

Magmatic evolution in Torishima and Sumisu volcanoes, Izu-Bonin arc: the possible role of phengite

Yoshihiko Tamura[1]; Kenichiro Tani[1]; Qing Chang[1]; Hiroshi Shukuno[1]; Hiroshi Kawabata[1]; Richard S. Fiske[2]

[1] IFREE, JAMSTEC; [2] Smithsonian Institution

The geochemistry of volcanic front magmatism at Sumisu in the central Izu-Bonin arc is well known as the result of studies on Sumisu island, dredging, and ROV/submersible dives in the adjacent Sumisu submarine caldera (Tamura et al., 2005; Shukuno et al., in press). Torishima is 110 km south-southeast of Sumisu. Torishima was also studied intensively in 2002 and 2003 by dredging and a two-week survey of Torishima island. The frontal volcanoes of Sumisu and Torishima contain low-K basalts originating from both wet and dry basalt magmas (low-Zr basalts and high-Zr basalts, respectively). These basalts result from different degrees of melting of the same source mantle (20 % and 10 % for wet and dry basalt magmas, respectively). Assuming that the wet basalts contain greater abundances of slab-derived components than their dry counterparts, geochemical comparison of these two basalt types permits the identification of the specific elements involved in fluid transport from the subducting slab. Using the abundant geochemical data from Torishima, where the downgoing slab is about 100 km deep, we find that Pb, Ba, and Sr are selectively concentrated in the slab-derived metasomatic fluids below this arc-front volcano, but K and Rb, are not. We suggest that the K-rich mica, phengite, plays an important role in determining the makeup of fluids released from the downgoing slab. In arc-front settings in the Izu-Bonin arc, where slab depth is about 100 km, phengite is stable, and released fluids contain little K. In backarc settings, such as Horeki, phengite is unstable, and K-rich fluids are released. We conclude that cross-arc variations of K and Rb are likely related to differing compositions of fluids released rather than the commonly held view that such variations are controlled by the degree of partial melting.

Tamura, Y., Tani, K., Ishizuka, O., Chang, Q., Shukuno, H. & Fiske, R. S., Are arc basalts dry, wet, or both? Evidence from the Sumisu caldera volcano, Izu-Bonin arc, Japan, *Journal of Petrology*, Vol. 46, 1769-1803, 2005.