

THE CASE FOR GLOBAL-SEARCH SEISMIC EVENT LOCATION

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Global-search methods for seismic event location produce comprehensive uncertainty information and can easily be used with 3D velocity models. The global-search approach is practical and rapid because seismic event location is a low-dimensional problem and because of the high performance of current computers.

In modern absolute-location studies, global-search methods should always be preferred over linearized approaches for the following reasons. Firstly, global-search methods produce more stable, complete and informative solutions than linearized methods. Global methods are not strongly dependent on starting locations and other inversion parameters, they can identify multiple optimal solutions, and they can define comprehensive, probabilistic, non-Gaussian uncertainty information. Secondly, global-search event location can be easily performed in three-dimensional structures, which is difficult or impossible with linearized methods. Locations in a three-dimensional medium can differ significantly from those obtained with simplified, one-dimensional models, and thus can lead to different scientific interpretations or hazard and risk estimations.

In the future, global methods will likely be applied to the important problem of relative-location between large sets of events.

In this presentation I will contrast global-search and linearized location methods, I will introduce several global-search algorithms, and I will show examples of probabilistic, global-search location results in 3D models.