Deep seismic structure in the margin of the southwestern Japan Sea off Tottori by Ocean Bottom Seismographic Expedition

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Deep seismic structure model across a subduction zone including the island arc and back-arc basin enables us to infer the geometry of the subducting plate, the deep structure in the seismogenic zone and the formation process of the island arc in the southwestern Japan arc, from an integrated wide-angle seismic survey in 1999, it is imaged that a subducting seamount is colliding with the arc and that it may have controlled the rupture process of the 1946 Nankaido earthquake (Kodaira et al., 2000). However, there are few seismic structure surveys from the Japan island arc to the back-arc basin in the Japan Sea. The purpose of this study is to reveal detailed information about the geometry of the subducting Philippine Sea plate and the transitional structure, which is concerned with the formational process of the Japan Sea. In August to September of 2002, an integrated onshore-offshore wide-angle seismic survey was carried out from the Shikoku Island to the southwestern Japan Sea off Tottori (Oki Trough, Oki Ridge and the southwestern Yamato Basin). The offshore survey line is a 170-km long line from off Tottori toward the southwestern Yamato Basin. Thirty-five ocean bottom seismographs (OBSs) were deployed every 6km along the offshore line and an airgun array (12,000 cubic inch) was used for controlled source. Also, multi-channel seismic (MCS) reflection survey was conducted on the line, simultaneously. In this presentation, we report a two-dimensional deep seismic structure beneath the southwestern Japan Sea off Tottori of the offshore line.

The OBSs and MCS recorded signals from an airgun array with high signal-to-noise ratio in the entire offshore survey line. On MCS profile, the acoustic basement is obvious in the southwestern Yamato Basin and not obvious in the Oki Trough. On OBSs record sections, first refraction phases, which are interpreted as refractions from the uppermost mantle, appear greater than 75 km and latter phases which are interpreted as reflections from the Moho and appear greater than 40 km.

We determined the shallow structure using MCS profile, tau-p method (Shinohara et al., 1994) and forward 2-D ray tracing (Cerveny et al., 1977; Hirata and Shinjo, 1986). The thickness of the sedimentary layer is about 1-1.5 km in the southwestern Yamato Basin and 0.3 km in the Oki Ridge, respectively. And, the P-wave velocity of the basement is about 3.1 km/s in the Basin. This sedimentary layer in the southwestern Yamato Basin is supposed to be similar to that in the western Yamato Basin (Kurashimo et al., 1996) and is interpreted as marine sediments from lower Miocene to Quaternary (Leg 127 Shipboard Scientific Party, 1990). The thickness of the crust beneath the southwestern Yamato Basin can be estimated about 12-14 km from the preliminary analysis. It is supposed that Moho deepens towards the southwestern Japan island arc.