Seismic crustal structure around the asperity regions along the southern Kuril trench revealed by Airgun-OBS seismic profiling

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In the southeast off Hokkaido region, Japan, large earthquakes have occurred repeatedly with temporal and spatial regularities along the Kuril trench due to the subduction of oceanic plates [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)]. Because a low seismic activity has been found in the offshore region of the Nemuro peninsula, it is considered that the next large earthquake will occur at the source region of the 1973 Nemuro-oki earthquake in the near future. Several seismic surveys were conducted at the profiles parallel and perpendicular to the trench axis in this area [e.g. Nakanishi et al. (2004), Azuma et al. (2006)]. Azuma et al. (2006) revealed the relation between the crustal structure and the afterslip distribution of the 2003 Tokachi-oki earthquake along the southern Kuril trench. In this study, we focus on the relation between the crustal structure and the asperity region of the 1952 Tokachi-oki earthquake, 1973 Nemuro-oki earthquake, 2003 Tokachi-oki earthquake and afterslip distribution of the 2003 Tokachi-oki earthquake by estimating the seismic structure around the plate boundary deeper than that estimated by Azuma et al. (2006).

The airgun-OBS seismic profiling was conducted during May-June in 2006. The experiment was performed by M/V Kaiko-maru No.5, Offshore-Operation Co., Ltd. We conducted the experiment to obtain the detailed crustal seismic velocity structure around the plate boundary, detect the lateral variation of the crustal structure across the asperity and afterslip areas and reveal the geometry of the subducting Pacific Plate. In this experiment we acquired the seismic refraction and wide-angle reflection data at two profiles. One is parallel to the trench axis (profile-A) and another is perpendicular to the trench axis (profile-B). In profile-A, 16 Ocean Bottom Seismometers (OBSs) were deployed with the spacing of 10-20 km. Three airguns with volume of 25 liters were fired every 90 seconds, which correspond to the shot interval of about 230m. In profile-B, 6 OBSs were deployed with the spacing of 11-22 km. Two airguns with volume of 25 liters were fired every 60 seconds which correspond to the shot interval of about 150m. Single channel seismic reflection date ware also acquired to obtain the accurate seafloor image and reveal the fine structure of the shallow sedimentary layers. In this presentation, we report on the preliminary result of the analyses.