ID: Type: **Poster**

1.2-P02. A Global 3D Velocity Model for Improved Seismic Event Location in Nuclear Explosion Monitoring

A global 3D velocity model of the Earth's mantle has been developed to improve the accuracy and precision of seismic travel time predictions for a wide suite of regional and teleseismic phases. Improved travel time predictions lead directly to significant improvements in the accuracy and precision of seismic event locations as compared to locations computed using standard 1D velocity models like ak135, or 2½D models like RSTT. A key feature of the model is that path-specific model uncertainty of travel time predictions are calculated using the full 3D model covariance matrix computed during tomography, which results in more realistic uncertainty ellipses that directly reflect tomographic data coverage. Recent improvements in the model include the generation of an S velocity model to compliment the P velocity model and development of capability to compute travel times for core phases, reflections off the core-mantle boundary, and underside reflections off the Moho and the surface of the Earth. For use in routine operations, travel time predictions and prediction uncertainties are precomputed and stored in station-phase-specific 3D lookup tables, which allows fast, reliable retrieval of information needed by locators. The lookup capabilities are based on the open-source GeoTess software package available at http://www.sandia.gov/geotess.

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Track Classification: 1. The Earth as a complex system