Sharp bottom boundaries of oceanic plates observed by P&S-receiver function of borehole ocean bottom broadband seismometer records

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The theory of plate tectonics has been successful in explaining many of geological and geophysical observations, and has been accepted as the basic frame work of how our planet works. Yet the most essential element of the theory *what defines the oceanic plate* is not resolved. Here we attempt for the first time to detect the bottom of oceanic plates using high resolution body waves. To achieve this goal we apply P- and S-receiver function techniques to the teleseismic data from two borehole broadband seismic observatories, WP1 and WP2, which are developed and deployed under the Ocean Hemisphere network Project (OHP) in the Philippine sea and the Pacific ocean, respectively. These seismological observatories are situated at a depth of ˜500m below the ocean floor with ˜5km thick water column. The preliminary results of both the receiver functions show consistent findings. The analyses reveal at least two prominent discontinuities present in the first 10s of receiver functions, one with positive polarity, Moho, followed by a negative discontinuity, a possible lithosphere/asthenosphere boundary (LAB). Crustal phases in both regions are observed at a delay time of ˜1s, corresponding to ˜8km thickness of the oceanic crust. Phases corresponding to LAB occur at ˜6-8s (˜60-75 km) at two stations, and there are some discrepancies between P- and S-receiver functions which may be due to seismic anisotropy. The effect of the water columns above stations on receiver functions are estimated using DSM synthetics, and it does not affect the interpretation.

A model that explains observations will be discussed.