

Mapping the mantle transition zone using the coda correlation wavefield

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Hours-long seismograms recorded after major earthquakes include body waves reflected multiple times in Earth. These weak reflections can be detected by cross correlation and stacking. Coda correlation has been found to be a powerful probe for studying Earth's layered structure as well as Mars and Moon. Similar to previous work, we find a plethora of core-reflected and core-refracted phases in cross-correlations of vertical-component GSN waveforms. However, our preliminary analysis suggests that reflections from the 410-km and 660-km discontinuities in the mantle transition zone are much weaker than the core phases.

We further investigate whether coda correlation is an effective technique for studying the mantle transition zone. Using the South California Network, we have found the coda correlation signal of Pv410p in a narrow inter-station distance range. We are using spectral-element-method synthetics to test the influence of the 3-D crust and mantle. We will test various dense continental-scale networks, explore the influence of earthquake depth, location, and mechanism on the quality of the cross-correlations. Furthermore, we will compare 410-km and 660-km discontinuity depths to the depths constrained by SS and PP precursors and receiver functions.