

Oligocene IBM

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The Izu-Bonin-Mariana volcanic arc (IBM arc) system is an excellent example of an intra-oceanic convergent margin where the effects of crustal anatexis are considered to be minimal. However, Tamura et al. (2009) suggest that large volume of Quaternary rhyolites produced from the submarine calderas in the Izu-Bonin arc may be derived from Oligocene andesitic sources. Thus, the Oligocene arc could be recycled in the Quaternary, but many questions remain. For example, how does the present IBM arc assimilate the Oligocene paleoarc? Were there cross- and along-arc variations in the compositions of Oligocene magmas, similar to that we observe in the Neogene and Quaternary arc? How did the IBM arc evolve geochemically and petrologically from the Oligocene to the present?

Subduction to form the IBM arc initiated at about 50 Ma. The first mature arc, termed the Oligocene IBM arc, was stable until 30 Ma, at which point it began to break apart to form the Shikoku and Parece Vela back-arc basins. Yamazaki & Yuasa (1998) reported three conspicuous north-south trending long-wavelength magnetic anomalies in the IBM arc, which are slightly oblique to the present day volcanic front. The eastern-most anomaly correlates with the frontal arc highs, the western-most coincides with the Kyushu-Palau Ridge (the remnant arc), and the central anomaly lies at 139 degree E in the Izu rear arc. Yamazaki & Yuasa (1998) attributed all three to the loci of Oligocene magmatic centers, which are now covered by thick Neogene and Quaternary volcanic rocks and sediments.

The Oligocene IBM arc crust, however, exists below the present IBM arc. Kodaira et al. (2008) suggested that the seismic image of the Izu rear arc represents a paleoarc (Oligocene arc), which shows little effects from post-Miocene magmatism.

We will compile geochemical data from tephra and turbidites sampled during ODP drilling, and lavas from Kyushu-Palau ridge, Omachi seamount and Mariana forearc islands, to re-assemble and answer the outstanding questions regarding the Oligocene IBM arc.