

Isotope and Boron of Quaternary lava in Central Sunda arc, Indonesia: an assessment of slab influence to mantle wedge

Haryo Edi Wibowo^{1*}, HASENAKA, Toshiaki¹, HANDINI, Esti¹, SHIBATA, Tomoyuki², Yasushi Mori³, HARIJOKO, Agung⁴

¹Department of Earth Science, Graduate School of Science and Technology, Kumamoto University, ²Beppu Geothermal Research Laboratory, Kyoto University, ³Kitakyushu Museum of Natural History and Human History, ⁴Department of Geological Engineering, Gadjah Mada University

We estimated contribution of slab-derived fluid of the arc mantle beneath Central Sunda Arc (CSA) in order to better understand the subduction processes. Sunda arc, a part of Pacific ring of fire, extends from Sumatera to Flores. Magmatism beneath Sunda arc is associated with subduction process. CSA is represented by a series of Quaternary volcanoes from fore arc toward back arc, consisting of Merapi, Merbabu, Telomoyo, Ungaran and Muria. We analyzed samples from these volcanoes by using X-Ray Fluorescence, Prompt Gamma-Ray and Instrumental Neutron Activation Analysis. Representative samples were also analyzed by Thermal Ionization Mass Spectrometer to obtain $^{87}\text{Sr}/^{86}\text{Sr}$ and $^{143}\text{Nd}/^{144}\text{Nd}$ ratios.

Boron is distinctively enriched in ocean floor sediment and altered oceanic crust (AOC). Higher mobility of boron from sediment to sediment-derived fluid than that of altered oceanic crust makes distinction of fluid sources. Fluid contribution to source mantle was estimated by applying ratio of boron and other mobile elements against HFSE. Estimation at CSA shows general decreasing trend of fluid contribution toward back arc with the highest contribution observed in the middle (Telomoyo) of arc transect, instead of the volcanic front (Merapi). This pattern is different from that estimated by Sr-Nd isotope ratios which are sensitive to modification of mantle by sediment-derived fluid. These isotope ratios show that influence of slab smoothly decreases from volcanic front toward back arc. Distinction between contributions from sediment-derived fluid and AOC-derived fluid was generated by plots of B/La, Rb/La, B/Nb, Rb/Nb against those of Sr and Nd isotope ratios. These plots show that the highest contributions of sediment occur at the volcanic front, whereas that from AOC occurs just a little behind the volcanic front. In addition to the variability of slab-derived fluid contribution, the small variation in isotopic and Nb/Zr, Nb/Ta ratios among fore arc volcanoes of CSA indicate little heterogeneity of the mantle source beneath them. Exception comes from the back arc volcano, Muria, which indicates relatively enriched mantle with only a little slab influence.

Keywords: Boron, Subduction, Slab fluid, Sunda arc