

Offshore active faults around Japan -recent earthquakes and survey-

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More than hundred active faults have been surveyed after the 1995 Hyogo-ken Nanbu (Great Hanshin) earthquake to date their rupture events. Most of these surveyed faults were selected from the active faults that were known in 1995, and they do not include offshore active faults except those in bay areas. In 2007, Noto-Hanto and Chuetsu-oki earthquakes occurred by the rupture of offshore active faults that were not well known, and caused sever damages along the coastal area. These two 2007 earthquakes strongly suggested that we do not know about offshore hazardous active faults near coasts.

The reason we had not conducted enough survey of offshore active faults was that survey methods were not established. Seismic profiling survey is the most important data that provide locations and structure of active faults, however it was not easy to obtain high-quality high-resolution profiles under the shelves along the coast facing Pacific Ocean and Japan Sea. High frequency profiling systems which provide high-quality seismic profiles in bay areas are not available in those open sea areas. We have developed a seismic profiling system which consists of a boomer as seismic source and 12 channel streamer. The survey system is portable and can be equipped on small boats or fishing boats, which makes it possible to obtain seismic data in very shallow seas close to coasts. In addition, the quality of the profiles was largely improved.

The multi-channel system was used first for the survey of the offshore active fault that caused the 2007 Noto Hanto earthquake. The stacked profiles clearly showed deformation in Holocene sediments due to the displacement of active fault. Before the earthquake, only a part of the active fault was reported by Katagawa et al. (2005) based on the sparker seismic profiles, but they underestimated the earthquake risk of the active faults because of low-resolution of the data. The new multi-channel system profiles showed that the fault slipped several times during the period of the last 18,000 years and continues more than 20 km.

In the source area of the 2007 Niigata-ken Chuetsu-oki earthquake, the boomer multi-channel profiles indicated that the erosional surface during the last glacial age has been deformed forming an anticline about 30 km long. however, its event history was not revealed because of the lack of the Holocene sediment. The anticline was shown in the marine geological map (Okamura, 1994) based on air gun seismic data before the earthquake, but it is not clearly understood that the structure generate the large earthquake.

After the two earthquakes, Geological Survey of Japan conducted offshore geologic survey 2008 along the northern coast of the Noto Peninsula in 2008 and off Niigata area in 2009. In addition, Ministry of Education, Culture, Sports, Science and Technology (MEXT) started offshore active fault surveys from 2009 and consigned surveys of 10 active faults to Geological Survey of Japan in 2009 and 2010. These survey results will be summarized.