

Iron oxide copper-gold deposits in South America

¹LEVEILLE, R.A. and ²MARSCHIK, R. ¹Phelps Dodge Exploration Corporation, Rio de Janeiro, Brazil; ²Department of Mineralogy, TU Bergakademie Freiberg, Freiberg, Germany

Iron oxide Cu-Au deposits, while not common, are widely distributed both in time and space in South American rocks. The oldest known deposits are those of the Carajás district, Brazil. These are magnetite-dominated systems with locally elevated concentrations of LREE, F, U, Mo, and Co. The largest deposit in the district is Salobo (789 Mt @ 0.96% Cu, 0.52 g/t Au, 5.5 g/t Ag). Metasomatic Fe \pm Cu-Au deposits are common in Perú and Chile, ranging from Jurassic to Plio-Pleistocene age. These include, from north to south, the Raúl-Condestable, Eliana, Monterossas Cu-Au deposits, and Marcona, a major Fe deposit that also contains minor Cu, Au, and Ag. Localized near the Atacama Fault Zone and its splays are the Manto Verde deposit (85 Mt @ 0.82% Cu), the Candelaria deposit (400 Mt @ 1.0% Cu, 0.2 g/t Au, 4.5 g/t Ag) and the nearby Punta del Cobre district (~120 Mt @ 1.5% Cu, 0.2-0.6 g/t Au, 2-8 g/t Ag). Manto Verde's orebody consists of specular hematite-Cu oxides (after chalcopyrite) with locally anomalous concentrations of Au and LREE. Candelaria-Punta del Cobre orebodies are characterized by magnetite-chalcopyrite-pyrite, \pm hematite or pyrrhotite-rich zones. Elevated concentrations of Zn, LREE, and Mo are locally present. Common themes among most of the South American iron oxide Cu-Au deposits are: 1) host rocks consistent with an extensional tectonic setting, 2) often in or near major shear or brittle fault zones, 3) location in Fe districts, 4) variable intrusive association, but intrusives invariably nearby, 5) complex Ca-Na-K-Fe alteration, but 6) best deposits tend to have a major K component to alteration, 7) paragenesis: early Fe oxides \pm K \pm Na alteration, later Cu sulfides \pm Ca \pm K alteration. Whether any of the South American iron oxide Cu-Au deposits share a common origin remains to be demonstrated.