

Deformation structure in the eastern margin of the Japan Sea observed using seismic reflection data

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Large earthquakes have occurred along the eastern margin of the Japan Sea. For example, the 1964 Niigata earthquake (M 7.5), the 1983 Nihonkai-Chubu earthquake (M 7.7), the 1993 Hokkaido-Nansei-Oki earthquake (M 7.8), and the 2004 Mid-Niigata Prefecture earthquake (M 6.8) caused great damage along the eastern margin. Furthermore, on the basis of a geophysical and geological study, Ohtake et al. (2002) proposed that the concentration of a large strain rate was recognized along the coast of the Japan Sea, explaining the concentration of large historical earthquakes and active faults in this area.

The 2007 Niigata-ken Chuetsu-oki earthquake was also located in a belt of strain concentration along the Japan Sea coast. Using R/V Kairei of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), a multichannel seismic reflection (MCS) survey was conducted to investigate the tectonic structure off Niigata that caused the 2007 Niigata-ken Chuetsu-oki earthquake. Remarkable development of an asymmetric fold structure, including fault-related folds, was identified from the localized strain concentrations near the source region. In comparison with the aftershock distribution reported by Shinohara et al. (2008) and The Headquarters for Earthquake Research Promotion (2008), most aftershocks were considered to occur below about 7 km, which corresponds to the 6.0-km/s layer, and a single plane with a dip to the southeast, indicated by the aftershock distribution, was correlated with deformation of the fold structure. Imaging by a seismic reflection survey provides very important information for the study of relationships between short- and long-term deformations.

We plan to acquire active source seismic data, including multichannel seismic reflection, refraction, and wide-angle reflection data, using R/V Kairei and Kaiyo in the eastern margin of the Japan Sea from 2009 to 2012. To plan the survey and perform a preliminary study in the eastern margin of the Japan Sea, we designed a database based on previous multichannel seismic reflection data of JAMSTEC and JOGMEC. We report preliminary interpretations based on the database, from which we extracted information on the deformation of the sedimentary and basement structure in the eastern margin of the Japan Sea.