.