10Be abundance in volcanic rocks from Izu arc and its relation with other trace elements

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Cosmogenic nuclide 10Be with a half-life of 1.5 million years is produced in the atmosphere and subsequently absorbed onto marine sediment. Although 10Be trapped in the mantle at the formation of the Earth should have been decayed away, trace amount of 10Be has been confirmed in the volcanic rocks derived from subduction areas (0.1-25 million atoms per gram). The presence of 10Be is considered as a rigid evidence indicating the recycle of subducted sediment derived component in arc volcanism. Since the abundance of 10Be is very low, only Accelerator Mass Spectrometry (AMS) can measure its abundance in rock samples.

The 10Be analyses are still very difficult especially for volcanic rocks with low abundance. This study aims at establishing analytical method of 10Be in volcanic rock samples and applying it to the samples from Izu arc where information on other trace element abundances and isotopic tracers are available. Our final goal is to investigate across-arc variation of 10Be abundance and its relation with other trace element and isotopic systems.

Samples of basalt from Oshima, Miyakejima and Niijima were used for analyses to investigate across-arc variation. The samples were leached with dilute acid to remove surface contamination of 10Be following the method described by Shimaoka et al. (2004). After the leaching, about five grams of rock powder was digested with HF, HNO3 and HClO4. Be was separated from other major and minor constituents of rocks. 10Be abundances were analyzed with an AMS at the Research Center for Nuclear Science and Technology in the University of Tokyo. Abundances of 9Be were analyzed with a ICPMS at ERI in the University of Tokyo.

10Be abundances of the samples from Oshima, Miyakejima and Niijima have been determined as 0.79-0.80, 0.61-1.26 and 0.78 million atoms/g, respectively. Our results are consistent with previously reported values. 10Be/9Be ratios are higher in the samples from Oshima than other two islands. While other abundance ratios between fluid mobile to fluid immobile elements, such as Ba/Th and (238U/230Th) shows clear across-arc decrease, 10Be/9Be ratio of a sample from Niijima was similar to those from Miyakejima. This may result from the relatively larger partition coefficient of Be between mineral and fluid than those of Ba and U, which decreases mobility of Be.