

## Seismic structure of plate boundary zone off Miyagi by seismic survey -relation between geometry of plate boundary and asperity-

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In a region off Miyagi, it is suggested that a large earthquake will occur in the near future. Therefore a long-term ocean bottom seismic observation has been performed since 2002. In addition, many seismic surveys using ocean bottom seismometers(OBSs) and controlled sources were carried out. In August 2005, a large thrust-type earthquake ( $M=7.2$ ) occurred in the estimated source area of future off-Miyagi earthquake. However, a detailed seismic structure around the source area is not still obtained due to its depth. We conducted an intensive seismic refraction/reflection survey using OBSs, land stations and controlled sources in sea and land in 2004. The purposes of this experiment are to obtain detailed P wave velocity structures around the plate boundary including asperities of large earthquakes and to study amplitude variation of reflected waves from the plate boundary. Two profiles, one is perpendicular to the trench and another is parallel with the trench, pass across the asperities of past and future Off-Miyagi earthquakes. The east-west (EW) profile, which is 200 km long in the marine area, was extended to the land to obtain a deep structure. The EW line had 22 OBSs at an average interval of about 3.7km, and 7 land stations. The north-south (NS) profile is 300km long, and 21 OBSs were deployed on this profile at an interval of 15km. In the marine area, explosives whose charge size was 40 kg were used as seismic sources on the EW line and the trench parallel profile. On the land area, 300kg charge size explosive was used. Two dimensional velocity models beneath two profiles were estimated by a 2-D ray tracing method. Beneath the trench parallel profile, an island arc Moho exists at 18-24 km depth and P-wave velocity of the uppermost mantle is estimated to be 7.9-8.1 km/s. Furthermore, the depth to the plate boundary was estimated to be about 29-34 km by using travel times of reflected waves. The refracted waves penetrated to a depth of 25 km below the EW line. The structure deeper than 25 km was determined by reflected waves. The dip angles of the subducting plate are 10 degree and 27 degree at distances from the trench axis of 80 - 140 km and 140 -170 km, respectively. The subducting plate is estimated to bend at depths of approximately 25 km. The asperity areas of 1981 earthquake and 1978, 2005 earthquakes correspond to the plate boundaries with gentle and steep dip angles, respectively. In addition, boundary of asperities between 1981 and 1978 earthquakes is positioned at the bending point of the subduction plate. A shape of the plate boundary between the landward plate and the subducting oceanic plate may influence rupture of the interplate earthquakes.