

The seismic structure of the northern Izu-Ogasawara arc-rifting zone-backarc system

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We carried out a deep wide-angle seismic experiment using a large airgun array with total capacity of 12,000 cubic inches and 110 ocean-bottom seismographs (OBSs) in the northern Izu-Ogasawara arc area. The experiment was conducted on the R/V Kaiyo of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) during 5 October – 2 November 2005 (KY05-11 cruise). An airgun-OBS seismic line (IBr6) extends from Izu-Ogasawara trench, forearc basin, volcanic front, the Sumisu rift (1~2Ma), the Nishi-Shichito ridge to the Shikoku basin. Objectives of this profile were to determine the velocity structure of the entire arc-rift zone-backarc system and the relationship of rifting structure and the heterogeneity of uppermost mantle structures.

In the provisional result of the tomographic inversion and a reflection wave mapping, the middle crust is distributed in the rift zone from the east of the volcanic front to the Nishi-Shichito ridge. In the forearc region, thickness of middle crust is about 5km and P wave velocity of middle crust is about 6.5km/s. Reflectors are in the upper and lower sides of a layer. This velocity is higher than the rift zone, and more similar to the Ogasawara ridge. In the rift zone, thickness of middle crust is about 3km and it becomes thinner in the Smith rift. P wave velocity of middle crust is about 6.0 - 6.5km/s. The upper part of the lower crust is distributed in the rift zone and the thickest part is about 5km in the Sumisu rift. P wave velocity of the upper part of the lower crust is about 6.5 - 7.0 km/s. The high velocity lower crust, P wave velocity is about 7.0 - 7.5 km/s, is underneath the upper part of the lower crust and it is distributed from the western part of the Sumisu rift to the eastern side of the Nishi-Shichito ridge. Reflectors are in the lower sides of a layer. P wave velocity of mantle under the Sumisu rift is about 7.5km/s, and it is more intentionally slower than P wave velocity 8km/s of typical oceanic mantle. High-velocity layer, P wave velocity is about 8 km/s, located under the Nishi-Shichito ridge. Reflectors locate the lower part of High-velocity layer and the depth decreases towards the Kinan escarpment.