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千島海溝・日本海溝会合部周辺での地殻構造不均質と2003年十勝沖地震破壊域、余効変動域との関係

Lateral crustal heterogeneity and its relation to spatial distribution of afterslip of the 2003 Tokachi-oki earthquake

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In the area off southeastern coast of Hokkaido, Japan, a collision between the Kuril arc and the Northern Japan arc is in progress due to the oblique subduction of the Pacific Plate. Around this region, several large interplate earthquakes have repeatedly occurred; the 1952 Tokachi-oki earthquake (Mw=8.1), the 1968 Tokachi-oki earthquake (Mw=8.5), and the 2003 Tokachi-oki earthquake (Mw=8.0). For the 2003 Tokachi-oki earthquake, there have been many studies on spatial distribution of coseismic slip and afterslip (e.g. Yamanaka and Kikuchi, 2003; Ozawa et al., 2004; Miyazaki et al., 2004). These results indicate the afterslip region does not overlap with the coseismic slip region, and surrounds the asperity. Machida et al., (2009) compared the northeastern side of the coseismic slip region with its overriding plate, and they indicated that the trench-parallel velocity heterogeneity in the landward plate could be a principle factors in controlling the rupture area of the 2003 Tokachi-oki earthquake. However, the correlation in the southwestern side of the region is not still understood. In order to understand the relation, we performed a seismic refraction and reflection survey using Ocean Bottom Seismometers (OBSs) in the southwest side of the rupture area in 2007. In this survey, two profiles are parallel to strike of the northern Japan Trench. Length of both profiles has about 160 km. Along these profiles, 33 OBSs were deployed at a spacing of 10 km and three 25 liter airguns were fired every 110 seconds. We estimated P-wave velocity models using first arrival tomography method, then, reflective boundaries were estimated using later phases. The estimated models show lateral heterogeneity along the Trench. In the northern part of the profiles, the P-wave velocity in the island arc crust is lower than that of the southern part. In addition, there is no difference for depths of the plate boundary between two profiles in northern part. The afterslip of the 2003 Tokachi-oki earthquake has terminated at the structural boundary. This characteristic relation agrees with that of the northeastern end of the coseismic slip region. This suggests that the lateral heterogeneity of the crustal structure contributes to both the coseismic slip and the afterslip distribution in this region.

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