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Retrieval of source parameters in anisotropic media

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Anisotropic material properties may significantly influence characteristics of moment tensors. For example, apparent volumetric components may be produced and real tensile characteristics of earthquake sources may be hidden. Thus, slip and fault orientation cannot be safely deduced from moment tensors without further knowledge of the elastic properties. Therefore, accounting for anisotropiy in inversion algorithms is desirable wherever appropriate anisotropic velocity models exist.

Based on synthetic waveforms generated in anisotropic media we present characteristic properties of forward-modelled and inverted moment tensors. We first ignore anisotropy during the inversion process. By varying the orientation of the elastic tensor within and outside the source region we systematically alter the calculated waveforms and investigate their specific effects on moment tensors. The fault plane orientation can be derived accurately if additional constraints are used in the inversion. However, inverted and forward-modelled moment tensors may differ significantly. The deviations are systematic for different orientations of the elastic tensor with respect to the source. If the medium along the ray-path is isotropic the elastic properties in the source region may be derived from the non-double-couple components of observed moment tensors. By accounting for general anisotropy along the ray path and within the source region we present a new inversion algorithm. Slip and fault normal are derived directly. This allows further interpretation in terms of possible volumetric changes connected to the faulting process. The Green's functions used during inversion are calculated by the ANRAY package.