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Multiple event location analysis of aftershock sequences in the Pannonian basin

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Accurate seismic event location is crucial to understand tectonic processes such as active faults in the crust that are most commonly investigated by studying seismic activity. Location errors can be significantly reduced using multiple event location methods. We applied both the double difference, HypoDD and the Markov Chain Monte Carlo, Bayesloc methods to relocate aftershock sequences in the Pannonian basin to identify the pattern of active faulting, and compared the results of the different algorithms.

We used the extended ISC location algorithm, iLoc to determine the absolute single event locations for the aftershock sequences and applied multiple event location algorithms on the new hypocenters. To improve location precision, we added differential times from waveform cross correlation to the multiple event location processes to increase the accuracy of arrival time readings. We tested both HypoDD and Bayesloc with different initial locations and velocity models. We also compared the results of relocating bulletin and iLoc hypocenters to investigate the effect of initial hypocenter parameters on the relocation processes.

We show that both HypoDD and Bayesloc collapses the initial, rather diffuse locations into a smaller cluster and the vertical cross-sections show sharp images of seismicity. Some of the relocated events in the cluster are ground truth quality with a location accuracy of 5 km or better.