

Abstract ID: 263

Title: THE TECTONICS AND STYLE OF METALLOGENESIS IN ARIZONA

Student: No

Topic: Economic Geology

Medium: Invited Oral Presentation

Author 1 (CONTACT AUTHOR)

Name: Spencer Titley

Org: University of Arizona

Country: USA

Keywords: tectonics, metallogenesis, Arizona

Abstract: Arizona lies at the southwest corner of the North American craton, a location occupied since the Proterozoic. This crustal block has undergone episodes of many styles of variable stress, both orogenic and anorogenic thermal events, and important igneous cycles. A consequence of this history has been evolution of episodes of overprinted mineral deposits of varied style and composition. The panoply of polygenetic and polycyclic mineralization styles is unique.

Some of the oldest of the Proterozoic successions of the craton in Arizona (Yavapai Series ca. 1.8Ga) host Volcanogenic Massive Sulfide Ores of Cu-Zn-Pb-Ag- Au (Jerome and Copper Queen). Permissive interpretation of crustal compression allows inference of Proterozoic plate interactions. A Layered Mafic Intrusion consisting of gabbro and anorthosite with (anecdotal) chromite, (ca. 1.7Ga) in this Proterozoic succession is interpreted at Bagdad Arizona where, also, younger, penetrating, Laramide intrusions are progenitors to copper ores of PGE-enriched chalcopyrite. Numerous gold-base metal veins and minor Hg occurrences of the central Arizona mountains are not rigorously dated but manifest pre-Phanerozoic stratigraphic ages. Younger Proterozoic “rift-related” diabase dikes and sills (ca. 1.1Ga) of central Arizona are known to be locally enriched in PGE’s.

Ores of the Phanerozoic in Arizona correspond with stages of a current Wilson Cycle that commenced with formation of Pangea. Paleozoic-Mesozoic-aged (ca. 240-200Ma) U-bearing base metal ores of MVT style occur as pipes in Mississippian and younger platform strata, of northwestern Arizona, where they border shelf strata of the Cordilleran miogeocline. The thermal event related to these ores (~150C) may be related to thermal stress during the “Stasis” stage of a Wilson Cycle.

Convergence of the North American and Pacific plates resulted in “convergence style” mineralization along the southern boundary of the Arizona craton that include (Bisbee and Courtland Gleeson ca. 200Ma), and within southeastern Arizona, Laramide porphyry style ores (~65Ma) dominated by a distinctive igneous suite and base-precious metal mineralization. The Laramide event also corresponds with orogenic gold deposits of southwestern Arizona in a NW-trending belt that extends into California. Cessation of the

high plate convergence rate at ca.40Ma, marked onset of formation of Tertiary precious and base metals vein and replacement ores that are diminutive in contrast with those of the Laramide. Poorly dated sandstone Uranium ores of the Colorado Plateaus are likely products of changing base levels and leaching of the Mesozoic section during the Cenozoic. Subsequent mineralization of the region is characterized by detachment fault localization of gold and by surficial modification of pre-existing ores resulting in enriched base metal ores and gold placers.