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Basement controls over the composition of Andean arc magmas: Hf isotopic constraints from Central Chile (~33°-34.5°S)

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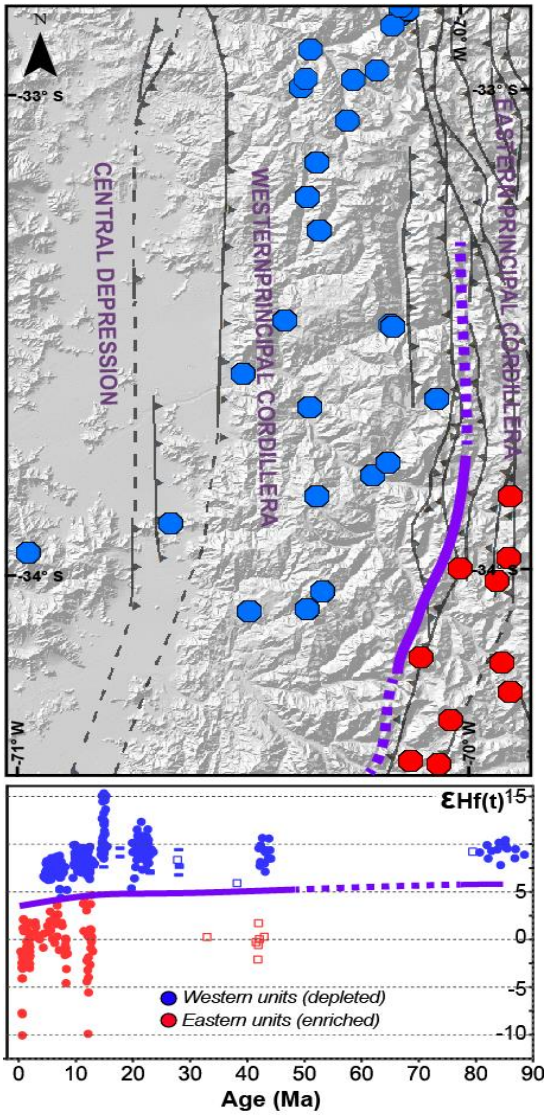

Figure 1: Spatial distribution of analysed samples and corresponding εHf(t) signature. Purple line shows the inferred limit between

different basement domains. Filled and empty symbols after magmatic and inherited zircons, respectively. Data from this work, Muñoz et al. [3] and references therein.

New and published zircon Hf isotopic data of Cenozoic Andean igneous rocks from central Chile shows that these define a spatial isotopic segmentation in the orogen (Fig. 1). Those emplaced in the Eastern Principal Cordillera are variably more enriched than coeval igneous rocks emplaced in the Western Principal Cordillera (Fig. 1). Western units reveal a significant mantle input showing a restricted range of εHf_I values mostly between +6 to +10, a signature also shared by analyses performed in one Mesozoic unit (westernmost sample in Fig. 1). This is a remarkable feature considering that these rocks were formed throughout a period where extensional tectonics followed by building up of the Andean orogen developed in the continental lithosphere. In contrast, igneous rocks from the Eastern Principal Cordillera are variably more enriched and define a wider range in εHf_I values between -10 to +5 (Fig. 1). Units from both sectors range from basic to intermediate in composition and have the typical characteristics of arc related igneous rocks. They show no discernible patterns between the Hf signature and the chemical composition, a characteristic also observed on a Nd, Sr and Pb basis [1], which precludes crustal contamination processes to account for the observed isotopic segmentation. In addition, the simultaneous generation of magmas with contrasting signatures also argues against a compositional control in the asthenospheric source (Fig. 1). Such isotopic segmentation can be explained instead as buffered by different basement domains hosting the magmatic sources in the continental lithosphere, as in the MASH model envisaged by Hildreth & Moorbath [2]. Although the origin of isotopically different basements in the Andean orogen remains elusive, this can at least be considered as inherited from pre-Andean evolution.

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References:

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[2] Hildreth W and Moorbath S (1988) Contrib Mineral Petr 98: 455-489

[3] Muñoz M et al. (2014) In: *XIX Congreso Geológico Argentino*, Digital Proceedings