

The Diverse and Unique Metallogeny of the Tethyan Belt

Jeremy P. Richards*

Dept. Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, Canada

*E-mail, jeremy.richards@ualberta.ca

The Tethyan orogen is the best-preserved example of a complete Wilson Cycle, from continental rifting through convergence to terrane and full continental collision and, finally, postcollisional readjustments. A wide variety of mineral deposits have formed over this tectonic cycle, ranging from seafloor hydrothermal and ophiolite-related deposits and sedimentary basin-hosted deposits related to oceanic and back-arc rifting, subduction-related porphyry, and epithermal deposits to syn- and post-collisional magmatic and hydrothermal deposits. These deposit types are distributed unevenly along the belt, reflecting different degrees of closure of the Wilson Cycle: Mesozoic porphyries are preserved in the Balkans, Tibet, and the Three Rivers region of southeast China, while Neogene subduction-related porphyry deposits occur above the active Makran subduction zone; syn-collisional porphyry and epithermal deposits occur along the Afro-Arabian–Eurasian suture (Carpathians-Balkans-Taurides/Caucasus-Zagros); and post-collisional porphyry systems occur in Tibet. The young age of the orogen results in preservation of many deposit types that are typically quickly lost to erosion, and are therefore not well represented in older orogenic belts. Collision-related deposits are particularly well preserved, and their study is shedding light not only on collisional metallogeny, but also on underlying tectonomagmatic processes. In contrast, although deposits related to earlier stages of the Wilson Cycle are present in the Tethyan orogen, they are less abundant than in active continental margins such as the Western Cordillera of the Americas. It is unclear whether this lower abundance reflects original sparsity or loss to erosion. Lower original abundance is suggested by the relatively low volume of arc magmatism preserved in batholithic or volcanoplutonic sequences exposed along the belt, perhaps reflecting the relatively small size and short duration of the Neotethyan ocean in the Mesozoic-Cenozoic. Larger arc batholithic complexes preserved in Tibet and Indochina are related to some significant Mesozoic porphyry deposits, but it has also been suggested that the overall fertility of arc magmatism in this region was low, perhaps due to relatively low magmatic oxidation states. Overall, the preserved metallogeny of the Tethyan orogen more closely resembles accretionary margins such as the Southwest Pacific or the Canada-Alaska Cordillera than long-lived convergent margins such as the Andes; its complement of collision-related deposits is uniquely well preserved.