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Cross correlation in real-time for data reduction, data control, and solution convergence in regional moment-tensor inversions

Jaime A. Convers (1) and Susana Custodio (2)

(1) Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo, São Paulo, Brazil., (2) Instituto Dom Luiz, Facultade de Ciencias, Lisbon, Portugal (jaime.convers@gmail.com)

Proper seismic information that takes advantage of the faster acquired regional seismic data is becoming increasingly achievable and pertinent. Timely and reliable solutions nowadays can be inferred due to low latency, high reliability of regional data transmission, and increasing computing capabilities at local networks. Seismic products such as regional moment-tensor solutions are now more than ever achievable and valuable for hazard mitigation entities.

High-quality moment-tensor solutions rely on high-quality data that are evenly distributed around the epicenter. However, this is seldom the case for coastal areas close to offshore seismic sources. Due to geographical constraints, in these regions the azimuthal gap is large, a feature that cannot be mitigated by dense onshore instrumentation . This characteristic often has a negative impact on the confidence of results and on the increase of the latency of rapid moment-tensor solutions at regional scales.

As part of the adaptation of regional moment-tensor inversion of earthquakes offshore southwest Iberia, using the KIWI moment-tensor inversion tools, we examine the use of cross-correlation between neighbor stations as an automated tool for data reduction, quality control and as an advantageous tool for faster converging moment-tensor inversion solutions. We examine intermediate size earthquakes and use cross-correlations between stations to produce an automated first-order data quality assessment aiming at avoiding problematic stations and reducing redundant information. We used synthetic distributions of cross-correlations to obtain guidelines and benchmarks for the classification of data , thus benefitting subsequent regional moment-tensor calculations. We also examine the impact of this method on the convergence and reliability of solutions.

We apply the developed method to SouthWest Europe, offshore Chile and the Pacific Northwest. For these settings, we review the different outcomes of the moment-tensor inversions using this methodology and assess the possible benefits in reliability and fast result convergence.