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Imaging the Leipzig-Regensburg-Zone (East Germany) applying moment tensor inversion to low magnitude local earthquakes

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The Leipzig-Regensburg-Zone (LRZ) is a region of increased seismic activity in eastern Germany. Since the year 2000 the universities of Leipzig and Jena together with Saxon State Office for the Environment, Agriculture and Geology and Thuringian Regional Office for the Environment and Geology established a dense regional seismic network. From this network a comprehensive seismological database has emerged with a magnitude completeness of ML -0.5. The largest observed earthquakes had magnitudes of ML 3.5, although there are records of historical earthquakes near the city of Gera with estimated magnitudes ML 5. In contrast to the NW-SE striking major tectonic features in the region of central Germany, the earthquake distribution of the LRZ is along N-S direction in a 40 km broad strip that is not related to a single major fault. The LRZ could be seen as an extension of the highly seismic active Eger-Rift in the north west of the Chech Republic, but the source characteristics are quite different. It lags the typical earthquake swarms and the sources tend to be deeper.
Moment tensor solutions are well established in global seismology and an optimal tool to better understand source mechanisms. Nevertheless, it is difficult to get stable moment tensor solutions for low magnitude local earthquakes. Our aim is to calculate moment tensor solutions below ML 2.0. In order to get results with good error estimations we use the Grond-package based on the Pyrocko-tool-box developed by Sebastian Heimann (GFZ-Potsdam). This package is based on a bootstrap algorithm to calculate the moment tensor solutions and provides an excellent estimation of the solution errors, but is computationally demanding. So far, we are able to gain stable solutions down to ML 1.4. For the inversion of events below ML 3 it has proven to be advantageous to use not only P- and S-waveforms but also the amplitude spectra as an inversions target. The resulting high quality moment tensor solutions will enable us to perform stress analysis of the area and provide new insights in the earthquake and fault dynamics of the Leipzig-Regensburg-Zone. Therefore, it will be useful for improving hazard assessment in this region.