Crustal structure around the Oki-Daito Escarpment

Mitsuhiro Oikawa[1]; Azusa Nishizawa[2]; Kentaro Kaneda[3]; Yasutaka Katagiri[1]; Junzo Kasahara[4]

[1] Hydrographic and Oceanographic Dept. of Japan; [2] Hydrogr. & Oceanogr. Dep., JCG; [3] HODJ; [4] JCSS

http://www1.kaiho.mlit.go.jp/

The Oki-Daito Escarpment (ODE) is located at about 250 km south from the Oki-Daito Ridge. The ODE is in the northern part of the West Philippine Basin which accounts for the west half in the Philippine Sea. A southerly facing WNW-ESE escarpment is named the Lapu-Lapu Ridge (anomaly) by Mrozowski et al. [1982] and the ODE by Ohara et al. [1997]. The topographic fabric to the south side of the ODE is in NW-SE direction, and to the north side is in N-S direction.

Kasuga and Ohara [1997] proposed the ODE is a large normal fault formed by the post-spreading deformation of the back-arc basin oceanic crust along the mechanical boundary between buoyant active island arc and isostatically sinking inactive back-arc basin. Therefore, crustal structure is inferred to be different between to the north and to the south of the escarpment.

In the former experiment in 2004, we obtained a crustal velocity model of the seafloor to the north area of the ODE, and two characteristic features exist in that model: a low velocity layer in the lower crust and a very high velocity layer of 8.6 km/s at about 2 km below the Moho.

In 2005, new wide-angle seismic refraction and reflection exploration was performed in order to clarify interesting velocity structure in the 2004 model. We used a non-tuned 6000 inch3 airgun array every 200 m (90 sec) firing for refraction and reflection experiments and a non tuned 700 inch3 every 80 m (20 sec) firing for reflection experiments. A 200 m single channel streamer cable was used as the reflection seismic receivers.120 Ocean Bottom Seismographs (OBS) were deployed at an interval of 5-7 km. The velocity model was estimated by a tomographic inversion and two-dimensional ray tracing.

The seismic reflection section shows that the unconsolidated sediments exist along the line at constant thickness of about 0.2 second (T. W. T.) except for the unevenness topographic areas. Therefore, the seafloor and the acoustic basement are parallel. A lot of faults can be found in E-W line crossing the topographic fabrics. On the other hand, a few faults are shown in the N-S line parallel to the fabrics.

First arrivals on the OBS records in the N-S profile are clearly detected over an offset distance of 150 km. However, first arrivals can be observed only within about 100 km in the E-W profiles. We can not observe high velocity layer of 8.6 km/s at the uppermost mantle recognized in the 2004 experiments.