Porphyry and epithermal metallogeny of the Anatolian-Tauride Belt, Turkey

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The Anatolian-Tauride block (ATB) of central Turkey is a Gondwana-derived micro-continent that collided into southern Laurasia, now called Eurasia, along the present Izmir-Ankara-Erzincan suture zone in the Late Cretaceous. The Cenozoic northward convergence of the African and Arabian plates has been responsible for the second orogenic event that is currently manifested as the Aegean subduction front along the western ATB. In eastern Anatolia, this orogenic episode involved subduction of the Arabian oceanic lithosphere from the Cretaceous to the Early Miocene followed by continental collision along the Bitlis suture zone since the Late Miocene. The closure of the two oceans, namely the northern and southern branches of the western Neotethys since the Late Cretaceous, has produced widespread subduction, post-subduction and post-collisional magmatism since the Late Cretaceous, hosting numerous porphyry- and epithermal-style mineral deposits. A compilation of 900 radiochronological dates, new geochronological data and a regional study conducted along the Anatolian-Tauride metallogenic belt reveal that the widespread subduction to post-collisional magmatism of the ATB occurred in five episodes since the Late Cretaceous, defining five east-west oriented magmatic belts: 1) Late Cretaceous (87-65 Ma), 2) Eocene (53-41 Ma), 3) Oligocene (26-25 Ma), 4) Miocene (22-9 Ma) and 5) Pliocene-Quaternary (<6 Ma). The Eocene and Miocene magmatic belts are continuous throughout the ATB, link the western Aegean and eastern Arabian domains of the Neotethyan accretionary margin, and host most of the economic porphyry and epithermal systems (52 Moz Au). The distribution of mineralization is heterogeneous in time, space, and nature. Mineral deposits occur in clusters that can be grouped into districts that share similar geological, structural, metallogenic, tectonic, geochemical, and geochronological features centered on key deposits. The mineralization peaks during the Early Eocene (52-42 Ma) and Middle-Late Miocene (15-8 Ma), thereby forming two prospective gold and copper metallogenic trends. The Late Cretaceous, Oligocene and Plio-Quaternary magmatic belts are currently not prospective because of an apparent absence of significant observable alteration (e.g. late Cretaceous Baskil district and Central Anatolia), small size of the magmatic complexes (e.g. Oligocene magmatic intrusions in Tunceli), or the absence of mineralization (e.g. Plio-Quaternary volcanic edifices). Nevertheless, the presence of small porphyry systems in the Late Cretaceous and Oligocene belts suggest that the porphyry fertility is not necessarily restricted to the two major Early Eocene and Middle-Late Miocene metallogenic trends.