

Differential Travel-time Pn Tomography in northeast Asia

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We are applying relative travel-time residuals to derive a 2D function that maps laterally-varying Pn residual slowness deviations from a background IASP91 model, as well as to obtain site terms based on the residual differentials.

We apply the technique to events from the Michigan State University eastern Russia seismic database. We have selected event / station geometries such that a 20 km change in source location results in less than 0.2 second change in the travel-time residual differences, based on synthetic sensitivity studies. For this study we restrict our test to source-receiver distances of 2 - 20 degrees. The eastern Russian database provides us with differential raypaths for 459 stations from the region, yielding 27,291 station pair combinations with a catalog of 65,489 earthquakes between 45° and 80° N, 100° to 175° E. This resulted in 666,387 differential paths from which to invert for the Pn slowness perturbations and station corrections. Results provide the first detailed look at Pn variations in this large region of northeastern Asia.

The comparison of pick residual differentials allows us to investigate catalog quality by inverting for systematic pick outliers among station-pair relationships. This can be a valuable tool for catalog QC when waveforms are not available for pick validation.