Mantle Transition Zone velocity jump and sharpness study using a compilation of temporary seismic arrays

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Global studies of Mantle Transition Zone (MTZ) seismic structure have often been approached by averaging observations from sparse (>1000 km instrument spacing), long-duration recordings from the Global Seismic Network. In comparison, we study global MTZ seismic structure using dense (average instrument spacing of <70 km) regional temporary arrays from various geodynamic and tectonic settings which provides a broader distribution of MTZ sampling and improved source estimations for deconvolution. Open source seismic arrays since ~1995 are accessed across a range of settings including: hot spots, continent-continent and ocean-continent subduction, spreading ridges, rift margins, and cratons. Stacked teleseismic P-to-S receiver functions are calculated using multichannel spectral deconvolution and migrated to depth using global tomography. A comparison of results shows frequency-dependent amplitude variations of the 410 and 660 for each region and a range of results for the 520 including regions where it is not observed. Synthetic receiver functions are calculated using the reflectivity method and identical processing is applied to the synthetics as was applied to the observed receiver functions. Markov Chain Monte Carlo sampling of a parameter space consisting of a series of linear gradients will be used to invert for MTZ V_S structure. Inversion results, such as the 410 km and 660 km discontinuity velocity jumps and sharpness, will be compared to results from modern laboratory mineral physics experiments that test the effect olivine content, temperature, and hydration can have on velocity at mantle pressures.

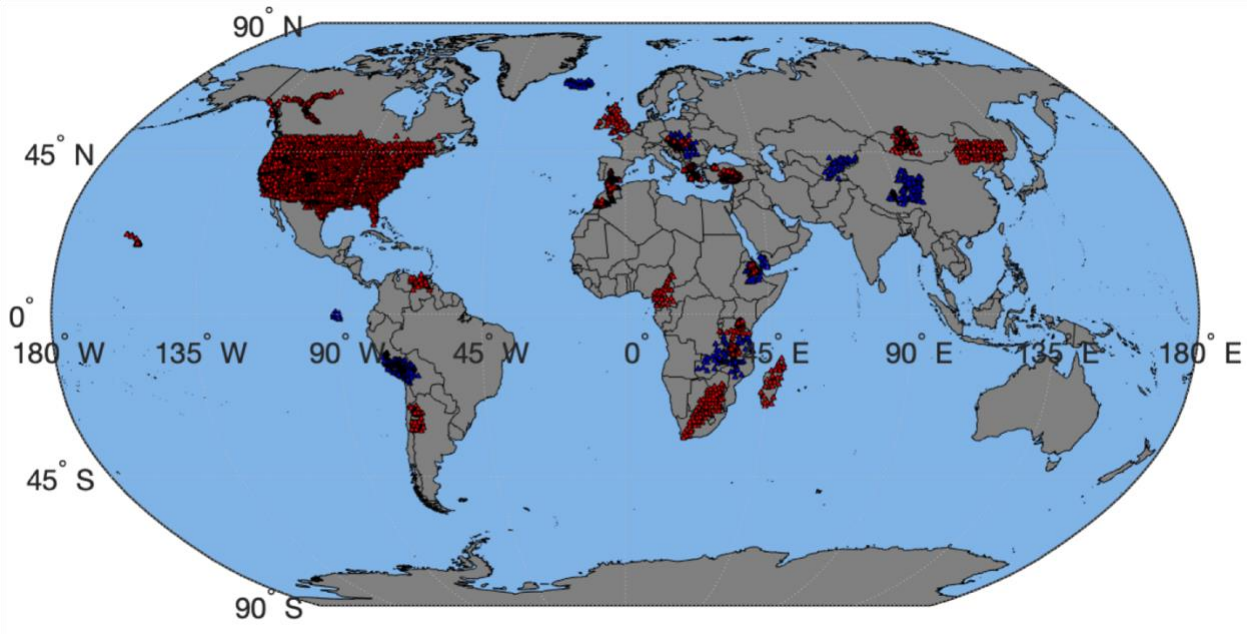

Figure. World map displaying seismic arrays used in this study. Red triangles represent stations where receiver functions have been calculated and blue triangles show target stations where receiver functions will be calculated.