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The fluid-flux signature in water-rich mafic magmas from Nevado de Longaví Volcano, constrains to fluid composition from whole-rock chemistry.

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Nevado de Longaví volcano (NLV; 36.2˚S), in the Southern Volcanic Zone of the Andes (SVZ), has erupted unusually water-rich magmas for this arc. We interpret this anomaly as a consequence of a localized high input of fluids related to the subduction of the oceanic Mocha fracture zone, which projects beneath NLV (Sellés *et al*., 2004). Modal abundances of amphibole in andesites and dacites are much higher at NLV than in neighboring centers, and augite is absent from dacites. We estimate water contents of 5-6 wt% on the basis of experimental results on the closely comparable Pinatubo dacite (Prouteau & Scaillet, 2003). The evolved products of NLV (63-65 wt% SiO_2), which exhibit a marked adakitic signature, can be modeled in terms of fractional crystallization, wherein amphibole is the dominant mineral phase, starting from a hydrous basaltic andesite (53 wt% SiO_2; Rodríguez *et al*., this volume).

Plausible parental mafic magmas for NLV adakites (MgO$<$6 wt%) are in many respects unlike other SVZ mafic magmas in that NLV basaltic andesites have relatively low or lower contents of many incompatible elements, notably Th, U, Zr, Nb, Hf and REE, in combination with higher B (19-25 ppm), Be, Cs, and Li contents and higher Ba/Th, Ba/Zr, Pb/Th ratios. HFSE ratios (Zr/Nb, Hf/Nb) of NLV magmas overlap with values for the arc as a whole. These features are consistent with NLV magmas being derived from high degrees of melting of the mantle source as a consequence of being fluxed by anomalously high amounts of slab-derived fluids. Two other volcanic centers south of NLV that are situated above oceanic fracture zones (Mocho-Choshuenco and Calbuco) have erupted amphibole-bearing lavas that exhibit similar,

though less pronounced, chemical characteristics. However, this interpretation must be reconciled with the observation that other putatively fluid-mobile elements, such as Ba, Rb, K, and La, are less concentrated in NLV mafic magmas than in lavas from other SVZ centers. Low contents of Ba, Rb, K and LREE in NLV parental magmas may be a consequence of a combination of factors. High amounts of fluids released from deserpentinized mantle in the Mocha fracture zone might actually have lower LILE concentrations than fluids related to dehydration of mafic oceanic crust. Passage of such fluids through the overlying, cold portion of the mantle may have reacted with peridotite, leading to precipitation of metasomatic phlogopite and/or amphibole, such that the fluid component that triggered partial melting in the hot portion of the mantle wedge had already lost a fraction of its Ba, Rb, K, and LREE. The LILE-poor nature of primitive magmas is then preserved through subsequent evolution.

References:

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