

MAGMATIC AND TECTONIC SETTING OF CENTRAL ANDEAN GIANT ORE DEPOSITS IN ARGENTINA AND CHILE

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The formation of central Andean (22°S to 34°S latitude) Late Oligocene to Recent giant ore deposits is related to the magmatic and tectonic evolution of the magmatic belts that host them. Common factors are a shallow subduction zone, a thickened continental crust, and formation at the time of initiation, expiration or migration of the magmatic arc. A key ingredient is hydration of the mantle and crust above a shallowing cooling slab over a period of some million years. Chemical analyses of 500 El Teniente, El Indio, Maricunga, and Cerro Rico region samples indicate temporal changes in mafic mineral residual assemblages in equilibrium with the magmas erupted before and during mineralization. Initially anhydrous pyroxene-based residual assemblages evolve to hydrous amphibole-based ones as shallowing of the subducting plate proceeds. Contemporaneous compression related to South America-Nazca plate convergence leads to shortening and thickening of the crust and progressive entrapment of ascending magmas in that crust. Eventually, the hot, magma-charged crust fails catastrophically under compression leading to dramatic crustal thickening. Fluids related to mineralization are liberated as hydrous amphibole-based assemblages break down to anhydrous garnet-based ones and from over-pressured plutons. Mineralization is followed by either cessation of magmatism or eruption of magmas that interacted with garnet-based assemblages in the thickened lower crust. Unless continental lithospheric thinning or arc migration allows further hydration of the mantle wedge, mineralization ceases.