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Testing different discrimination methods between microearthquakes and quarry blasts – a case study in Hungary

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Due to the development of seismological network, increasing number of events have been detected in the last years in Hungary. However about 50% of these shocks were quarry blasts. Therefore decontamination of catalogue for revealing the reliable natural seismicity has become an important task. We have studied the events occurring in the surroundings of Mecsek Hills. The goal of our research was to find the best method to separate earthquakes and quarry blasts.
In the first step we have studied the diurnal distributions of the events. Because of different focal mechanisms, the waveforms and amplitudes of arriving phases of earthquakes and quarry blasts are different. We have tested the most typical parameter, the P and S amplitude ratio, which is often used for separation. The waveform similarities have been analyzed using cross-correlation matrix and dendrograms. The earthquakes and the blasts of different quarries have been arranged into different clusters.
We have computed spectrograms and because the blasts were carried out by delay-fired technology we have computed binary spectrograms too. Computation of binary spectra is a useful visualization method to recognize the delay-fired explosions, because it emphasizes the long-duration modulations of the spectra. It is made from the original spectra by application of a filter that replaces the spectral amplitudes with a binary code, which simply reflects the local spectral highs and lows. The modulations were present in most of the spectra of blasts and in contrast to the earthquakes, the modulations have been observable until the end of the spectrogram.
We also have studied the scalloping and steepness of the spectra.