

Estimation of stochastic random heterogeneous parameters in the lithosphere from seismic exploration and natural earthquake data

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Recent high-resolution reflection experiments in Europa (E.G., DEKORP) and Japan (e.g., Daidai-toku Project) show that the uppermost mantle is almost transparent and the lower crust is very reflective to the seismic wave propagation.

Numerical simulation using a higher-order FDM using different structural model including or excluding heterogeneities in the uppermost mantle demonstrated that the strong reflectors in the lower crust hide heterogeneity in the upper mantle because most of seismic waves are perfectly reflected back to the surface and quite a few energy penetrate into the upper most mantle.

We therefore use deep, natural earthquake source and recording in regional distances in Australian continent to determine the stochastic distribution of heterogeneity in the uppermost mantle. The experiments demonstrate the existence of laminates structures in both crust and uppermost mantle.