Geophysical Research Abstracts
Vol. 20, EGU2018-2864, 2018
EGU General Assembly 2018

Laboratory-scale Investigation of Modified Omori Law

Junxian He (1), Arcady Dyskin (2), and Elena Pasternak (3)

(1) Civil Engineering, University of Western Australia, Perth, Australia (20657168@student.uwa.edu.au), (2) Civil Engineering, University of Western Australia, Perth, Australia (arcady.dyskin@uwa.edu.au), (3) Mechanical Engineering, University of Western Australia, Perth, Australia (elena.pasternak@uwa.edu.au)

Consistent statistical approach has been applied to examine the five aftershock sequences obtained from four hydraulic fracturing experiments using mortar blocks as physical models of rock. Due to the fact that the distribution of aftershocks is governed by a non-stationary Poisson point process, the maximum likelihood method is used to fit aftershock sequences with both the modified Omori law and the simplified Omori law characterised by zero the time shift. Based on the coefficient of determination and the AIC criterion, it is demonstrated that the modified Omori law serves as a better model for the sequences studied here. Both the estimated decay exponent and the time shift fall in the expected range as compared with the geological aftershocks. The statistical similarity between the geological aftershocks and laboratory aftershocks suggests that there is a common underlying mechanism governing the generation of aftershocks across the scale. The power law decay of aftershock frequency can be explained by the stress relaxation process through the reduction of modulus caused by the production of microcracks. Furthermore, the dependence of the exponent on the spatial distribution of microcracks suggests that small sliding zones might develop after the shut-in was applied to the hydraulic fractured samples.