Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SCG088-01 Room: 302 Time: May 28 09:00-09:15

Crustal structure in Toyama Trough and Yamato Basin studied using seismic reflection data

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In the second half of the 1990s, we have carried out crustal structure imaging in the seismogenic zone of the Nankai Trough and the Japan Trench and have contributed to the seismic exploration of this region. Although large earthquakes affecting serious damages have often occurred along the eastern margin of the Japan Sea in recent years, we do not have sufficient seismic exploration data about the seismogenic zone.
We plan to acquire active source seismic data, including multichannel seismic reflection, refraction, and wide-angle reflection data, along the eastern margin of the Japan Sea until 2012 using R/V KAIREI and R/V KAIYO. From July 2009 to August 2009, we have conducted a multichannel seismic reflection (MCS) survey in the Toyama Trough and Yamato Basin using R/V KAIREI and R/V KAIYO of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC).
Through this observation, we have investigated not only the deformation structure of the sedimentary layers but also the crustal structure under basement and have studied the tectonic history and seismic tectonics in the survey area. Moreover, in order to accurately determine the spatial distribution of reflections from each seismic line, we have reprocessed and interpreted the seismic data of the Japan National Oil Corporation around our survey lines.
As observed from preliminary results, the sedimentary layer gradually thickens eastward in the Yamato Basin. The basement of the Yamato Basin is highly deformed by structural features such as knolls. Low-frequency reflections are observed in the crust (about 6 s two-way travel time [TWT]) of the Yamato Basin. Although the thickness of the sedimentary layer off the northern Noto Peninsula is relatively thinner than that in the Yamato Basin and the Toyama Trough, asymmetrical folds and faults are identified in some parts of the deposits along the survey lines. In the Toyama Trough, the southern part of the survey area, sedimentary layers and basement dip eastward. In particular, the basement dips rapidly by about 1?2 sec [TWT] from the Toyama deep -sea channel about 10 km east, and the basement produces a low-frequency image and becomes ambiguous. On the other hand, although the basement does not dip rapidly in the north side of the survey area, it is highly deformed. The thickness of the sedimentary layer in the Toyama Trough gradually increases northward. The Moho and several coherent strong reflections are identified under the basement of the Toyama Trough. The most remarkable deformation structures in the entire survey area are a sedimentary basin located between the Toyama Trough and Hakusan-se and recently formed asymmetrical folds and faults.

Keywords: Multichannel seismic reflection survey, The eastern margin of the Japan Sea, Toyama Trough, Yamato Basin, High strain rate zone