Seismic velocity structure beneath the oldest region of the Pacific ocean basin from multiscale finite-frequency traveltime tomography

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The 12 broadband ocean-bottom seismometers (BBOBS) and 7 electro-magnetometers (OBEM) were deployed in Oct-Nov 2018 for a duration of 12 months on the 7˚x7˚ area of the oldest (~170 Ma) Pacific basin, where the mantle structure below is poorly constrained (Becker et al., 2014). This experiment (Pacific Array) was conducted as a collaboration between South Korea and Japan to investigate an early evolution of the Pacific lithosphere-asthenosphere system. In this study, we perform multiscale finite-frequency traveltime tomography to elucidate the lithospheric-scale seismic structure from the 12 BBOBS data. We extract teleseismic waveforms with earthquake magnitudes greater than 5.5 within an epicentral distance of 30-98 degrees from the array, and measure relative traveltime residuals of P waves in high-frequency (8-16 s) and low-frequency (16-32 s) bands by multichannel cross-correlation method (VanDecar and Crosson, 1990). The relative traveltimes measured at the two different frequency bands are sensitive to seismic velocity structures with different length scales and allow better recovery of the velocity perturbations in tomographic models (Hung et al., 2004). We apply data adaptive, multiscale parameterizations based on wavelet transforms, which can account for variability in data coverage and provide a tomographic model with spatial-varying resolutions (Hung et al., 2010). We plan to show preliminary P-wave velocity structure of the upper mantle below the Pacific Array region with the checkerboard resolutions test results to confirm the reliability of the obtained tomographic images.

Keywords: Pacific Array, broadband ocean-bottom seismometer (BBOBS), Pacific basin, multiscale finite-frequency traveltime tomography, lithosphere-asthenosphere system

