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Earthquake energy reduction by external action from laboratory simulation

Gennady Sobolev, Alexander Ponomarev, and Yuri Maibuk

Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, ul. Bol'shaya Gruzinskaya 10, Moscow,Russian Federation (sobolev@ifz.ru)

Series of laboratory experiments were performed on the model of two granite blocks under the biaxial compression. The main purpose of these experiments is to estimate possibilities of partial removal of the stored potential energy. The model was exposed to calibrated impacts that excite elastic impulses. Mechanical stress, deformation and acoustic emission were recorded. Impacts produced both large slips with stress reduction to the initial level and small slips with 5-8% stress decrease. Small slips mostly took place after appearance of the low-frequency and low amplitude elastic oscillations. Before large slips phases of acceleration of contact surfaces motion were observed. It was similar to the acceleration that occurs before natural slips, not initiated by impacts. This feature was not universal: after the phase of acceleration the model sometimes returned to the stationary state of contact without large slip. All slips occurred with time delays after impact moment. The time of the delay decreased with the increase of impact energy. The less time delay the higher the possibility of the small slip appearance. The energy of the impacts was 3 times less than the stored energy of the model that indicates the trigger mechanism of initiation. Series of impacts that produce small slips allowed partially reducing the stored energy and therefore preventing the appearance of the large stick-slip event. In case after series of such impacts a large stick-slip still appeared then its energy was larger in comparison with natural slips. Experiments revealed the complexity of the problem of the earthquakes' hazard reduction by external impact.