

Characterize Small-scale Heterogeneity in Earth Using Coherence Functions

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Fluctuations in amplitude and travel time of teleseismic P waves, measured by amplitude and phase coherences beneath elements of EarthScope seismic array, are used to invert for the heterogeneity spectrum of P velocity in a 1000 km thick region of the upper mantle beneath the array. Best fits to joint transverse coherence functions require a depth- dependent heterogeneity spectrum, with peaks in narrow depth ranges that agree well with the predictions for a temperature derivative of velocity that includes the effects of chemical and phase variations expected for standard models of the silicate mineral assemblage of the upper mantle. The results confirm the existence of significant chemical as well as thermal contributions to observed upper mantle heterogeneity at spatial scales between 50 km to 300 km.

