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Comparisons of Source Parameter Estimates Based on Moment Tensor and Coda Analysis Methods in the Sea of Marmara, NW Türkiye

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Reliable, stable, and internally consistent moment magnitude (M_w) estimates are essential for seismic hazard assessment and earthquake source characterization. Full waveform inversion provides physically robust seismic moment estimates; however, its applicability is often constrained by data quality, network geometry, and modeling assumptions. Conversely, coda-based approaches are a more efficient alternative that are less sensitive to radiation pattern and path effects. This study presents a systematic comparison between coda-derived moment magnitudes ($M_{w\text{-}coda}$) estimated using the Qopen framework and those ($M_{w\text{-}ISOLA}$) obtained from moment tensor inversion conducted through the ISOLA software.

Analysis is based on the same dataset examined by Özkan et al. (2024), comprising 303 local earthquakes ($2.5 \leq M_L \leq 5.7$) recorded by 49 broadband stations in the Sea of Marmara region, NW Türkiye. Qopen is utilized to jointly invert S-wave and coda-wave envelopes by employing Radiative Transfer Theory. This process yields frequency-dependent attenuation parameters and coda-derived source spectra, from which the $M_{w\text{-}coda}$ is estimated. For a subset of these events with sufficient waveform quality and azimuthal coverage, independent seismic moment estimates are obtained through time-domain waveform inversion using ISOLA.

Overall, we aim to evaluate the agreement and consistency between $M_{w\text{-}coda}$ and $M_{w\text{-}ISOLA}$ in terms of magnitude scaling, scatter, and potential systematic bias, with particular emphasis on magnitude range, source depth, and signal-to-noise conditions in a tectonically complex region characterized by strong lateral heterogeneity and frequency-dependent attenuation.