

Towards Focal Mechanisms in Poorly Known Velocity Models: Inverting Waveform Envelopes

Source characterization of low-magnitude seismic events (M 4-5) is very important for intraplate seismicity studies, like in Brazil. The events are often recorded just in a few regional seismic stations (>300 km), and, velocity models are highly uncertain. We propose determination of moment tensors with the application of a new technique – the waveform envelopes inversion, pre-constrained by polarities. As demonstrated by synthetic tests, the proposed technique is robust with respect to inaccuracies of existing velocity models. We study the event of Vargem Grande ~ 4.7 (mb) (Jan 3, 2017), northern Brazil. This widely felt earthquake occurred in an aseismic area with so far only 4 small events cataloged in the Brasilia Seismograph Bulletin since 1690. With the envelope inversion, we managed to fit polarities at 6 stations, and simultaneously match gross waveform features at 4 stations (one at 40 km and 3 above 500 km), using a simple generic velocity model. The strike-slip focal mechanism is in agreement with an independent study from Fábio Dias (2017), based on ad-hoc, path-specific velocity models.

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