Reconstruction of the volcanic-sedimentary environment of strata hosting the La Pitarrilla, Silver-Zinc-Lead Deposit, Sierra Madre Occidental, Mexico

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Abstract

Cretaceous, Eocene, and Oligocene strata that host the La Pitarrilla intermediate sulphidation epithermal Ag-Zn-Pb deposit (~ 449 million ounces of measured and indicated silver) constitute an Oligocene, bimodal volcanic centre and record a complex volcano-sedimentary and structural history. Deformed Cretaceous rocks form the basement to Eocene and Oligocene volcanic strata that unconformably overlie it. The Eocene volcaniclastic strata were derived from arc volcanism and the erosion of subaerial arc volcanoes, with the clastic material transported by sedimentary gravity flows and deposited into a below storm wave base basin that was developed in a back-arc extensional setting. Oligocene arc uplift, erosion, extension, and voluminous silicic pyroclastic volcanism recorded by the Sierra Madre Occidental were manifested at La Pitarrilla by NE- and NNW-trending faults, ignimbrite and surge deposits that were followed by the emplacement of rhyolitic and andesitic sills and dikes, and a rhyolitic flow-dome that caps all the strata.

The La Pitarrilla Ag-Zn-Pb deposit is characterized by iron oxide- and sulphide-associated mineralization, which defines a vertically stacked mineralized system centred on rhyolitic dikes and sills that constitute the feeder system for the rhyolitic flow-dome. The sulphide-associated mineralization is rooted in the basement Cretaceous sedimentary strata and is represented by an areally restricted, but vertically extensive zone of vein and disseminated Ag-Zn-Pb (-Cu-As-Sb) sulphide mineralization and stratabound replacement mineralization within conglomerates that define the Cretaceous-Eocene unconformity. The sulphide mineralization extends upwards into the overlying Eocene and Oligocene volcaniclastic strata and rhyolitic sills where it abruptly grades into a laterally more extensive zone of disseminated iron oxide-associated silver mineralization (after sulphides). The main Ag-Zn-Pb mineralization event is interpreted to have occurred during or shortly after emplacement of the rhyolitic flow-dome.