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Crustal structure of the Izu-Ogasawara intra-oceanic island arc

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Japan Agency for Earth-Marine Science and Technology (JAMSTEC) has repeatedly carried out seismic surveys since 2002 to understand crustal growth process using a multichannel seismic survey system (MCS) installed on R/V "Kairei" and R/V "Kaiyo" and ocean bottom seismographs (OBSs). Total length of these seismic lines is over 20,000 km. The Izu-Ogasawara has continental 6 km/s-layer inside despite of no continental collision since start of crustal growth (approximately 50 Ma). To enable to compare entire crustal structure of the Izu-Ogasawara arc, specifications of all seismic surveys should standardize. The seismic source is an airgun array system with total capacity of 12,000 cubic inches, which is composed of eight airguns with capacity of 1,500 cubic inches. A hydrophone streamer has 204 channels with a group interval of 25 m. Shot interval is 50 m. OBSs, which has three component velocity sensors and a hydrophone sensor, were deployed with an interval of 5 km. Data processing is also standardized and these are a tomographic inversion using first arrivals and a diffraction stack depth migration using reflection arrivals. In some cases, we employed a conventional 2-D ray tracing to construct simple layered structures. As the results, we understood distribution of arc crusts having a 6 km/s-layer, the structural commonalities and differences. In this arc, the crustal growth has two processes; one is crustal thickening by underplating basaltic magmas rising from subducting slab, and the other is crustal thinning by back arc opening. Beneath crustal thickening region, arc crusts has following structural commonalities; a thick middle crust with a velocity of 6 km/s, a thick lower crust with relative low velocity of 6.5-6.8 km/s, and a mantle with low velocity of 7.5-7.8 km/s. Such a crustal thickening region distributes beneath not only volcanic front but also forearc basin and rear arc side. On the other hand, the crustal thinning region has a thin middle crust and a lower crust with a high velocity of over 7 km/s. In this presentation, we will talk about these crustal characteristics paying attention to key elements, which are thickness of 6-km/s layer and velocity of the lower crust.

Keywords: Crustal structure, OBS, Izu-Ogasawara, arc growth