Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SCG062-04 Room:IC Time:May 27 11:30-11:45

Seismic velocity image off Awa-shima island, Niigata, deduced from the seismic refraction/wide-angle reflection survey

Takeshi Sato[1*], Tetsuo No[1], Narumi Takahashi[1], Shuichi Kodaira[1], Yoshiyuki Kaneda[1]

[1]JAMSTEC

In the eastern margin of the Japan Sea, some destructive earthquakes occurred and the fault-fold belts developed by the deformation of the extension by the opening of the Japan Sea during the early Miocene and the shortening since the late Pliocene (e.g., Sato, 1994). However, it is unknown to the relation between the mechanism of the deformation including the concentration of this shortening and the occurrence of these earthquakes in fault-fold belts in this margin. To understand this mechanism and this relation, it is need to clarify the crust and uppermost mantle structure from the area without this shortening to the fault-fold belts in this margin. For this study, we present the seismic velocity image in the crust and uppermost mantle from the Yamato basin off Awa-shima island, Niigata, to the south of this island including the source area of the 1964 Niigata Earthquake in this margin deduced from the offshore seismic data.

In 2010, the offshore seismic refraction/wide-angle reflection survey using 58 ocean bottom seismographs (OBSs) and a tuned air-gun array (7,800 cu. inch) was conducted in off Awa-shima island, Niigata, ranging from the Yamato basin, Sado ridge to the Awa-shima uplift zone in the south of this island. The survey line has about 300 km length and runs across the source area of the 1964 Niigata Earthquake. In record sections of several OBSs and land stations, not only the first arrived phases but also later phases reflected from interfaces in the crust and uppermost mantle are visible. In this study, to obtain seismic velocity image and reflection image in the crust including sediments and uppermost mantle, we used a seismic refraction tomography using first-arrival phases (Zhang et al., 1998) and a diffraction stack migration approach using picked reflection travel times (Fujie et al., 2006).

The crustal thickness of the Yamato basin off Awa-shima is about 18 km. This thickness is similar to that off the northwest Sado-ga-shima island. In these areas in this basin, the character that the upper and middle crust is thinner than the lower crust also resembles. In the Sado ridge, the crust is estimated as having about 24 km. The upper and middle crust of the Sado ridge is thicker than that of the Yamato Basin. The P-wave velocity in the lower crust beneath the Sado ridge shows slightly higher than that in the surrounding area of this ridge. In the south of Awa-shima island, the P-wave velocity in the sedimentary layer and the upper part of the upper crust has a large lateral variation. This variation may correspond to the geologic structure in the Awa-shima uplift zone.