Geophysical Research Abstracts, Vol. 7, 03213, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03213

Influence of Ultrasonic Events Space Clustering on Autocorrelation Parameters of their Time Series

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The changes of correlation parameters of ultrasonic emission event series from loaded rock samples were studied as a function of their inhomogeneity and applied uni-axial load level. The purpose of performed laboratory experiments was the evaluation of relation between non-uniform distribution of ultrasonic emission (UE) events foci and changes of UE event series correlation parameters. All the experiments were realized by the means of computer aided loading machine MTS Rock Test System (model 315). UE was monitored by 8-channel recording Vallen System. The loading experiments were carried out on cylindrical migmatite samples (diameter 50 mm and height 100 mm). The migmatite was taken from the region of intended radioactive waste repository in the Czech Republic. The migmatite from this region exhibits heterogeneous structure. The loading was realized by constant loading rate approximately 27kPa/s up to total rupture of rock specimen. The duration of each experiment was about 2 hours. It was found, in some cases, that just before the total specimen rupture the clustering of ultrasonic signals (US) foci occurs in one or more small volumes (so called nucleation centers) inside of the specimen. The nucleation centers are connected with the rock sample inhomogeneity and they predetermine the future sample fault plane. It was confirmed, that in the case of only one nucleation centre, after reaching the load level 90% of sample strength, the mutual interaction between US increases. This results in an increase of the first autocorrelation coefficient value, a rise of autocorrelation function linearity and an extension of positive autocorrelation coefficients interval. In the case of processing of all US from more nucleation centers together the changes in autocorrelation characteristics are less or even not pronounced at all. To preserve the predictive properties of autocorrelation parameters, the analysis should be performed separately for the UE events arising in different nucleation centers. The obtained re-

sults proved our original idea that there exists mutual influence of US occurrence close to the critical stage of loading (more than 90% of the rock specimen strength). Practical application of correlation parameters changes of UE series (seismoacoustic series, respectively) requires previous selection of US on the base of their location. The correlation analysis should be only realized separately for individual nucleation centers.