

Trace element composition of the Quaternary volcanic rocks of the Southern Volcanic Zone in Chile Arc

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Southern Volcanic Zone (SVZ; 33-46°S) of the Chile Arc in Southern America is formed by the subduction of the Nazca plate beneath the South American plate. To the north of SVZ, are distributed chains of volcanoes of the Central Volcanic Zone (CVZ) separated by volcanic gap of Pampean flat slab segment where the J. Fernandez Ridge collides. Austral Volcanic Zone (AVZ) is to the south of SVZ with the Patagonian Volcanic Gap between. SVZ has been divided into four segments; Northern, Transitional, Central, and Southern segments (Stern, 2004). We present XRF, ICP-MS, and Prompt gamma-ray analysis data for whole rock major and trace element composition of 32 volcanic rocks from 13 volcanoes along the volcanic front of the SVZ and Lautaro, the northernmost volcano of the AVZ. Samples of 10 out of 13 volcanoes are from Central-Southern SVZ.

Trace element concentration normalized to NMORB show typical arc-related signature, with enrichment in LILE, spikes in B and Pb, and low values of Nb and Ta. Samples of Hudson volcano, the southernmost volcanic center of the SVZ lacks the spike of B. Samples of Lautaro volcano show stronger HREE depletion compared to the others. Sr and other isotopic studies revealed that basaltic rocks of the volcanic front of the Central-Southern SVZ where the crust is only 30km thick have not obviously assimilated continental crust (Hickey-Vargas et al., 1986, 1989). B/La, Pb/Ce, Ba/La, and Ba/Nb in magmas of the volcanic front are low in Southern SVZ and decrease progressively to the north in Central SVZ. This suggests that the addition of the slab-derived fluid to the mantle magma source may increase with the age of the subducted oceanic plate. Decrease of the age of the subducting slab and increase of the subduction angle to the south might bring the difference of the dehydration of the subducting slab by beneath the volcanic front corresponding with the difference of thermal structure.

B/La, Pb/Ce, Ba/La, and Ba/Nb seem to decrease to the north in magmas of the Transitional-Northern SVZ. However most of the samples are evolved andesite-dacite, so the direct comparison to those of the Central-Southern SVZ is problematical. These elemental ratios are low for the sample of Lautaro volcano in AVZ. Since volcanic centers of the AVZ are composed of adakitic andesite-dacite, formed from slab melts which have interacted to some extent with overlying mantle wedge and crust (Stern and Kilian, 1996), contribution of the slab-derived fluid to the magma source might be small.