

Spatial variation of subduction component among volcanic rocks from Kyushu arc: The influence of Philippine Sea Plate

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We studied boron contents in volcanic rocks from Kyushu arc, and estimated the influence of Philippine Sea Plate on the composition of mantle beneath Kyushu. Spatial variation of subduction component among volcanic rocks from Kyushu arc suggested that the subduction of Philippine Sea Plate with different ages caused different modes of slab dehydration processes.

Volcanism in Kyushu island is associated with subduction of Philippine Sea Plate (PSP) under Eurasian plate. Kyushu-Palau Ridge, which subducts nearly at right angled to central part of Kyushu, marks the boundary between young (26-15 Ma) PSP in the north and old (60-40 Ma) PSP in the south. Thus volcanic rocks from Kyushu are good samples to test the compositional difference resulting from the subduction of oceanic plates with different ages.

We studied the difference in subduction component using boron element. The release of the fluid phase from the oceanic plate is believed to occur in two manners. One is by aqueous fluid at high temperature, and the other is by the dehydration process, i.e. the breakdown of hydrous phases at high pressures.

The across-arc variation as observed by B/Nb ratios in volcanic rock is almost absent in the northern Kyushu (NK), whereas it shows a gradual decrease in B/Nb from the volcanic front to the back-arc side in southern Kyushu (SK). In addition, the B/Nb ratio of rocks from the volcanoes at the volcanic front is relatively high in the SK (~5.1), whereas it is relatively low in the NK (~3.5).

The lack of lateral variation in subduction component in volcanic rocks from the NK indicates a possibility that the release of fluid phase is completed before the oceanic plate reaches the volcanic front. The relatively low number in B/Nb ratio also supports this hypothesis. The young age of oceanic plate suggests a high temperature gradient in the depth profile of the subduction plate. In contrast, the volcanic rocks from the SK show a normal across-arc variation of subduction component typically related with the subduction of relatively old and cold oceanic plate.

The highest B/Nb ratio of volcanic rocks from Kirishima is probably caused by the subduction of altered and H₂O-rich Kyushu-Palau Ridge.