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Developing and Validating Path-Dependent Uncertainty Estimates for Use with the Regional Seismic Travel Time (RSTT) Model

The Regional Seismic Travel Time (RSTT) tomography model has been developed to improve travel time predictions for regional phases (Pn, Sn, Pg, Lg) in order to increase seismic location accuracy, especially for explosion monitoring. The RSTT model is specifically designed to exploit regional phases for location, especially when combined with teleseismic arrivals. The latest RSTT model (version 201404um) has been released (http://www.sandia.gov/rstt). Travel time uncertainty estimates for RSTT are determined using one-dimensional (1D) distance-dependent error models that have the benefit of being very fast to use in standard location algorithms, but do not account for path-dependent variations in error. Although global in extent, the RSTT tomography model is only defined in areas where data exist. A simple 1D error model does not accurately model areas where RSTT has not been calibrated. We are developing and validating a new error model for RSTT phase arrivals by mathematically deriving this multivariate model directly from a unified model of RSTT embedded into a statistical random effects model. A goal for any RSTT uncertainty method is to be readily useful for the standard RSTT user. We will demonstrate the method and validation of the error model for Pn and other regional phases.

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