
**Submission code: NLB8YJ76LB**

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# Determining the Focal Mechanism of the 2025 Poconé/MT Earthquake (4.2 mb)

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# Determining the Focal Mechanism of the 2025 Poconé/MT Earthquake (4.2 mb)



On March 1, 2025, a magnitude 4.2 mb earthquake struck near the municipality of Poconé in the state of Mato Grosso (09:14:23 UTC). This earthquake occurred at the northern end of the Pantanal basin, a region with known seismic activity that experienced other moderate-sized events in the past, such as the February 13, 1964, Miranda earthquake (5.4 mb); the June 15, 2009, Coxim earthquake (4.8 mb); and the November 6, 2015, Miranda earthquake (4.0 mb). Moderate-sized earthquakes like these are rare in midplate South America, and as they are the primary source of information on the regional stress field, this results in poor constraint of the stress regime. Therefore, determining the focal mechanism of the Poconé/MT earthquake, as with other intraplate events, is fundamental to understanding the intraplate stress field. Our goal was then to determine the focal mechanism and centroid depth of the 2025 Poconé/MT earthquake through waveform inversion. To this end, we used regional seismograms from 16 stations ($\Delta \leq 10^{o}$) mainly from the Brazilian Seismographic Network (RSBR) and employed a simplified Cut-and-Paste (CAP) approach. This CAP-based method performs a grid search (10° steps) over the three fault parameters (strike, dip, and rake) to obtain the fault orientation that provides the best fit to the observed waveforms. Additionally, it accounts for inaccuracies in the velocity model, event location and origin time by incorporating empirical time shifts derived from waveform cross-correlation in the synthetic seismograms before inversion. The collected seismograms were demeaned, detrended, and corrected for instrument response to obtain ground displacement, then rotated along the great circle path to obtain the radial, transverse, and vertical components. The Green's functions were computed using a simple layered velocity model based on previous receiver function studies conducted in the Pantanal Basin. The model includes a 0.5 km-thick sedimentary layer overlying a 37 km-thick crust, underlain by a mantle half-space. Data and Green's functions were aligned to the P-wave arrival time and band-pass filtered between 0.07 and 0.11 Hz before inversion. This frequency range was selected through a systematic search to maximize the SNR while maintaining sufficiently low frequencies and a broad bandwidth to minimize the risk of cycle skipping. Only waveforms with an SNR ≥ 10 were considered in our inversions. Our preliminary results point towards an oblique strike-slip fault (strike=90º, dip=70º; rake=20º) at 9 km centroid depth with a scalar moment of 1.07e22 dyne-cm (4.0 Mw). This mechanism is consistent with the predominant stress regime in the Pantanal Basin, as indicated by previous solutions showing P-axes oriented from E–W to ENE–WSW. The next steps involve validating this solution by comparing it with regional P-wave polarities and investigating correlations with surface geology.