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Seismic point and kinematic source solutions from rotational ground motion

Including rotational ground motion into the waveform inversion for seismic sources increases the resolution of source parameters drastically, not only for point sources, i.e. moment tensors, but also for kinematic sources. With half the number of station locations the same if not better results can be obtained compared to inverting translational ground motion alone. Well known difficulties such as sparse station networks, a lack of appropriate velocity models, non-uniquenesses, and parameter trade-offs can be overcome.

Here, we present the summarized results from several studies based on synthetic test cases considering six components of ground motion. We compare the results of waveform inversion from translational ground motion only versus including rotational ground motion. Especially, source parameters with a depth-dependence have a high potential to benefit. Most likely, the reason lies in the horizontal components of the rotation vector. They include information on the vertical displacement gradient not available from translational recordings at the surface.

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