Vp velocity structure of the crust and the slab mantle of the subducted Pacific Plate near the Japan Trench by airgun-OBS survey

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The Japan Trench subduction zone, located east of the northeastern Japan, shows regional variations in seismic activity along the plate boundary in several aspects. For example, in the shallowest part of the interplate seismogenic zone, the location of the trenchward limit of the interplate earthquakes varies along the Japan Trench; the limit is closest to the trench axis in the central Sanriku-oki region than in the other regions. Accordingly, the microseismicity seems to be most active in this region.

In order to clarify whether there are crustal structural variations corresponding to the differences in the interplate seismic activity, we carried out a reflection/refraction seismic survey. The profile was about 350 km in length and located about 25 km westward (landward) from the axis of the Japan Trench. In the surveyed area, the depth to the plate boundary is expected to be about 8˜10 km referring to previous studies [e.g., Miura et al., 2005; Ito et al., 2004; Takahashi et al., 2004]. In the survey, we shot an air gun array with total volume of 100 liters as a controlled source, and 42 OBSs were deployed as receivers. During air gun shooting, we recorded near-vertical seismic signals by a single channel hydrophone streamer.

In the record sections obtained from the OBSs, we identify several phases with different appearances (e.g. apparent velocities, amplitudes etc.). In the offset range from 5 to 20 km, the refracted signals from the sedimentary layer forming the frontal edge appears as the first arrivals with low apparent velocity (2.9 - 3.3 km/s). Beyond this range, the first arrivals are interpreted as the refractions from the subducted oceanic crust layer 3 (P3) and the slab mantle (Pn). Altough the severe distortion of the apparent velocities due to rough seafloor topography along the profile forbids to examine lateral variations in intra-slab structure, we will be able to clarify characteristics of the seismic velocity structure of the subducted slab by analyzing these seismic data in detail.