

Metallogeny of the Lesser Caucasus: From Arc Construction to Post-Collision Evolution

R. Moritz,^{1,*} R. Melkonyan,² N. Popkhadze,³ V. Gugushvili,³ R. Tayan,² and V. Ramazanov⁴

¹University of Geneva, Rue des Maraîchers 13, 1205 Geneva, Switzerland

²National Academy of the Republic of Armenia, Baghramyan Ave 24, 0019 Yerevan, Armenia

³I. Javakhishvili Tbilisi State University, Politkovskaia St. 5, 0186 Tbilisi, Georgia

⁴Baku State University, Z. Khalilov St. 23, Az1145, Baku, Azerbaijan

*Corresponding author: e-mail, robert.moritz@unige.ch

The Lesser Caucasus is a segment of the Tethys orogenic belt, extending from the Black Sea to the Caspian Sea, and it sits astride the territories of Georgia, Armenia, and Azerbaijan. Its complex geodynamic and metallogenic evolution is the result of the convergence and the collision of Arabia, Eurasia, and Gondwana-derived microplates.

The host-rock lithologies, magmatic associations, deposit styles, ore controls, and metal endowment vary greatly along the Lesser Caucasus as a function of the age and the tectonomagmatic distribution of the ore districts and deposits. The ore deposits and ore districts can be essentially assigned to two different geodynamic evolution stages: an initial Mesozoic arc construction and evolution along the Eurasian margin, followed by Cenozoic magmatism and tectonic evolution after Late Cretaceous accretion of Gondwana-derived microplates with the Eurasian margin.

Jurassic arc construction resulted in the formation of the Somkheto-Karabagh belt and the Kapan tectonic zone along the Eurasian margin. The available data suggest that the metallogenic evolution was dominated by subaqueous magmatic-hydrothermal systems and VMS-style mineralization in a fore-arc environment or along the margins of a back-arc ocean located between the Eurasian margin and Gondwana-derived terranes. This metallogenic stage coincided with the rearrangement of tectonic plates, resulting in steepening of the subducting plate during the Middle to Late Jurassic transition.

Porphyry Cu and high-sulfidation epithermal systems were formed along the Somkheto-Karabagh belt during the Late Jurassic and the Early Cretaceous, once the arc reached a mature stage with a thicker crust and fertile magmas were generated by magma storage and MASH processes. During the Late Cretaceous, low sulfidation-type epithermal deposits and transitional VMS-porphyry-epithermal systems were formed in the northern Lesser Caucasus during compression, uplift, and hinterland migration of the magmatic arc, coinciding with subduction flattening.

Late Cretaceous collision of Gondwana-derived terranes with Eurasia and closure of the northern branch of the Neotethys resulted in a rearrangement of subduction zones. Cenozoic magmatism and ore deposits stitched the collision and accretion zones. Eocene porphyry Cu-Mo deposits and associated precious metal epithermal systems were formed during subduction-related magmatism in the southernmost Lesser Caucasus. Subsequently, late Eocene-Oligocene accretion of Arabia with Eurasia and final closure of the southern branch of the Neotethys resulted in the emplacement of Neogene collision to postcollision porphyry Cu-Mo deposits along major translithospheric faults in the Zangezur-Ordubad tectonic zone of the southernmost Lesser Caucasus.

The geodynamic and metallogenic evolution of the Lesser Caucasus extends laterally into the Anatolian and Iranian mountain belts. The Cretaceous and Cenozoic magmatic and metallogenic evolutions of the northern Lesser Caucasus and the Turkish Eastern Pontides are

intimately related to each other. The Cenozoic magmatism and the metallogenic setting of the southernmost Lesser Caucasus are also linked with the Cenozoic Iranian Urumieh-Dokhtar and Alborz magmatic belts in the south. By contrast, different tectonic, magmatic, and sedimentary records support independent geodynamic evolutions of the Iranian Alborz belt and the southernmost Lesser Caucasus during the Mesozoic and explain the absence of any Mesozoic metallogenic connection between both belts.