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# Observations and analysis of teleseismic body-waves recorded by a 5000-node array in Long Beach, CA

Access to a novel seismic dataset has motivated efforts to extend passive source structural seismology methods to imaging at new length-scales and with typically unobservable signals. Continuous short-period vertical component velocity seismograms from a 5000-node industrial array in Long Beach provide rare opportunities to examine passive source wave-fields with an average sampling interval of 100-150 meters. Structural imaging efforts with surface-waves and body-waves isolated from ambient noise interferometry and with body-waves from teleseismic earthquakes are all ongoing. Some examples of each will be presented, but observations and analysis of teleseismic body-waves will be the focus of the presentation. As a result of the short-period instrument response (10 Hz low corner) only very large magnitude and/or exceptionally impulsive teleseismic earthquakes are observed by the Long Beach array. High-quality direct P-wave signals from a few deep earthquakes and the 2011 Tohoku-Oki earthquake will be presented. Signal-to-noise is maximal around 1 Hz, or about 3 km wavelength near the surface. Yet, spatially coherent amplitude variations are observed at scales as small as 300-500 m. Complexity in the timing of incident teleseismic energy can be observed by deconvolution of an estimated source wavelet derived from array stacking. This reveals strong secondary arrivals with a different ray parameter. The strength of these arrivals compromises efforts to image basin structure with free-surface multiples of the direct P-wave. However, the dense array data can be used to constrain the source of multipathing, which appears to be a steep, 55-60 degree, east-dipping ramp in the Moho as it deepens from approximately 18-20 km beneath the Inner Borderland to >30 km onshore. With a better understanding of the origin of multipathing signals it may be possible to quantitatively remove them and isolate P multiples to constrain topography of the sediment-to-basement contact beneath Long Beach."