

OBS seismicity observations for crustal structure analysis in Northern Izu-Bonin arc

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The Izu-Bonin Island arc is an oceanic island arc, where the Pacific plate subducts beneath the Philippine Sea plate. Recent active seismic surveys in the Izu-Bonin arc show significant variations of the thickness of the middle crust along the volcanic front [Kodaira et al, 2006]. The thickness of the middle crust shows an inverse correlation with the average P-wave crustal velocity and the SiO₂ composition of the Quaternary volcanoes along the arc. To understand the crustal evolution in the oceanic island arc, we have to clarify structures in the mantle wedge along the arc in addition to the oceanic island arc crust. However, seismic surveys using control sources, such as an airgun array, is difficult to image structures below the island arc Moho. We conducted seismicity observations to investigate structure variations in northern Izu-Bonin arc using natural earthquakes. A temporal ocean bottom seismograph (OBS) network consists of 40 pop-up type OBSs with a three-component short-period (4.5Hz) seismometer was deployed in April 2006 between Tori-shima and Hachijo-jima islands. These OBSs were retrieved in July after about 80-day observations. We used continuous seismic data at 36 OBSs and three F-net and Hi-net seismic stations on Hachijo-jima and Aoga-shima islands operated by National Research Institute for Earth Science and Disaster Prevention.

During the observation period, about 1600 earthquakes were located based on the 1D velocity model. These earthquakes clearly show the double seismic zone along the subducting Pacific plate. Using the arrival time data of these earthquakes, we estimated P- and S-wave seismic velocity structures based on the tomography method by Kamiya and Kobayashi [2000]. We used about 17000 P- and 18000 S-wave arrival time data of about 1300 earthquakes. The estimated structure model shows variations in the mantle along the volcanic front. For examples, P-wave velocity (V_p) in the mantle wedge has lower velocity at the Sumisu-jima. On the other hand, the mantle wedge at South Hachijo Caldera has higher V_p. Compare to the crustal structure along the volcanic front [Kodaira et al., 2006], low V_p anomaly in the mantle correspond to the thick island arc crust due to the thick middle crust with V_p of 6.0-6.8km/s.