Behavior of fluorine in arc magmatism of Southern Volcanic Zone, Chile

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Recently, halogens are revealed as one of the powerful tracers of water cycling in subduction zones (e.g., Sumino *et al.,* 2010). However, little is known about the behavior of halogens during subduction processes and their fate in the earth's mantle. Therefore, we newly analyzed halogen concentrations in regional representative lavas obtained from 13 volcanoes on the Quaternary volcanic front of the Southern Volcanic Zone (SVZ) of Andean arc in Chile by using the pyrohydrolysis method (Chai & Muramatsu 2007) combined with ICP-MS and IC. Particularly, we focus on fluorine that is least influenced by degassing on volcanism and report the first finding of decoupling of along-arc variation in fluorine and boron.

The evolved rock samples from which apatite crystallized were excluded from further discussion. Compared to major and trace element data obtained from the same samples (Shinjoe et al., 2013), fluorine concentrations are not coupled with boron ones ones in spite of that they are clasified as fluid-mobile elements. This suggests that fluorine shows different behavior in the subduction zone magmatism The basaltic samples from Hudson and the other volcanoes in SSVZ have extremely higher fluorine concentration than those of Northern and Central SVZs. Similar anomalies are confirmed also with Nb, Ta and REE. The chemical characteristics suggest that the magma source of the SSVZ derived from the mantle wedge metasomatized by phengite-bearing slab-derived melt. The previous studies also suggested that the mantle source of SSVZ basalt was contaminated by slab-derived melt (e.g., Kilian and Behrmann 2003). Thus the fluorine content becomes new sensitive indicator of slab-derived melt rather than dehydration-induced fluid in arc magmatism.