Geophysical Research Abstracts
Vol. 14, EGU2012-1477-2, 2012
EGU General Assembly 2012

Imaging velocity and attenuation anomalies in mining environments using Acoustic Emissions

S. Cesca (1), S. Monna (2), D. Kaiser (3), and T. Dahm (1)

(1) University of Hamburg, Institute of Geophysics, Germany (simone.cesca@zmaw.de), (2) INGV Roma, Italy, (3) BGR Hannover, Germany

Imaging structural properties and monitoring fracturing processes in mining environments is of importance for mining exploitation. It is also helpful to characterize damages induced by mining activities, thus it is of primary interest for mining engineering and civil protection. Additionally, the development of improved monitoring and imaging methods is of great importance for salt deposits as potential reservoirs for CO_2 sequestration. The analysis of Acoustic Emission (AE) and microseismicity data, which are routinely used in mining survey, is typically limited to estimate location of induced microcracks and seismicity. AE data will be here further analysed to obtain images of the seismic structure. We focus on an AE dataset recorded at the Morsleben salt mine, in Germany; the dataset contains more than 1 million events, recorded during a period of two months, with AE magnitudes spanning 5 units. Arrival times of first P and S onsets, as well as maximal amplitudes recorded for both seismic phases, are used to assess the seismic velocities and attenuation properties of the mining environment. Given the large size of the considered dataset, a spatial clustering of the events is first performed and a spatial homogeneous catalog of averaged "pseudoevents" is built. This new catalog is then used to provide first averaged images of the attenuation and velocity anomalies at specific depths. Results points to clear velocity and attenuation anomalies, which are correlated with the main structural features and the geometry of the salt body. The potential of the dataset for tomographic applications is investigated, both including synthetic simulations and considering real data. This study is funded by the project MINE, which is part of the R&D-Programme GEOTECHNOLOGIEN. The project MINE is funded by the German Ministry of Education and Research (BMBF), Grant of project BMBF03G0737.