

Offshore-onshore seismic survey across asperity area of off Miyagi earthquake, NE Japan

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In the region off Miyagi, it is suggested that there is a high possibility 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 off Sanriku. As a result of these experiments, it is inferred that the plate boundary region has heterogeneity by amplitude variation of reflection waves from the plate boundary. In summer 2004, we conducted an intensive seismic refraction/reflection survey using OBSs, land stations and controlled seismic sources such as airguns and explosives in sea and land. The purposes of this experiment are to obtain P- and S- wave velocity structure around plate boundary including Pn velocity of the landward plate and exact position of the plate boundary, and to study the amplitude variation of reflected waves from the plate boundary. Three profiles, one is perpendicular to the trench and two are parallel with the trench, passes across the asperity of past and future Miyagi-oki earthquakes. The EW profile was extended to the land to obtain a deep structure and a position of the EW profile coincided with a seismic survey line carried out in 1999. Explosives whose charge size was 40 kg were used as seismic sources on the EW line and the trench parallel profile close to land. The EW line had 22 OBS at an average interval of 4km and 7 land stations. Twenty-one OBSs were deployed on the parallel profile at an interval of 15 km. All of the OBSs deployed on the EW line and the parallel profile were recovered after the shooting. The OBS records have generally good quality for explosive signals. First arrivals from explosive sources can be recognize until an epicentral distance greater than 150 km on record sections of both the EW-line and the parallel line. On the record section in the parallel line, the first arrivals which are estimated to pass uppermost mantle of the landward plate have apparent velocities of 8 km/s. In addition, many later phases, which are thought to be reflected waves, are observed.