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Seismic velocity image from off Sado Island to Nishi-Aizu area deduced from seismic refraction/reflection surveys

Takeshi Sato[1*], Tetsuo No[1], Narumi Takahashi[1], Shuichi Kodaira[1], Yoshiyuki Kaneda[1], Hiroshi Sato[2]

[1]JAMSTEC, [2]ERI, Univ. of Tokyo

In the eastern margin of the Japan Sea, some large earthquakes occurred (e.g., the 2007 Niigataken Chuetsu-oki Earthquake). In the area, 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 large earthquakes in the eastern margin of the Japan Sea. To understand this mechanism, it is need to clarify the crust and uppermost mantle structure from the undeformed area to the deformed one in this margin. For this study, we present the seismic velocity image in the crust and uppermost mantle from off the northwestern Sado Island, Sado Island, Sado strait, Niigata Plain, to Nishi-Aizu area in this margin deduced from the onshore and offshore wide-angle seismic data. In 2009, the offshore seismic refraction/reflection survey using 30 ocean bottom seismographs (OBSs) and an airgun array (12,000 cu. inch) was conducted in off the northwestern Sado Island ranging from the Yamato basin, Hakusan-se to the Toyama trough, and the Sado strait. And, the onshore seismic refraction/reflection survey using controlled sources was conducted from Sado Island to Nishi-Aizu in the northeastern Japan arc (Sato et al., this meeting). The lines of these surveys compose a onshore-offshore wide-angle seismic survey line from off the northwestern Sado Island to Nishi-Aizu area. 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 the seismic refraction tomography using first-arrival phases (Zhang et al., 1998) and reflection travel-time mapping method (Fujie et al., 2006). The crustal thickness of the Yamato basin is about 18 km. This thickness is neither that of a typical oceanic crust nor that of a typical continental crust. The upper and middle crust is thinner than the lower crust in the Yamato basin. In the Hakusan-se which is the topographic high, the crust has about 25 km, and is thicker than that of the Yamato basin. From the Yamato Basin to Hakusan-se, the upper and middle crust thickens steeply, however, the lower crust thickens gently. In the Toyama trough, the crust has thickness of about 20 km and this thickness is thinner than that of Hakusan-se and Sado Island. And, the sediment is thick in this trough. Besides, the crustal thickness in Sado Island is estimated as about 30 km.