

## Experiment on seismic reflection profiling of crustal structure by changing towing depth of streamer cable

Tetsuo No<sup>1\*</sup>, Satoshi Shimizu<sup>2</sup>, Shuichi Kodaira<sup>1</sup>, Narumi Takahashi<sup>1</sup>

<sup>1</sup>IFREE, JAMSTEC, <sup>2</sup>Nippon Marine Enterprises

After the 1995 Hyogo-ken Nanbu earthquake, which caused serious damages, many seismic explorations have been carried out around active faults and plate boundaries. Furthermore, the Integrated Ocean Drilling Program (IODP) expedition of the deep-sea drilling vessel "Chikyu" has been carried out in the Nankai Trough since 2007. Thus, the importance of seismic reflection imaging in not only the sedimentary layers but also the deep crustal structure is increasing. In general, although seismic reflection imaging is advantageous for imaging sedimentary layers and shallow structures, it is not necessarily the best technique for imaging the crust under the sedimentary layers in a seismogenic zone. In order to progress with research on seismogenic zones by carrying out seismic exploration, it is necessary to obtain clear images of both sedimentary layers and deep crustal structures. Recently, some studies have been carried out by changing the towing depth of airgun arrays and streamer cables in order to obtain better images of deep crustal structures (e.g., White et al., 2008, Singh et al., 2009). In petroleum exploration, a new technique called over/under towed-streamer acquisition has been employed to carry out broadband imaging by towing several streamer cables at different depths (e.g., Moldoveanu et al., 2007).

Since 2009, we have carried out crustal structural imaging experiments by towing a streamer cable at different depths using the seismic reflection system onboard R/V KAIREI.

The 2009 experiment was conducted around the Toyama Trough. The purpose of this experiment was to obtain deep crustal images of the faults and folds formed around the high strain rate zone along the eastern margin of the Japan Sea. In this experiment, the towing cable depths were 12 m and 21 m. The ship in these surveys was the same direction. Data acquisition was carried out using 130-liters (7800 cu.in.) airguns with a shot spacing of 50 m and a 444-channel streamer cable with a group interval 12.5 m. The maximum offset was 5600 m. Seismic reflections with a length of 15 s and sampling interval of 2 ms were recorded. During the survey, the weather and sea conditions were normal and the ocean currents were weak; therefore, the data quality of this exploration was good.

The 2010 experiment was conducted in the Sagami Bay. The purpose of this experiment was to obtain the crustal images of the subducting Philippine Sea Plate and faults. In this experiment, the towing cable depths were 10 m and 17 m. The direction of the ship in this survey was same. Data acquisition was carried out using 130-liters (7800 cu.in.) airguns with a shot spacing of 37.5 m and a 360-channel streamer cable with a group interval 12.5 m. The maximum offset was 4600 m. Seismic reflections with a length of 15 s and sampling interval of 2 ms were recorded. During the survey, the weather and sea conditions were normal and the ocean currents were weak; therefore, the data quality of this exploration was good.

Keywords: Seismic reflection profiling, Deep crustal structural imaging, Ghost reflection