

Paleo-arc arrangement during Eocene to Oligocene in Izu-Ogasawara forearc region revealed from seismic reflection survey

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The Izu-Bonin (Ogasawara)-Mariana (IBM) arc is known to be the typical oceanic island arc, and it is the most suitable area to understand the growth process of island arc. The IBM arc consists of several arrangements which were created by repetition of rifting and backarc spreading. Taylor (1992) identified Eocene and Oligocene paleo arcs located in the IBM forearc region by ODP drilling.

By previous seismic survey and deep sea drilling, convex basements are distributed along North-South direction in the present forearc region. The convex basements are reported to be formed during Eocene and Oligocene (Taylor, 1992). In the IBM forearc region, the middle crust with 6 km/s is recognized by seismic survey using OBSs. In the IBM region, four IODP drilling sites are proposed in order to understand the comprehensive growth process of arc and continental crust evolution (Tatsumi, 2008). Two of them are located in the forearc region.

Japan Agency for Marine-Earth Science and Technology (JAMSTEC) carried out a multi-channel seismic reflection survey using 7,800/12,000 cu.in. air gun and 5-6 km streamer with 444/204 ch hydrophones for understanding of crustal structure in the IBM region since 2004. JAMSTEC also conducted mini-MCS survey using 12 ch short streamer and 3,000 cu.in air-gun around the IBM region for linkage of volcanic sediments in 2007. We analyzed and interpreted these data in order to obtain the configuration of paleo-arc arrangement in the forearc region.

In the IBM forearc region, thick sedimentary basins distribute from the east side of the volcanic front. Two convex basement peaks are indicated in a cross profile of the forearc region. These peaks are estimated to be the top of the paleoarc (Eocene and Oligocene) by previous ODP drilling. We considered from MCS profiles that these peaks are continued along the current volcanic arc. The distance between the Eocene and Oligocene arcs is different along the NS direction. We also applied attribute analysis for the MCS profile to emphasize the reflection from the volcanic basement. The profile of reflection strength shows a clear peak of volcanic arrangement. By mapping the basement high beneath the sediments, we identified the volcanic arrangement between the Oligocene arc and Eocene arc. We discuss about the crustal evolution from these characteristics.