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Reconstruction of the Devonian pull-apart basin of southern Ural, Russia

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Reconstruction of Devonian Khudolazovo pull-apart basin was carry out in volcanic-sedimentary rock sequences of the Magnitogorsk Megasynclinorium. The basin under consideration bears structural, morphological, and facies features typical of rhomb-shaped pull-apart basins.

The KizilUrtazym lithology-structural zone, which is located on the western slope of the Magnitogorsk Megasynclinorium, comprises a series of meridional en-echelon synclines. The largest one is known as the Khudolazovo. The Zilair flysch Formation and Ulutau tephroid-siliceous Formation are occurs in syncline core. In the east, the syncline is limited by the Kizil Fault and Bakruzyak Anticline composed of basalts of the Karamalytash Formation. The similar Sibai, and Uldashevo anticlines are situated on the southern and northern centreclinal closures of the syncline. The well-known volcanogenic massive sulfide deposits are localized in the Sibai and Bakruzyak anticlines. Coarse-clastic mixtite rock sequences with large olistoliths and abundant volcanogenic materials are typical of the structure under study.The study of various maps and satellite images, suggested that the Khudolazovo Syncline is a typical pull-apart basin, was formed as a result of displacements along the large sinistral strike-slip fault. The palinspastic reconstruction yielded a common volcanic center of the Karamalytash time. The Sibai and Bakruzyak deposits previously represented a common ore field. The proposed model of the Khudolazovo Syncline formation explains the discrete localization of copper massive sulfide deposits in the present-day structure. The size of the Khudolazovo Basin fits the statistical range of known modern and ancient pull-apart basins (40x15 km and total thickness - 2.5 km).

It was a marine basin as indicated by units and interlayers of siliceous rocks with abundant radiolaria, sponges, and conodonts. The oolitic limestone interlayers, the gypsum admixture and the shallow-water conglomerates mark the coastal-marine sedimentation conditions at the basin periphery. The existence of the Khudolazovo Basin is supported by the directions of clastic material removal from the margins to the axial zone.

As indicated by the condensed siliceous units (they outline in plan the contours of a rhomb-shaped basin), the Khudolazovo Basin evolved for a long time in a stepwise manner. The development of stepwise normal faults at moving-apart walls might have served as a driving force for the formation of chaotic mixtite complexes.

The northwestern corner of the basin incorporated a volcano that supplied the explosive and effusive materials. The redstone alteration of volcanics, vesicular scoria and clinker in lavas, and opacitization of dark-colored minerals indicate that the volcanic eruptions occurred in a subaerial environment.

Several analogous rhomb-shaped basins are registered in the strike-slip zone to the north and south of the Khudolazovo Syncline. This pattern is typical of regional strike-slip systems.