Magmatic evolution of the Quaternary volcanics from Hudson and Lautaro volcanos, Chilean Patagonia

Yuji Orihashi[1]; Shun'ichi Nakai[2]; Hironao Shinjoe[3]; Jose A. Naranjo[4]; Akihisa Motoki[5]; Daiji Hirata[6]; Ryo Anma[7]

[1] ERI, Univ. Tokyo; [2] ERI, Univ. of Tokyo; [3] Fac. Business Administration, TKU; [4] SERNAGEOMIN, Chile; [5] Rio de Janeiro State Univ.; [6] Kanagawa Pref. Mus. Natl. Hist.; [7] Life-Environment, Tsukuba Univ.

http://www.eri.u-tokyo.ac.jp/KOHO/STAFF2/oripachi.html

At the Titao Peninsula where the Antarctic, Nazca and South American plates meet, subduction of a segment of the active Chile ridge system along the Chile trench forms a ridge-trench-trench-type triple junction, namely the Chile Triple Junction (CTJ) (e.g., Herron et al., 1981). Near the CTJ, there is a volcanic gap having about 350 km long in recent subduction-related volcanic activity. This gap separates two distinct volcanic zones along the axis of the Andean Cordillera; the Southern Volcanic Zone (SVZ) and Austral Volcanic Zone (AVZ) (e.g., Stern, 2004). Geochemical characteristics of the Quaternary volcanics drastically change across this volcanic gap; AVZ is composed of calc-alkaline andesite to dacite of adakitic and/or high-Mg andesitic affinities, while SVZ consists mainly of low-to medium-K calc-alkaline basalt and arc-tholeiite with minor andesite and dacite (e.g., Stern, 2004; Stern and Kilian, 1996). The distinction has been attributed to incorporation of contributions linked to slab melting in south of the CTJ, caused by subduction of the Chile ridge (e.g., Ramos and Kay, 1992; Stern and Kilian, 1996).

Recent study has shown that dacite and basaltic andesite of late Pliocene to Quaternary ages (younger than 2 Ma) dredged on the continental slope offshore of the Taitao peninsula adjacent to the active CTJ also have subduction-related geochemical characteristics (Guivel et al., 2003). This suggests the possibility that volcanic activity along the volcanic front of the Andean Cordillera had ceased and jumped to forearc province near the CTJ during late Pliocene to Quaternary in age. If so, detail information about geochemical variations as well as spatiotemporal distribution of volcanic activity of this period provides an important key to figuring out the magmatic evolution in the mantle wedge influenced by the active Chile ridge subduction. Particularly, geochemical data with precise age-controls in the Plio-Quaternary volcanoes near CTJ would allow more focused discussion of the above issue. In this presentation, we newly report twenty-nine whole rock compositions of major and trace elements with boron of an immobile element and Sr, Nd and Pb isotope compositions, having precise K-Ar ages determined in Orihashi et al. (2004), for the Quaternary lavas and ejecta obtained from Hudson volcano in the southern end of the Southern Volcanic Zone and Lautaro volcano in the northern end of the Austral Volcanic Zone near the Chile ridge subduction zone and address magmatic evolution in the mantle wedge influenced by the Chile ridge subduction.

Based on the above data of the Hudson and Lautaro volcanoes, we suggest that the magma source in Hudson volcano might be generated by addition of slab-derived fluid toward mantle wedge having E-MORB affinity rather than E-MORB-like asthenospheric injection through slab window, although the addition rates were much smaller than those of the other SVZs due to a hotter slab subduction. As for the Lautaro volcano, our data also suggests that the magmatic sources were generated by slab melting triggered by the Chile ridge subduction as pointed out by previous literatures (e.g., Stern and Kilian, 1996) and moreover, high-Mg adakite affinity possibly generated by a mantle wedge interaction are newly discovered in the products of earlier stages (0.17-0.10Ma), Lautaro volcano, which supports the above conclusion.