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Rayleigh and Love Wave imaging of Iceland using ambient noise and teleseismic sources

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Iceland is one of the few regions where ridge-plume interaction can be examined with a terrestrial seismic array. Velocity structure from broadband surface wave dispersion measurements can be used to constrain the complicated crustal and upper mantle structure caused by the plume enhanced rifting activity.

Here I use data from the ICEMELT and HOTSPOT arrays on Iceland to generate phase velocity dispersion maps of both Rayleigh and Love waves from ambient noise cross correlation and teleseismic events. I invert Rayleigh and Love wave dispersion observed from ambient noise for tomographic velocity structure. For teleseismic Rayleigh waves I use the two-plane wave approximation array-based method of Forsyth and Li [2005]. I also develop and adapt this method for teleseismic Love waves. This requires additional preprocessing of the data to estimate the amplitude and phase for teleseismic Love waves. Specifically, for each station, the vertical component phase observation of the fundamental mode Rayleigh is used to predict and remove the horizontal components of Rayleigh waves. Then I invert for the maximum amplitude and apparent back azimuth at each period of interest of the Love wave from the transverse and radial components. The amplitude and phase measurement is then inverted for phase velocity structure using a modified version of the two plane-wave approximation.

Preliminary results indicate a low velocity region at short periods (8-15 s) in both the Rayleigh and Love wave phase velocity maps beneath the active volcanic centers in the middle of the island. At longer periods (20-125 s) a low velocity region is visible beneath central Iceland. The velocity minimum is located to the north of Iceland in the Rayleigh wave maps. These observations are consistent with previous studies in the region.