

Zonation of Alteration Facies at Western Tharsis: Implications for the Genesis of Cu-Au Deposits, Mount Lyell Field, Western Tasmania

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Abstract

The Western Tharsis deposit, located in the Mount Read volcanic belt of western Tasmania, is one of 22 mainly Cu-Au deposits in the Mount Lyell district. Although the orebody at western Tharsis is characterized mainly by disseminated pyrite-chalcopyrite like most other deposits in the Mount Lyell district, it also contains bornite-rich ores characteristic of a second, less common type of deposit. The deposit is stratiform and occurs within intermediate and felsic volcanic rocks of the ~500 Ma Central Volcanic Complex. Alteration is developed broadly symmetrically around the ore zone, with an ore-bearing core characterized by a quartz-chlorite ± sericite assemblage. The core is enveloped by a quartz-pyrophyllite ± topaz ± fluorite ± zunyite ± woodhouseite assemblage with local bornite-bearing ore zones. This zone, in turn, is enveloped by a pyritic quartz-sericite assemblage. The outermost quartz-chlorite-carbonate-sericite ± albite assemblage is only developed in the stratigraphic footwall more than 200 m below the ore position.

The hypogene pyrophyllite-bearing assemblage is more characteristic of high sulfidation than volcanic-hosted massive sulfide (VHMS)-related alteration assemblages. Moreover, the close relationship of this alteration assemblage with the more prevalent quartz-chlorite ± sericite assemblage associated with disseminated pyrite-chalcopyrite mineralization suggests that these two types of mineralization are two stages of one mineralizing event, not the two separate events suggested by previous authors (e.g., Arnold and Carswell, 1990). Geologic relationships and radiogenic isotope data are consistent with an Ordovician (~460 Ma) timing for Mount Lyell Cu-Au mineral deposits; this mineralization may be related to the geologic event that formed the local "Haulage unconformity." These observations indicate a potential new exploration model for mineralization in the Mount Read volcanic belt and in surrounding Ordovician rocks.