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Mesozoic to Cenozoic Metallogenic and Magmatic Evolution of the Lesser Caucasus and the Eastern Pontides

Robert Moritz[1], Marc Hässig[1], Marion Grosjean[1], Samvel Hovakimyan[1], Hervé Rezeau[3], François Turlin[1], Şafak U. Sönmez[1], Okan Delibas[2]
1. University of Geneva, Geneva, Switzerland, 2. Hacettepe University, Ankara, Turkey, 3. Massachusetts Institute of Technology, Cambridge, MA, USA

The Eastern Pontides and the Lesser Caucasus are two adjacent mountain ranges that belong to a continuous metallogenic belt (Fig. 1) and that are particularly well endowed in copper, gold, and molybdenum. The metallogenic and magmatic evolution occurred in successive and distinct steps, as the geodynamic setting evolved from subduction to postcollision.

During the Jurassic and Early Cretaceous, the Eastern Pontides and the Somkheto-Karabagh belt were the active margins along the southern Eurasian plate during subduction of the northern Neotethys (Fig. 1). A calc-alkaline magmatic arc and porphyry Cu and intermediate- to high-sulfidation epithermal deposits were mainly emplaced in the Somkheto-Karabagh belt, in Azerbaijan and Armenia, during arc maturation and thickening, but they are also recognized in the Eastern Pontides. This is evidence that during the Early Cretaceous, both mountain ranges were part of the same continuous metallogenic and magmatic belt.

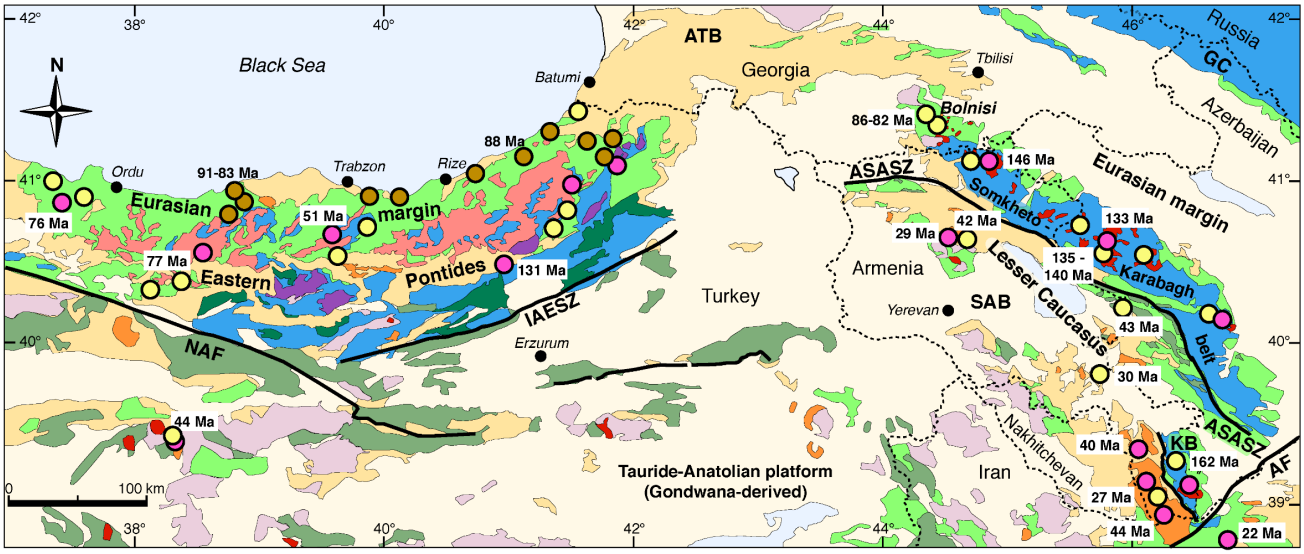
The Jurassic to Early Cretaceous evolution was followed by a metallogenic and magmatic lull during ~40 m.y., between ~130 and ~90 Ma. This lull coincides with the opening of the eastern Black Sea and Transcaucasian basins and was possibly related to submarine plateau accretion along the southern Eurasian margin, which blocked the subduction of the northern Neotethys.

Subduction of the northern Neotethys resumed during the Late Cretaceous resulting in abundant Turonian to early Campanian mafic and silicic magmatism along different segments of the Turkish Eastern Pontides and in the Georgian Bolnisi district, northern Lesser Caucasus (Fig. 1). This magmatic evolution during arc rifting was accompanied by the formation of volcanogenic massive sulfide and epithermal ore deposits. During the waning stages of the northern Neotethys subduction, porphyry deposits were emplaced at ~77-76 Ma in the Eastern Pontides, coeval with high-K calc-alkaline to shoshonitic magmatism.

The northern Neotethys was closed during the Late Cretaceous to Paleocene, as a consequence of the accretion of the Gondwana-derived Tauride-Anatolide platform and South Armenian block with the Eurasian margin (Fig. 1). During postcollisional evolution, early Eocene adakite-like magmatism affected the Eastern Pontides and the Georgian Bolnisi district, which was accompanied by postcollisional porphyry mineralization in the Eastern Pontides.

After closure of the northern Neotethys, the active subduction jumped to the south of the Tauride-Anatolide platform and the South Armenian block. Middle Eocene calc-alkaline magmatism related to the subduction of the southern Neotethys resulted in porphyry Cu-Mo and epithermal deposits mainly in the South Armenian block, where it was controlled by dextral strike-slip tectonics. The middle Eocene magmatic and ore-formation stage, related to subduction of the southern Neotethys, is also recorded in the Eastern Pontides.

After collision of the Arabian plate with the Eurasian margin, the final evolution resulted in late Eocene to Oligocene high-K calc-alkaline to shoshonitic magmatism and late Oligocene to Miocene adakite-like magmatism, accompanied by postcollisional porphyry Cu-Mo and epithermal deposits within the South Armenian block (Fig. 1).



- Oligocene to Quaternary sedimentary and volcanic rocks
- Paleocene and predominantly Eocene sedimentary and volcanic rocks
- Late Cretaceous volcanic and sedimentary rocks
- Cretaceous flysch
- Jurassic and Early Cretaceous sedimentary and volcanic rocks
- Middle Jurassic to Early Cretaceous ophiolitic series
- Undifferentiated Proterozoic to Triassic rocks
- Lake and Sea

- Cenozoic magmatic intrusion
- Cretaceous to Cenozoic magmatic intrusion
- Cretaceous magmatic intrusion
- Late Paleozoic to Jurassic magmatic intrusion
- Major fault and suture zone

Main types of ore deposits and prospects:

- Volcanogenic massive sulfide
- Porphyry
- Epithermal

AF	Araks fault
ASASZ	Amasia-Sevan-Akera suture zone
ATB	Adjara-Trialeti belt (Eurasian margin)
GC	Greater Caucasus (Eurasian margin)
IAESZ	Izmir-Ankara-Erzincan suture zone
KB	Kapan block (Eurasian margin)
NAF	North Anatolian fault
SAB	South Armenian block (Gondwana-derived)

Figure 1 – Geology of the Eastern Pontides, the Lesser Caucasus, and adjacent tectonic zones, with ages and locations of major ore deposits and prospects.