

Relationship Between Porphyry Copper Systems, Crustal Preservation Levels, and Amount of Exploration in Magmatic Belts of the Central Tethys Region

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The relationship between the number of known porphyry copper occurrences, the levels of crustal preservation and exposure, and the amount of exploration that has taken place over time in magmatic belts of the central Tethys region of Turkey, the Caucasus, Iran, western Pakistan, and southern Afghanistan was investigated as part of the USGS-led global mineral resource assessment. Tectonic, geologic, geochemical, geochronologic, and ore deposits data compiled and analyzed for the assessment of the 26 porphyry copper tracts or belts identified in this region show that magmatism and associated porphyry mineralization can be rationalized in terms of fundamental plate tectonic principles, including mantle-involved postsubduction processes. However, uplift, erosion, subsidence, and burial of porphyry copper systems also played an essential role in shaping the observed metallogenic patterns. Results from this study show that there is a correlation between the number of known porphyry occurrences and the levels of crustal preservation and exposure. Magmatic belts with numerous identified porphyry occurrences exhibit subequal areas of broadly coeval plutonic and volcanic units and lesser cover rocks. Belts with fewer porphyry occurrences display either high or low volcanic to plutonic ratios and/or greater cover, pointing to crustal levels that are too shallow for exposure or too deep for preservation of porphyry systems. As a consequence, exploration for porphyry deposits has traditionally occurred first and, if successful, has been longer lived where mineralized systems are exposed to the surface by an appropriate balance in the combined effects of preservation and exposure.