Multichannel seismic reflection imaging off western Hokkaido, Japan Sea, using the R/V *Kaimei*

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Since 2013, we have performed marine seismic surveys in the Japan Sea as part of the “Integrated Research Project on Seismic and Tsunami Hazards Around the Sea of Japan”. In the summer of 2017, we conducted a survey to study the crustal structure of the area between the continental shelf off western Hokkaido and the Japan Basin. In this area, the existence of active faults has been presumed, particularly around the Ishikari Basin, the Musashi Basin, and the Okushiri Ridge. Recent seismic activity has also been recognized, mainly around the Okushiri Ridge and the Ishikari Basin. Among the large earthquakes in the area, the 1940 Shakotan-oki earthquake (M_J 7.5) is the most well-known. This earthquake is significant due to its relationship with the 1983 Nihonkai-Chubu (M_J 7.7) and the 1993 Hokkaido Nansei-oki (M_J 7.8) earthquakes. However, since it occurred about 80 years ago and its hypocenter was located about 200 km offshore, there is disagreement among previous studies as to its source fault model. We believe that the crustal structure data derived from our survey can improve the accuracy of studies on source fault models and seismotectonics off western Hokkaido.

We conducted our seismic survey using the 2-D multichannel seismic (MCS) system of the R/V *Kaimei*. The seismic system of this ship has two important features. First, its receiver interval is narrower than that of general multichannel seismic reflection systems. As a result, seismic data which is obtained by this system is able to operate effectively for processing waveform data of spatial direction, such as the suppression of spatial aliasing, migration, and velocity filter. Second, it is possible to change the cable length at sea during the cruise, because the vessel has four streamer cable winches. Thus, although we set the standard cable length at about 6 km, we changed the length to 3 km or 300 m when surveying in coastal areas. The main data acquisition specifications for our survey, other than the cable length, are as follows: The shot spacing was 50 m or 25 m. The tuned air gun array in this survey used a maximum capacity of 5,300 cu in (approximately 86 L) and comprised 22 air guns. The standard air pressure was approximately 2,000 psi (approximately 14 MPa). The air gun array was kept 10 m below the sea surface throughout the experiment. The towing depth of the streamer cable was maintained at 12 m below the sea surface using depth controllers.

We present the results obtained by MCS imaging off western Hokkaido, and report the relation of these results to the presumed active faults and crustal structures of other researches in the survey area.

Keywords: Japan Sea, off western Hokkaido, seismic reflection imaging, 1940 Shakotan-oki earthquake, R/V Kaimei

