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Validation of Regional Seismic Travel Time (RSTT) Predictions and Use in Event Location

The Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) is sponsoring international cooperation activities that enhance the Regional Seismic Travel Time (RSTT) model. In order to assess current and future versions of the RSTT model, we are developing approaches to measure both RSTT prediction accuracy and the impact on seismic event locations. Validation of RSTT performance emphasizes non-circular empirical tests, whereby data used for validation are not used for model development. Data that provide the most information about RSTT model performance are identified based on prior knowledge of the event location and the geographic distribution of the recording network. A model for testing is then produced without the benefit of the validation data, with the goal that test results are representative of performance for future events. Travel time tests include direct comparisons of observed and predicted travel times. Location tests include the difference between estimated and 'ground-truth' event locations, as well as assessments of whether computed location uncertainty estimates (e.g. epicenter confidence ellipses) are representative of observed error. We find average epicenter error is less than 10 km when RSTT is used, and uncertainty estimates are representative of true error when uncertainty estimates account for data and model prediction covariance.

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