Discrimination between earthquakes and quarry blasts in the Vertes Hills, Hungary using a correlation detector

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Contamination of earthquake catalogues with anthropogenic events largely complicates seismotectonic interpretation. It is especially true for relatively low seismicity areas, such as Hungary. In the present study, we analyze the characteristics of the waveforms of earthquakes and quarry blasts that occurred in the close vicinity of Csokako (CSKK) station between 2017 and 2019 in the Vértes Hills, Hungary.

The objective of this study was to determine the linear discrimination line between the of earthquake and explosion populations. We investigated the effectiveness of P/S amplitude ratios using filtered waveforms at different frequency bands. We applied waveform cross-correlation to build correlation matrices at CSKK and performed hierarchical cluster analysis to identify event clusters. Because most of the quarry blasts were carried out by ripple-fire technology, we computed spectrograms and examined the spectral ratio between low and high frequencies and the steepness of spectra.

Overall, classes of earthquakes and quarry blasts have separated well from each other by combining the amplitude ratio, waveform similarity and the different spectral methods. We created a set of master events for individual quarries to run correlation detectors on past waveforms and identify the explosions of analyzed quarries that were misclassified as earthquakes in the annual Hungarian National Seismological Bulletins.