

Deep seismic profiling across the southern Izu-Ogasawara arc - backarc system

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It is known that an andesitic middle crust with P-wave velocity of 6 km/s exists in oceanic island arcs in the northern Izu-Ogasawara arc and Mariana arc areas deduced from the seismic surveys. This andesitic middle crust of an oceanic island arc is one of the key to probe crustal growth. Because the island arc generally is formed by a subduction between oceanic crusts with no andesitic materials and the andesitic materials are one of significant components within a continental crust. Until now, it is clarified that there is variation of a distribution of the andesitic middle crust in the Aleutian arc and Tonga arc areas. Crustal growth of oceanic island arc seems to be controlled by many parameters of a subduction factory, which are crustal age, the background tectonics, heterogeneity of the mantle structure and so on. According to history of the Izu-Ogasawara-Mariana arc, after the initial arc forming in Eocene, a backarc opening during 30-15 Ma and volcanism in Miocene, current volcanism in Quaternary have occurred. Because a southern Izu-Ogasawara arc has separated Eocene arc (Ogasawara ridge), this arc-backarc system is one of best regions to investigate relationship between the crustal structure and the age. However, there are no wide-angle and MCS seismics to investigate whole arc-backarc system.

Japan Agency for Marine-Earth Science and Technology (JAMSTEC) carried out a multichannel reflection seismics (MCS) and a wide-angle seismics. A seismic line for wide-angle seismics runs from the Ogasawara trench axis to the central Shikoku basin through the Ogasawara ridge, the Ogasawara trough, the current volcanic front, the Sofugan tectonic line, Miocene volcanoes and the Kinan seafloor cliff. A length of this line is about 580 km. A MCS line was extended to the west Philippine Sea through the Kyushu Palau ridge, and the length is about 1000 km.

We carried out the MCS using R/V Kairei of JAMSTEC in December, 2004. The control sources are an airgun array with a capacity of 12,000 cubic inches, and the shot interval is 50 m. The seismic signals from 204-channel streamer are recorded with 4 msec sampling and the record length of 15 sec. This MCS section shows some remarkable events, which are the Moho reflections beneath the Shikoku basin, some inclined faults toward east as a part of the Sofugan tectonic line, basements and deeper events seen at 9-10 sec bsl beneath the Ogasawara trough, a boundary event between an arc crust and a serpentinite diapir and a subducting oceanic crust. It is confirmed that the Sofugan tectonic line reaches to a depth of about 9 sec bsl.

Then, we also conducted the wide-angle seismics using R/V Kaiyo of JAMSTEC and 110 ocean bottom seismographs (OBSs) in February, 2005. An airgun array with capacity of 12,000 cubic inches was adapted as a control source. The shot interval was 200 m.

In this presentation, we introduce the MCS section and OBS records and report a preliminary velocity model.