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# Seismic velocity image off the northern Oga Peninsula in the Japan Sea, deduced from the offshore seismic survey

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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 late Oligocene and the shortening since the late Pliocene (e.g., Sato, 1994). However, it is unknown to the relation between the occurrence of these earthquakes and the crustal structures including active faults and folds developed by these deformations in fault-fold belts in this margin. To understand this relation, it is need to clarify the crustal structure from basin areas without this shortening in the Japan Sea (Japan and Yamato Basins) to the fault-fold belts in this margin. For this study, we present the seismic velocity image in the crust from the southern tip of the Japan Basin to off the northern Oga Peninsula across the source area of the 1983 Nihonkai-Chubu Earthquake in this margin deduced from the offshore seismic data using ocean bottom seismographs (OBSs).

In 2011, the offshore seismic refraction/wide-angle reflection survey using 55 OBSs and a tuned air-gun array (7,800 cu. inch) was conducted from the southern tip of the Japan Basin to the continental shelf off the northern Oga Peninsula where Awashima-Oga fault belts locates (Okamura et al., 1998). This survey line has about 283 km length and runs across the source area of the 1983 Nihonkai-Chubu 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. To obtain seismic velocity image and reflection one in the crust including sediments and uppermost mantle below this line, 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 southern tip of the Japan Basin is about 9 km. This crust is thinner than those of the Yamato Basin off the northwest Sado-ga-shima island and Awa-shima island. The crust exhibits a quite uniform thickness in the basin area with water depths greater than 3000 m. However, this thickens gently to the land from the area at the water depth of 3000 m. This area where this crust is thickening may correspond to the active fault zone locate to the southwest part of the Okushiri Ridge (Okamura et al., 1998). In the source area of the 1983 Nihonkai-Chubu Earthquake, the crustal thickness is about 19 km and the Moho lies at the depth of about 21 km. Moreover, the P-wave velocity below this area has an anomaly compared to the surrounding area. The boundary of the south-eastern side of this anomaly area may correspond to the fault plane of the 1983 Nihonkai-Chubu Earthquake. In the continental shelf area where active faults and folds have developed, the sedimentary layer and the upper crust have large lateral variations.