FIELD VERIFICATION AND MATHEMATICAL SIMULATION OF TRANSIENT SEISMIC PROCESSES

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The transient processes in seismicity are considered as a response to the quite powerful influences of different origin, which disturb stationary state of seismicity. Investigation of the transient process allows to study regularities of seismicity excitation and relaxation and to reveal physical factors controlling the dynamics of seismicity. A series of laboratory experiments for modeling of transient processes in seismicity was carried out. Laboratory results was verified by field experiment in Soultz-sous-Forets (France) hot dry rock area and analysis of natural seismic swarms in Corinth rift. Physical interpretation and mathematical simulation for found regularities was suggested. The aim of the experiments was to understand the character of excitation and relaxation of the failure, triggered by the external influence. The failure initiated by step-wise strain or force impacts results in transient acoustic emission similar to aftershocks and swarms. When increasing quickly, such impact generates processes similar to aftershock sequences; when increasing gradually, it generates swarm-like activity. The parameters of the induced activity change in a regular manner with increasing acting stress level: the stronger the stress, the later the activity starts to decay; Gutenberg-Richter b-value decreases with stress increasing; parameters of the Omori's law changes too. b-value varies in time during excitation and relaxation of acoustic activity (for given stress level): it decreases when activity is increasing and increases when activity is decreasing. This indicates a transition of failure at the increase stage from lower to higher levels (crack grows and fusion scenario) and from higher to lower levels at the decay stage (aftershock scenario). Similar regularities was found in natural conditions: in the experiment of seismicity generation by the water injection into a borehole (Soultz-sous-Forets, France) and in seismic swarms in Corinth rift. A hypothesis of excitation and depletion of some «failure reservoir» is suggested for explanation of obtained regularities. Mathematical simulation has confirmed the validity of this hypothesis. The work is supported by RFBR grant 08-05-00248 and project 08-05 of IPGP - IPGM collaboration.

ES6/TH/O10 - SYNCHRONIZATION PHENOMENA OF LOW-FREQUENCY MICROSEISMS.

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The vertical seismic records with sampling rate 1 Hz obtained from global IRIS broadband seismic network (1988-2009, 131 stations) and Japan F-net (1997-2010, 83 stations) were analyzed by estimating their multi-fractal parameters: the width of singularity spectra support, generalized Hurst's exponent and coefficient of singularity spectra asymmetry. Besides that linear predictability index of waveforms, spectral exponent and logarithm of variance were estimated as well. These statistics were calculated within adjacent «short» time windows of the length 30 minutes for initial 1 Hz data and for time windows of the length 1 day for records after coming to 1 minutes sampling.The seismic stations were split into a number of spatial clusters (7 clusters for global IRIS network and 5 clusters for F-net). The median values of all parameters were taken from stations in each cluster. A multiple correlation measures for different combinations of parameters were estimated within moving time window of the length 1 and 2 years for these median time series with uniform sampling time interval 1 day. Using of long time windows for estimating multiple correlation measure allows to average influence of storms and hurricanes.The sequence of waves of microseisms noise essential global synchronization was extracted. The most strong synchronization effects correspond to time interval 2003-2007 and the 2nd one started at the beginning of 2008 and is continuing till now. The microseisms field at Japan islands transfers to high level synchronization of its parameters starting from the middle of 2002, one year before the Hokkaido earthquake, 25 of September, 2003, M=8.3. This high level of synchronization keeps rather constant up to the current time. Based on the statement of the theory of catastrophes that synchronization is one of the flags of an approaching catastrophe, it may be suggested that the Hokkaido event, notwithstanding its power (M=8.3), could be only a foreshock of a still stronger earthquake at the region of Japan's islands. The cluster analysis of 7 median daily statistics from the whole network indicates a strong linear trend of cluster exponent starting from 2007 which is continuing till now. This trend peculiarity is similar to the trend before 2003 event. The peculiarities of correlation coefficient estimate within 1 year time window between median values of singularity spectra support width and generalized Hurst exponent indicates that starting from July of 2010 Japan islands come to the state of waiting strong earthquake.

ES6/TH/O11 - A STUDY OF TEMPORAL VARIATIONS IN 'B' VALUE AND MAGNITUDE OF COMPLETENESS FOR THE HIMALAYAN REGION.

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The Himalayan arc region is one of the most seismically active region of the world. An earthquake catalog containing over 3812 earthquake events with 622 events having more than 5.0 magnitude for the Himalayan region for the period 1964-2007 is considered. In this study, earthquake data are collated for the period 1964-2007 from International Seismological Center (ISC), National Earthquake Information Centre (NEIC) and HRVD. This catalog is analyzed to determine the variations in the seismic parameters and magnitude of completeness in time. Seismic parameters have been determined by two different methods namely, Maximum Curva-

The latest prediction: dangerous time for waiting catastrophe begins at the middle of 2010

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