Seismic crustal structure of the southernmost Kuril trench by Airgun-OBS seismic profiling

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In the southeastern coast off Hokkaido, Japan, several great earthquakes occurred repeatedly due to subduction of the Pacific plate [e.g. the 1952 Tokachi-oki earthquake (Mw=8.2), the 1973 Nemuro-oki earthquake (Mw=7.8) and the 2003 Tokachi-oki earthquake (Mw=8.2)]. It is considered that the next large earthquake will occur at the source region of the 1973 Nemuro-oki earthquake in the near future because a low seismic activity has been found in the offshore region of the Nemuro peninsula. In this region, we performed a seismic survey across the coseismic rupture areas of the 2003 Tokachi-oki earthquake and 1973 Nemuro-oki earthquakes and the afterslip area of the 2003 Tokachi-oki earthquake parallel (profile-A) and perpendicular (profile-B) to the Kuril trench using Ocean Bottom Seismometers (OBSs). The main purpose of this study is to understand the relation between crustal structure and recurrence of large earthquakes. In profile-A, 19 OBSs were deployed at a spacing of about 10km and three 25 liter air-guns were fired every 90 seconds which corresponds to a shot interval of about 230m. In profile-B, 11 OBSs were deployed at a spacing of about 11km and two 25 liter airguns were fired every 60 seconds which corresponds to a shot interval of about 150m.

In profile-A, the sedimentary layers consist of three layers with velocity of 1.50-1.75, 1.80-2.85, and 3.00-4.30 km/s. Thickness of island arc crust is about 15-20 km and heterogeneous velocity structure was confirmed in profile-A. The P-wave velocity is higher in the eastern side than the western side of this profile. In profile-B, the crustal model comprises the sedimentary layer, the island arc crust, the subducting oceanic crust, and the uppermost mantle. The sedimentary layers form a sedimentary wedge. This model is consistent with previous study (Nakanishi et al.,2004).

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