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## Comparing three-dimensional velocity models for seismic location accuracy using a consistent travel time framework

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Location algorithms have relied on simple, one-dimensional (1D) velocity models for fast, seismic event locations. The fast-computational speed of these models made them the preferred type of velocity model for operational needs. Higher-dimensional (2D-3D) seismic velocity models are becoming readily available and provide more accurate event locations over 1D models. The computational requirements of these 2D-3D models tend to make their operational use prohibitive. 1D are generally used as travel-time lookup tables, one for each seismic phase, with travel-times pre-calculated for event distance and depth, that are extr fast to use. Comparing location accuracy for 2D-3D seismic velocity models tends to be problematic as each model is determined using different ray-tracing algorithms. Attempting to use a different algorithm than used to develop a model usually results in poor travel-time prediction. We will demonstrate the current/updated ability to quickly create travel-time correction surfaces using an open-source framework (PCalc+GeoTess, [www.sandia.gov/geotess](http://www.sandia.gov/geotess)) that easily stores 3D travel-time data. This framework overcomes the ray-tracing algorithm hurdle because the lookup tables can be generated using the exact ray-tracing algorithm that is preferred for the model. Having a common travel-time framework for a location algorithm allows individual velocity models to be compared in a fair, consistent manner.

### Promotional text

Allowing for direct comparison and/or use of 3D velocity models pertains to Goal 1 for identifying opportunities/methods for improving nuclear test monitoring. Goals 4-5 are also relevant for supporting the exchange of knowledge and promoting wider application of techniques.

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