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Geochemical characteristics of Late Cretaceous to Pliocene arc magmatism in the Central Chilean Andes (~35°S) and its records of the evolving geodynamic frame

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We have undertaken a study in the Andes of central Chile at ~35°S aimed to characterize the geochemistry of igneous rocks between Late Cretaceous and Pliocene. Currently, such region remains poorly studied and in this contribution we present the preliminary results derived from whole rock chemical and Sr-Nd isotopic analyses, and discuss their implications over the evolving geodynamic frame throughout this period in the area. In cordilleran arc orogenic systems like the Andes, magmatism constitutes a most valuable tool to characterize and track such frame and also constitutes a unique record to test deep processes hypotheses.

The units sampled correspond mainly to lava flows and intrusive rocks exposed along the upper Tinguiririca river valley (~35°S) in the main Andes cordillera. Cenozoic rocks are part of the magmatism occurring throughout the deposition of Abanico (Eocene-early Miocene) and Farellones (Miocene) formations [1,2], plus isolated younger igneous activity. As characterized in the region further north (~33°-34°S), these respectively represent the arc activity developed in the margin throughout contrasting tectonic conditions: an extensional intra-arc basin, inverted in early Miocene, followed by a continuous contractional regime responsible for building up of the modern orogen [1,2,3]. The Late Cretaceous is represented by the Guanaco unit, a mainly volcanic series recently recognized in the main range [4], which is separated from the overlying Abanico Formation by a ~18 Ma hiatus. Similar units crop out only in the region north from ~34°S and remain poorly studied. They have been tentatively attributed to a late phase of an extensional episode in an intra-arc setting [3].

Our preliminary results for the Andean igneous rocks at 35°S indicate that all the studied units present the typical arc-like characteristics as a calc-alkaline affinity, an enrichment of LILE over HFSE elements, a Nb-Ta trough in normalized multielement diagrams, and also according to tectonic discrimination diagrams based in trace element contents. The isotopic $^{87}Sr/^{86}Sr_I$ ratios and εNd_I values vary in a range of respectively 0.7036-0.7040 and 4-6 and define a temporal variation amongst the different units. This is characterized by a trend towards less evolved signatures between from Late Cretaceous (Guanaco unit) to Oligocene-early Miocene (Abanico Formation), and a reversal towards evolved signatures in Miocene-Pliocene. Such pattern has also been recognized for units further north by Nyström et al. [5]. Altogether, the studied rocks show increasing $^{87}Sr/^{86}Sr_I$ ratios with increasing Sr contents which suggests that crustal contamination processes are variably involved in the genesis of these Andean magmas regardless of their age. Finally, rocks from Late Cretaceous, Eocene-early Miocene and Miocene-Pliocene show differences in the Sm/Yb and Sr/Y ratios, which can be used as proxies for tracking changes in crustal thickness in time [2,6]. The patterns observed suggest a crustal thinning event in Eocene-early Miocene, inbetween the Late Cretaceous and Miocene-Pliocene. Units of the latter ages show higher Sm/Yb and

Sr/Y ratios suggesting a comparatively thicker crust, as also indicated by the Sr-Nd signatures previously described.

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