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T1.2-O1. Developing 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 regional phase predictions (Pn, Sn, Pg, Lg) in order to increase seismic location accuracy and precision even when regional and teleseismic data are combined. Travel time uncertainty estimates for RSTT are determined using phase-specific one-dimensional, 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 uncertainty and structural inadequacy of the RSTT model (e.g., model error). While the RSTT error models provide reasonable estimates of travel time prediction error in regions that were well sampled by the tomography data, they likely severely underestimate the errors in poorly calibrated regions. We are developing and investigating a new covariance matrix for RSTT phase arrivals by mathematically deriving a multivariate error model directly from a unified model of RSTT embedded into a statistical random effects model that captures the residual as distance, path and model error effects. Initial work has been the development of a two-dimensional error model using path-distributed residuals, partitioned by distance/turning depth. The goal for a new RSTT uncertainty method is to be readily usable to the standard user.

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