

Structural-Metallogenic Zones in the Lesser Caucasus of Azerbaijan: Geology, Ore Deposits and a Tethyan Ore Belt

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The structure and geological history of the Caucasus is largely determined by its position between the still-converging Eurasian and Africa-Arabian lithospheric plates, within a wide continental collision zone. During the Late Proterozoic-early Cenozoic, the region belonged to the Tethys Ocean and its Eurasian and Africa-Arabian margins and associated system of island arcs, arc rifts, and arc basins are all characteristic of the pre-collisional stage of its evolution. The Lesser Caucasus mountain-fold system covers the southern part of the Caucasus and is characterised by a heterogeneous internal structure, influenced by convergence within the two branches of the Alpine-Himalayan mobile belt: Iberian-Elburss in the north and Dinara-Zond in the south. There are four main structural-metallogenic zones in the Lesser Caucasus in Azerbaijan.

The *Lok-Karabakh Zone* is situated in northwestern Azerbaijan. Bajocian sedimentary sequences form the basic structure of the zone and consist of a complex of volcanogenic, volcanogenic-sedimentary, and, to a lesser extent, sedimentary rocks of basalt-andesite-dacite-rhyolite composition. The complex is divided into the Lower Bajocian basalt-andesite and Upper Bajocian dacite-rhyolite complexes, the latter in paragenetic connection with metalliferous mineralization. High-sulfidation gold deposits at Gedabek, Chovdar, and Ugur; a low-sulfidation gold deposit at Gadir; and other epithermal gold deposits at Dakhkesaman, Gyzybulag, and Gosha are located in this zone. Other types of mineral deposits contain aluminum (Zaylik), cobalt and iron (Dashkesan), and manganese (Molladjalili) within the zone.

The *Geycha-Akera Zone* exhibits a folded ophiolite rock sequence, which represents the ocean closure suture zone that once separated the continental plates. Ophiolite associated rocks in Azerbaijan and others trending NW in adjacent Turkey can be combined to form a series of ophiolite splays defining a single suture zone, the Erzincan-Lesser Caucasian Zone. Based on the specifics of metallogenic zoning, forecasting mineral potential should be focused on the discovery of chromite (Goydere), gold (Agduzdag), and mercury-antimony deposits (Agyatag, Shorbulag) that are controlled by ring structures. The Soyudlu deposit reportedly contains more than 80 tonnes of gold resources, further suggesting this structural zone defines a significant mineral region.

The *Miskhano-Zangezur Zone* contains wide magmatic complexes of acid and alkaline composition related to medium- and small-scale sized porphyry gold-copper-molybdenum ores. Ore-bearing intrusive rocks, satellites of the Ordubad pluton, define the metallogeny of the region. All economic deposits of copper, gold, and tungsten are related to the intrusive activity. Mercury, antimony, and arsenic deposits are associated with subvolcanic facies. This zone hosts

an abundance of several types of mineral deposits containing mercury (Narzanli, Chilgazchay, Saribulag) and 18 tonnes of gold at the Vejnali deposit where ores are related to quartz veins.

The *Araz Metallogenic Zone* exhibits widespread endo- and exo-contact zones surrounding the Late Eocene-Oligocene Ordubad granitoid massif. Economic copper deposits at Ordubad include Misdag, Goydag, and Diahchay. They contain combined reserves of more than 2 million tonnes of copper, with copper grades of 0.5 to 1.6%. Gold deposits, including Agyurt, Pyazbashi, and Shakardara, are located in this zone. In addition, molybdenum-rich deposits are known, with the main example being Paragachay containing a 54 tonne resource.