



Hierarchical cluster analysis and multiple event relocation of Hungarian seismic event clusters between 2000 and 2016.

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The objective of our work is to develop a workflow that allows us to calculate highly accurate hypocenter parameters in seismic event clusters of aftershock sequences or anthropogenic events. We have used all of the digitally registered seismic events of the last 16 years in Hungary. The data have been provided by the Hungarian National Seismological Network and the neighbouring countries. First, we performed an initial hierarchical cluster analysis with only spatial distances in the distance matrix. We selected two different probe clusters from the resulting initial seismic clusters – one containing explosions, and another containing earthquakes, then we applied waveform cross-correlation at every stations. We repeated the hierarchical cluster analysis, but this time we used the correlation matrix as a distance metrics. The dendrogram analysis refined the initial clustering by creating new subclusters. To prepare for the hypoDD multiple event location analysis, we manually revised the routinely picked arrival times in the HNSB in order to increase the consistency and accuracy of the arrival times. We obtained improved single event locations with the iLoc algorithm to provide initial locations the double-difference analysis. Finally we performed the double-difference multiple event location on the clusters both on the initial and the refined subclusters. We demonstrate the sensitivity of our results to the refined clustering method.