Chollay Plutonic Complex: the roots of the Andean Triassic Arc?

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The western border of South America has been proposed like periodically active margin since the Paleozoic, with a period of diminished or arrested subduction during the Permian-Triassic (Pre-Andean Cycle). The magmatism generated during this period has been explained by crustal melting in a continental rift context, however recent field, petrological and geochemical data show that this magmatism was probably created within an active margin.

The largest pre-andean intrusive unit cropping out in the High Andes of Chile (28°30'S – 30°S) is the Chollay Plutonic Complex (CPC). The CPC has a wide compositional variety, ranging from gabbros to granites being the granodiorites and granites the most common lithologies, all of them with hydrated mafic minerals. This complex was incrementally constructed between 249-234 Ma intruding Paleozoic metasedimentary and plutonic units, now exposed within the batholith, specifically in its western border, as elongated NE-SW strips. Mylonite bands along the western margin of the CPC indicate active deformation during its emplacement. The general disposition of the inner lithological pulses of CPC and its host rocks is subvertical. In its eastern flank, a Lopingian–Carnian dacitic to rhyolitic volcanic and volcanosedimentary sequence is in close spatial and temporal relationship to the CPC, and partially intruded by it.

In this work we present new field, petrographic, geochemical and isotopic data from the CPC and its host rocks in order to evaluate the source and the petrogenetic processes responsible of this magmatism. The geochemistry indicates a calcalkaline nature, an enrichment of LILE in relation to HFSE and negative anomalies of Nb-Ta, Ti and P, characteristics of a magmatism controlled by fluid induced melting of a depleted asthenospheric mantle, in an active subduction context, with variable contribution from a crustal source. A revised model for the Permian-Triassic evolution of the Andean margin is proposed in light of these results, suggesting a protracted subduction with the development of an extensional framework in the overriding plate during the Triassic-Jurassic period. This model fits recent reconstructions of global plate boundaries.