Geophysical Research Abstracts
Vol. 13, EGU2011-623, 2011
EGU General Assembly 2011

Statistical Tools for Seismicity Analysis in Mining Environments

Samira Maghsoudi (1), Simone Cesca (1), Sebastian Hainzl (2), Dirk Becker (1), Torsten Dahm (1), Diethelm Kaiser (3), and Volker Oye (4)

(1) Institute of Geophysics, University of Hamburg, Germany (samira.maghsoudi@zmaw.de), (2) GFZ Potsdam, Germany, (3) BGR Hannover, Germany, (4) NORSAR, Norway

Seismicity observed in mining environments represent an excellent possibility to study earthquake processes in the near field. Seismicity catalogues in mines contain information about several phenomena, including mining blasts, rockbursts and induced microseismicity. The application of statistical tools commonly used to analyse seismic catalogues at larger spatial scales can be applied to mining environment, in order to provide information about the spatiotemporal and magnitude distribution of detected seismicity. The Gutenburg-Richter law, which describes the earthquake size distribution, the b-value and the spatial and temporal variability of the magnitude of completeness are very important parameters to characterize seismicity and evaluate seismic catalogues. The spatial variation of b-value can be related to differences in stress perturbation or material heterogeneity, while its temporal variation may indicate stress perturbation related to transient phenomena. Sorting out undesired signals from the catalogue, as blasts or mining related noise, is an important aspect of statistical seismicity studies in mining environments. In this project we are planning to evaluate different seismic catalogues in a statistical way. Datasets proceed from different mining regions and present significant differences in terms of instrumentation (including both seismometers and piezoelectric sensors), network geometry, seismicity rate and range of magnitudes. All applications focus on local scale seismicity, with receivers located at a maximal distance of 2km. We aim to estimate spatiotemporal variations of the b-value and the magnitude of completeness, based on existing techniques (e.g., earthquake sample technique, network sample technique), and to evaluate the spatiotemporal evolution of the earthquake activity in mining environments. In particular, we focus on variations of the seismic energy release and the clustering properties which might be related to instabilities in mines. We additionally plans to evaluate the probability of earthquakes detection, as derived by the spatial distribution of detected events at each station. This information can be joined to evaluate the detection performance of the whole network. The probability of earthquake detection is a powerful tool to evaluate triggering conditions, which can be used to identify regions where the network is unable to accurately identify and locate events. In the future, results from these studies might be used to mitigate hazards related to the mining activity.This work has been funded by the German BMBF "Geotechnologien" project MINE (BMBF03G0737A).