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Adjoint Waveform Tomography Models for Improved Moment Tensor Inversions with Three-Dimensional Greens Functions and Sparse Regional Networks

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Seismic moment tensor (MT) inversions have become an important method for characterizing source type (e.g. earthquake, explosion, collapse), seismic moment and depth. However, these methods commonly use average plane-layered one-dimensional (1-D) Green's functions (GF's). For areas where path-specific structure is complex, 1-D GF's cannot fit observed waveforms and source parameters from MT inversions are poorly resolved. These problems are compounded for shorter periods and/or longer paths where structural effects accumulate. We are developing improved three-dimensional (3-D) models on a regional- and continental-scale using Adjoint Waveform Tomography. These models provide improved simulations of regional distance waveforms compared with 1-D models, particularly at far-regional distances, say > 1000 km. MT inversions using 3-D GF's show greater variance reductions (improved waveform fit) and smaller phase delays between observed and simulated waveforms. We have developed models for the western United States where we have good data coverage for the tomography and ample source types to evaluate MT inversion performance. Results for other regions and will be presented at the conference. We are particularly attuned to MT inversions in tectonically complex parts of the world with sparse regional observations, such as the International Monitoring System.

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Promotional text

This presentation demonstrates the power of adjoint waveform tomography to produce seismic Earth models that can be used to improve source characterization by moment tensor inversion.

Oral preference format

in-person

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