Temporal and spatial influence of Philippine Sea Plate on the composition of basaltic rocks from southern Kyushu, SW Japan arc ~ a study from boron analysis

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Boron is a suitable element to investigate the influence of subduction of oceanic crust on the composition of source materials, because it is enriched in sea floor sediments and altered oceanic crust (AOC). The AOC and sediments are possibly brought into the mantle as a part of a descending slab. Experimental results show that the slab releases hydrous fluids during dehydration at high pressures, and these slab-derived fluids may be added to the source mantle wedge. Thus boron contents of arc basalts are consistently higher than those of MORB and OIB.

We determined boron contents of basaltic lavas which erupted during the period from middle Miocene to Recent from southern Kyushu, and estimated the influence of Philippine Sea Plate on the compositions of lavas. The object of our research is to estimate the space-time variation of the subduction component influencing the source materials.

Our result showed that the basaltic rocks from southern Kyushu contain less boron than those from NE Japan arc. This is probably because the Philippine Sea Plate is younger than Pacific Plate. It has smaller amount of sea floor sediments and the degree of alteration of the oceanic crust is weaker than Pacific Plate. Therefore, the subduction component is smaller for Kyushu than for NE Japan.

Across-arc variation of the boron contents of source materials were investigated by comparing fore-arc basaltic rocks with back-arc ones. The former samples have higher B contents than the latter. This trend was observed for both Pleistocene and Recent periods. In southern Kyushu, the appearance of relatively high boron contents in basalts at the volcanic front is restricted to the period younger than 1Ma.

In southern Kyushu, middle Miocene volcanism is unrelated to subduction as shown by boron data. The subduction of the Philippine Sea Plate to southern Kyushu occurred much later than that. Subduction-related volcanism probably started around 1Ma at the volcanic front.