Geophysical Research Abstracts
Vol. 13, EGU2011-1890, 2011
EGU General Assembly 2011

Analysis of the seismograms recorded on a prone-to-fall rock column (Vercors massif, French Alps)

Clara Levy, Denis Jongmans, and Laurent Baillet
ISTerre, University J. Fourier of Grenoble, France (denis.jongmans@ujf-grenoble.fr)

A small-aperture (40 m) short-period seismic array was installed during three months on the Vercors massif (Western French Alps) at the top of a limestone column which collapsed one month and a half later. During this monitoring period, 193 seismic events were recorded by the 7 seismometers of the array. Signal analysis yielded three main types of local seismic events to be identified from temporal and spectral characteristics: microearthquakes (single or multiple events), individual block falls and rock falls. One third of these events remained unclassified. About 60% of these events were classified as microearthquakes, exhibiting distinct P and S-waves.
A relation was found between the daily number of seismic events and the temperature values. The largest numbers of events fit with minima in the temperature curve, after a severe temperature drop (from 15 to 20°C). This result suggests a temperature control on rupture events and damaging, as it was recently shown from resonance frequency analysis on the same site.
Out of the microearthquakes, 40 events with a good signal-to-noise ratio were selected and processed. P and S-wave travel times were picked on the records and the inferred hypocentral distances agree with the two zones of the scarp exhibiting fresh ruptures after the fall. Polarization analysis of the 3-C records, along with numerical simulations, allowed discriminating between the two possible rupture mechanisms (toppling and sliding). Shear rupture was the predominant mode in the lower part of the column whereas toppling (traction mode) mostly affected the upper part. Finally, the comparison between the motions recorded on the column and on the rock mass showed a systematic amplification on the column. Signal processing and numerical modelling both suggest that this amplification resulted from the excitation of the natural frequencies of the column and is higher (> 3) for microearthquakes occurring at the column-to-mass interface. The follow up of the first natural frequency showed that it significantly decreased before the collapse.