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Resolving Seismic Moment Tensors with Body-Wave Amplitude Ratios

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Seismic body-wave amplitude ratios are relatively immune to bias by wave-propagation effects such as geometric spreading and anelastic attenuation, and are therefore more useful than raw amplitudes for determining seismic moment tensors. Applying amplitude-ratio inversion to several volcanic and geothermal areas has shown strong evidence of microearthquakes that involve volume changes and other significant departures from the traditional double-couple source model. On the other hand, theoretical confidence regions in source-type space often exhibit systematic trends that resemble those found in the results from inverting real data sets. This suggests that some apparently systematic trends in results may be artifacts of measurement error. We analyze the theoretical resolving power of hypothetical sets of body-wave polarity and amplitude-ratio data, systematically investigating the effects of factors such as the seismometer distribution, the choice of seismic phases used (*P, SH, SV*), and uncertainties in crustal structure,and instrumental calibration.