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Station distribution and quality control for real-time moment tensor inversion at regional distances for the southwestern Iberian Peninsula

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Rapid assessment of seismological parameters pertinent to the nucleation and rupture of earthquakes are now routinely calculated by local and regional seismic networks. With the increasing number of stations, fast data transmission, and advanced computer power, we can now go beyond accurate magnitude and epicentral locations, to rapid estimations of other higher-order earthquake parameters such as seismic moment tensor. Although an increased number of stations can minimize azimuthal gaps, it also increases computation time, and potentially introduces poor quality data that often leads to a lower the stability of automated inversions.

In this presentation, we focus on moment tensor calculations for earthquakes occurring offshore the southwestern Iberian peninsula. The available regional seismic data in this region has a significant azimuthal gap that results from the geographical setting. In this case, increasing the number of data from stations spanning a small area (and at a small azimuthal angle) increases the calculation time without necessarily improving the accuracy of the inversion. Additionally, limited regional data coverage makes it imperative to exclude poor-quality data, as their negative effect on moment tensor inversions is often significant.

In our work, we analyze methods to minimize the effects of large azimuthal gaps in a regional station coverage, of potential bias by uneven station distribution, and of poor data quality in moment tensor inversions obtained for earthquakes offshore the southwestern Iberian peninsula. We calculate moment tensors using the KIWI tools, and we implement different configurations of station-weighing, and cross-correlation of neighboring stations, with the aim of automatically estimating and selecting high-quality data, improving the accuracy of results, and reducing the computation time of moment tensor inversions. As the available recent intermediate-size events offshore the Iberian peninsula is limited due to the long recurrence times of moderate to large earthquakes, we study intermediate-size earthquakes (6-7Mw) offshore Iberia and in the Euro-Mediterranean region, to test our weighting scheme and data-quality selection.

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