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to the Regional Seismic Travel Time (RSTT) tomography model: tomography and path-dependent uncertainty

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A function of global monitoring of nuclear explosions is the development of Earth models for predicting seismic travel times for more accurate calculation of event locations. Most monitoring agencies rely on fast, distance-dependent one-dimensional (1D) Earth models to calculate seismic event locations quickly and in near real-time. RSTT (Regional Seismic Travel Time) is a seismic velocity model and computer software package that captures the major effects of three-dimensional crust and upper mantle structure on regional seismic travel times, while still allowing for fast prediction speed (milliseconds). We describe published updates to the RSTT model (pdu202001Du, https://www.sandia.gov/rstt) using a refined data set of regional phases (i.e., Pn, Pg, Sn, Lg). We improve on the former distance-dependent uncertainty parameterization for RSTT using a random effects model to estimate slowness uncertainty as a mean squared error for each model parameter. The random effects model separates the error between observed slowness and model predicted slowness into bias and random components. Validation of the updated RSTT model demonstrates significant reduction in median epicenter mislocation along with more appropriate error ellipses, compared to the iasp91 1D model as well as to the current station correction approach used at the Comprehensive Nuclear-Test-Ban Treaty Organization International Data Centre.

Promotional text

The inclusion of new data for RSTT from prior Workshops addresses Goals 3-5, while the update of RSTT in general applies to Goals 1 and 5 for identifying opportunities to improve nuclear test monitoring and to promote wider civil and scientific applications.

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