

Chapter 6

Metallogeny of the Lesser Caucasus: From Arc Construction to Postcollision Evolution

Robert Moritz,^{1,†} Rafael Melkonyan,² David Selby,³ Nino Popkhadze,⁴ Vlademir Gugushvili,⁴
Rodrig Tayan,^{2,*} and Vagif Ramazanov^{5,**}

¹*Department of Earth Sciences, University of Geneva, Rue des Maraîchers 13, 1205 Geneva, Switzerland*

²*Institute of Geological Sciences, National Academy of the Republic of Armenia, Baghramyan Avenue 24, 0019 Yerevan, Armenia*

³*Department of Earth Sciences, University of Durham, DH1 3LE United Kingdom*

⁴*A. Djanelidze Institute of Geology of I. Javakhsishvili Tbilisi State University, Politkovskaia St. 5, 0186 Tbilisi, Georgia*

⁵*Geological Department, Baku State University, Z. Khalilov St. 23, Az1145, Baku, Azerbaijan*

Abstract

This contribution reviews the metallogenic setting of the Lesser Caucasus within the framework of the complex geodynamic evolution of the Central Tethys belt during convergence and collision of the Arabia-, Eurasia-, and Gondwana-derived microplates. New rhenium-osmium molybdenite ages are also presented for several major deposits and prospects, allowing us to constrain the metallogenic evolution of the Lesser Caucasus. 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 tectono-magmatic distribution of the ore districts and deposits. The ore deposits and ore districts can essentially be assigned to two different evolution stages: (1) Mesozoic arc construction and evolution along the Eurasian margin, and (2) Cenozoic magmatism and tectonic evolution following Late Cretaceous accretion of Gondwana-derived microplates with the Eurasian margin.

The available data suggest that during Jurassic arc construction along the Eurasian margin, i.e., the Somkheto-Karabagh belt and the Kapan zone, the metallogenic evolution was dominated by subaqueous magmatic-hydrothermal systems, 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 event coincided broadly with a rearrangement of tectonic plates, resulting in steepening of the subducting plate during the Middle to Late Jurassic transition.

Typical porphyry Cu and high-sulfidation epithermal systems were emplaced in the Somkheto-Karabagh belt during the Late Jurassic and the Early Cretaceous, once the arc reached a more 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 flattening of the subduction geometry.

Late Cretaceous collision of Gondwana-derived terranes with Eurasia 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 southernmost Lesser Caucasus.

The Cretaceous and Cenozoic magmatic and metallogenic evolutions of the northern Lesser Caucasus and the Turkish Eastern Pontides are intimately linked to each other. The Cenozoic magmatism and metallogenic setting of the southernmost Lesser Caucasus can also be traced southward into the Cenozoic Iranian Urumieh-Dokhtar and Alborz belts. However, contrasting tectonic, magmatic, and sedimentary records during the Mesozoic are consistent with the absence of any metallogenic connection between the Alborz in Iran and the southernmost Lesser Caucasus.

[†] Corresponding author: e-mail, robert.moritz@unige.ch

* Deceased March 25, 2016.

** Deceased May 7, 2014.