Geophysical Research Abstracts, Vol. 8, 04794, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04794

Seismicity patterns and variation of the frequency-magnitude-distribution of microcracks in salt

N. Koehler (1), T. Spies (2) and T. Dahm (1)

(1) Institute of Geophysics, University of Hamburg, (2) BGR Hanover (Contact Email: koehler@dkrz.de)

Three-dimensional b-value distributions were derived from acoustic emission data of microcrack processes in a salt mine in the Allertal graben in Germany. The analysed rockmass has linear dimensions of about 60 x 60 x 90 m and mainly consists of ductile rock salt and stiff anhydrite.
Within the rockmass a cavity was backfilled with salt concrete which caused a time-dependent thermal- and gravity-induced stress-load inducing a large number of microcracks. The microcracks had dimensions of mm to cm and were recorded in the frequency range between 1 to 100 kHz by 24 sensors over a period of several years.
For the determination of the b-value distributions data from three years were used covering the time periods before, during and after backfilling of the cavity. The filling process lasted six months.
The results show strong variations of b and of the seismicity patterns during the different time periods. Before backfilling started, the rockmass showed an almost constant value of b $\approx$ 1.1. With the start of backfilling a limited volume in a distance of about 40 m to the cavity developed in which the b-values rose up to 4.45. The transition to adjacent volumes with nearly constant b-values of 1 - 1.5 was relatively sharp and well defined. The volume of high b-values increased with time and changed in shape.
Besides the identification of volumes with anomalous high b-values a correlation between the change in loading stress, number of events and b could be found in an area close to the cavity roof.
We discuss preliminary models to explain both the spatial and temporal b-value variations. Future work will concentrate on further developements of these physical models and will investigate more details of the seismicity patterns from this data set.