Waveform modeling of BBOBS data for old oceanic lithosphere-asthenosphere system

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Analysis for a base of lithosphere, at nearly 100 km depth, is still difficult because of a lack in observation data which contain a pure information for the lithosphere-asthenosphere system (LAS). Recent developments in seafloor in-situ observation and waveform analysis enable to determine more detailed structure of the LAS. In this study, we modeled broadband seismic waveforms of outer-rise earthquakes occurring after the Tohoku earthquake around the Japan trench that are observed by 5 broad-band ocean bottom seismometers(BBOBSs) at the northwest pacific seafloor; the traveling paths of these seismic waves are entirely within the old (~130Ma) ocean LAS, and can be used to constrain the average 1-D velocity structure under ’normal ocean’. Because the observation data contain much short-period noise, the waveforms need to be applied appropriate bandpass filters: periods 6-100s for P wave, 33-100s for Rayleigh wave, and many octave-range filters for Love wave. We compared observed and synthetics waveforms, and then adjusted our model. Very preliminary analysis indicated that (1) crust is 3% faster in P wave or 0.5 km thinner than the PA5 model (Gaherty et al., 1999), (2) LID is 20km thicker or 2% slower than PA5, but (3) the model has still strong trade-off between crust thickness and crust velocity, and between LID thickness and LID velocity. As a result, the depth of lithosphere-asthenosphere boundary (LAB) or G-discontinuity is not constrained uniquely. Further analysis for multiply bounced S-waves (e.g., ScS, SS, SSS) should constrain more detailed structure for the depth.

