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Alteration, Mineralization, and Host-Rock Geochemistry of the Yanıklı Epithermal Prospect, Eastern Pontides, NE Turkey

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The western Tethyan Metallogenic Belt (wTMB) consists of different segments characterized by voluminous magmatism from the Jurassic-Cretaceous to the Miocene. The Eastern Pontides in northeastern Turkey is one of the most remarkable segments of the wTMB and hosts different types of magmatic-hydrothermal deposits, including porphyry Cu, epithermal Au-base metal, skarn, and volcanogenic-hosted massive sulfide (VHMS). The Yanıklı prospect is one of the major target areas in the Artvin province within the Eastern Pontides. The prospect has been explored by the MTA (General Directorate of Mineral Research and Exploration) since 2018 by surface sampling and a total of 18 drill holes have been completed in the prospect so far.

The present study aims at constraining the alteration pattern, the spatial distribution and timing between the host-rock units, and the different metal associations. An approximately 20-km^2 area was mapped at a scale of 1:5,000 and includes the geologic units and alteration zones. The samples were collected from the main volcanic/volcaniclastic and intrusive rocks, together with the different hydrothermal alteration types. The samples have been analyzed for both geochemical purposes and petrographic examinations. The composition and temporal relationships between alteration minerals were determined via the Terraspec HALO mineral spectrometer.

The different rock types at the Yanıklı prospect include 1) predominantly rocks of intermediate and subsidiary mafic geochemical composition, with porphyritic-textured volcanic rocks, 2) felsic porphyritic-textured and flow-banded rocks, and 3) intermediate volcaniclastic rocks. In addition to these units, different types of dikes were mapped and identified as mafic to intermediate in composition.

The interpretation of the Terraspec measurements enabled us to identify three main mineral alteration zones, including argillic, propylitic, and phyllic alteration zones. Moreover, these alteration zones can be subdivided into different mineral assemblages and alteration intensities. The argillic, prophylitic, and phyllic alteration assemblages dominantly consist of (i) kaolinite and smectite group minerals, (ii) a chlorite-epidote-zeolite mineral assemblage, and (iii) white-mica group minerals, including illite, muscovite, paragonite, etc., respectively.

The metal association was investigated through 16 drill holes. Our preliminary results show that there are two main different metal phases. The first metal phase consists of a Cu-rich metal zone hosted by a predominantly propylitic alteration zone, which also includes a Pb and Zn mineralization. In contrast, the second phase is enriched in Zn and Pb related to the sericitic alteration zone. Gold mineralization is mainly associated with the second mineralization phase, which also contains weak, subsidiary Cu assemblages.