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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 crustal faults that are most commonly investigated by studying seismic activity. Location errors can be significantly reduced using multiple event location methods. We applied the double difference method to relocate the earthquake occurred near Oroszlány and its 200 aftershocks to identify the geometry of the related fault.
We used the extended ISC location algorithm, iLoc to determine the absolute single event locations for the Oroszlány aftershock sequence and applied double difference algorithm on the new hypocenters. To improve location precision, we added differential times from waveform cross-correlation to the multiple event location process to increase the accuracy of arrival time readings. We also tested the effect of various local 1-D velocity models on the results.
We compared hypoDD results of bulletin and iLoc hypocenters to investigate the effect of initial hypocenter parameters on the relocation process. We show that hypoDD collapses the initial, rather diffuse locations into a smaller cluster and the vertical cross-sections show sharp images of seismicity. Unsurprisingly, the combined use of catalog and cross-correlation data sets provides the more accurate locations. Some of the relocated events in the cluster are ground truth quality with a location accuracy of 5 km or better.
Having achieved accurate locations for the event cluster we are able to resolve the fault plane ambiguity in the moment tensor solutions and determine the accurate strike of the fault.