

Two types of basalts erupted in Active rift, Izu-Bonin arc, Japan

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We observed that two types of basalts have erupted in Sumisu rift, Izu-Bonin arc, Japan. High-Zr type basalts have higher concentration of K₂O, Na₂O, Y, Zr, Ni than Low-Zr basalts at similar FeO*/MgO ratio. High-Zr type basalts have higher Nb/Yb, Ce/Yb, Zr/Yb ratio and lower Ba/Th ratio than Low-Zr type basalts. The Sr isotope composition tends to be higher in direction from High-Zr type to Low-Zr type, although the Nd isotope composition of both types are similar. The Hf isotope composition (¹⁷⁶Hf/¹⁷⁷Hf) tends to be lower in direction from High-Zr type to Low-Zr type. The Hf isotope composition of Low-Zr type basalts similar to basalts from Sumisu Caldera in the volcanic front.

Olivines in High-Zr type basalts have higher wt. % NiO than those in Low-Zr type basalts at given Fo contents. Estimated primary olivine compositions are more magnesian (Fo = 92.3) in Low-Zr type basalts compared with those in High-Zr type basalts (Fo = 89.6).

Major element compositions of the calculated primary magmas indicate that the primary High-Zr type magmas segregated from source mantle at deeper than those of Low-Zr basalts (High-Zr: 1-2 GPa; Low-Zr: 2-3.5 GPa).

From the petrological and geochemical factors mentioned above, it is difficult to explain the differences of two types of basalts from different degrees of partial melting of the same source mantle and addition from slab-derived components (for example, sediment melt). Thus, we concluded that the two types of basalts are derived from different source mantle. This may indicate that the mantle beneath Sumisu rift have heterogeneities in the vertical direction (High-Zr type sources are in the shallow part of the mantle and Low-Zr type sources are in the deep part of the mantle). Moreover, Low- and High-Zr type basalts similar to West Philippine Basin MORBs and Shikoku basin basalts, respectively. The mantle heterogeneities beneath the Sumisu rift might have been related to the development of Izu-Bonin arc.

In this presentation, we also discuss the basalts from Myojin and Aogashima rift near the Sumisu rift.

Keywords: Izu-Bonin arc, Active rift, Back-arc basin basalts, Mantle heterogeneity