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Source Time Function of mining-induced seismic events at Rudna Copper Mine, Poland: an accuracy analysis

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The Empirical Green's Function technique was applied for the inversion of seismograms from the mining-induced tremors to obtain the Relative Source Time Function. The set of selected events consisted of 22 pairs of main and green's events recorded by a network built of 61 vertical, short period seismometers located mainly at the exploitation level, which ranges down to 1.4 km depth. The selection of events for this analysis was based on similarity of focal mechanisms, difference in magnitude (larger than 1.0) and difference in epicenter location – smaller than 100m.

The sought source time functions were approximated using the pseudo-spectral technique, assuming STF to be a sum of Gaussian kernel functions with variable magnitude and time shifts. This approximation allows inclusion of the constrains imposed on the STF, such as causality, positiveness, finiteness and limited frequency band. Inversion was performed with two algorithms: the optimization Adaptive Simulated Annealing and the Metropolis (Markov Chain Monte Carlo) space search method. This second algorithm allows to find out not only the "best" model, but also an estimation of inversion uncertainties.