Upper mantle and crustal structure beneath the northwestern Pacific basin by seafloor borehole broadband seismometer WP-2 and OBSs

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A detailed structure of an oceanic plate is important information to consider the dynamics of an oceanic plate. In August 2000, the sea floor borehole broadband seismometer, WP-2 was installed in the northwestern Pacific basin. The seismic experiments with ocean bottom seismometers (OBSs), the WP-2 and airguns were performed around the WP-2. Broadband seismic records for 436 days in total were retrieved from the WP-2. Reflecting low noise environment, many teleseismic events were recorded. The crustal structures were estimated by forward modeling using a two dimensional ray tracing method. The results of seismic surveys show that the crustal seismic structure around the WP-2 is laterally homogeneous and is classified to typical oceanic crust. The uppermost mantle has a seismic anisotropy. The velocity variations are about 5% for P-wave and about 3.5% for S-wave, and the fast direction seems to be perpendicular to the magnetic lineations. Travel times of earthquakes recorded by the WP-2 and the previous seismological studies suggests that the lower part of the lithosphere has larger anisotropy than that in the uppermost mantle. To explain late first-arrivals from the earthquakes occurred in the slow direction with epicentral distances between 1600 km and 2200 km, a low velocity below a depth of 30 km and a rapid increase of velocity at a depth of 210 km are inferred. Receiver function analysis of 16 events with a high signal-to-noise (S/N) ratio form the WP-2 data was performed to estimated depths of 410 km and 660 km discontinuties. From the receiver function analysis, depths of discontinuties in the upper mantle are estimated to be 416 km and 666 km, which is consistent with those of global average.