Geophysical Research Abstracts, Vol. 7, 05519, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05519

On the aftershock decay scaling properties

V. Smirnov (1), A. Ponomarev (2)

(1) Physics Faculty of Moscow State University, Vorobievy Gory, Moscow, 119899, Russia, (vs60@ phys.msu.ru), (2) Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, Moscow, Russia, (avp@ifz.ru / Fax +007 095-2542478)

Aftershock sequences of earthquakes possess characteristic statistical properties. The intensity decay in the aftershock flow with time obeys the Omori power law: with attenuation of the aftershock activity, the recurrence plot slope b increases and the fractal dimension of the set of hypocenters d decreases. The origin of aftershock sequences is traditionally related to the relaxation of the seismic regime initiated by the main shock. Analysis of laboratory results obtained from relaxation simulation during fracture of rocks showed that statistical relaxation properties are the same as those observed in perturbation modes of the fracture regime, when a main shock source is absent. With step like loading of a sample (when its deformation abruptly increases and held afterward constant), each loading step gives rise to a sequence of acoustic events similar to aftershock sequences. The properties of sequences of acoustic events examined by determining experimentally their times and sources were found to be the same as in aftershock sequences of earthquakes: activity decay by the Omori law, an increase in b, and a decrease in d. The inferred results indicate that the presence of a main shock is not a necessary condition for the formation of relaxation processes similar to aftershock sequences. Such processes are likely initiated by an abrupt change in a certain region of the stress field whose relaxation is characterized by the aforementioned features of the transient seismicity regime. Main shocks typical of seismicity are only one of the possible sources of local perturbations in the stress field. Primary experimental data were obtained in the laboratory of rock mechanics headed by Prof. D. Lockner (Geological Survey, Menlo Park) in cooperation with S.A. Stanchits (Ioffe Physicstechnical Institute, RAS). This work was supported by the Russian Foundation for Basic Research, project no. 02-05-64268, and the Ministry of Science and Education of the Russian Federation, project no. NSh-1270.2003.5.