

Origin and variability of Izu-Bonin-Mariana arc basement

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International Ocean Discovery Program Expedition 351 recovered basement of the Izu-Bonin-Mariana (IBM) arc in its rear arc area (Amami Sankaku Basin). $^{40}\text{Ar}/^{39}\text{Ar}$ dating of the low-Ti tholeiitic basalt basement gives a weighted average of 48.7 Ma (Ishizuka et al., 2018); this age overlaps those for basalt outcropping in the present-day IBM forearc (forearc basalts: 52- 48 Ma (Ishizuka et al., 2011) which were generated by seafloor spreading at the time of subduction initiation.

A similarity in age range and geochemical character (e.g., low Ti/V, highly depleted in incompatible elements compared to N-MORB) between the rear arc and forearc basalts implies the ocean crust newly formed by seafloor spreading during subduction initiation extended from fore- to reararc of the present-day IBM arc, i.e., most of the subsequent IBM arc stratovolcanoes formed on ocean crust which was produced immediately following subduction initiation, and not on significantly older oceanic crust. This raises possibility that the plate on which the IBM arc formed might not be purely oceanic, but the plate hosting the Mesozoic remnant arc terrane (the Daito Ridges) comprised the overriding plate at subduction initiation. This remnant arc terrane was rifted prior to the onset of spreading at subduction initiation.

It is still unclear whether this revealed origin of arc basement is applicable to the entire arc, i.e., arc basement might be variable along the IBM arc. R/V Hakuohmaru cruise (KH14-5) to the IBM forearc in Northern Mariana and Northern Izu aimed to investigate possible along-arc variation in initial arc crust stratigraphy due to the variation of origin and age of arc basement. Based on the spreading model of West Philippine Basin, northern part of ancient Mariana arc volcanoes might have formed on very young ocean crust of the West Philippine Basin while the basin was still spreading. If this is the case, it is expected that the initial arc crustal section in northern Mariana is distinct from other sections of the IBM arc. Dredge sampling in the northern Mariana forearc recovered a wide variety of volcanic rocks and mantle peridotites. Volcanic rocks include forearc basalts and boninites with the same age as those from other parts of the IBM forearc. This result implies that subduction initiation and subsequent seafloor spreading and nascent arc magmatism occurred almost contemporaneously along the entire length of the IBM at 52 Ma, and requires reconsideration of tectonic relationship between the IBM arc and West Philippine Basin.

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