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Correlation between climatic variation and microseismic events collected on a large fractured slope: application of statistical techniques.

C. Clement, V. Merrien-Soukatchoff, Y. Gueniffey, C. Dünner
LAEGO-INERIS Nancy France (cecile.clement@mines.inpl-nancy.fr/Fax: 0383533849)

The *Rochers de Valabres* slope is a large fractured cliff, located in the Tinee Valley (France's Southern Alps region) and showing high susceptibility to rock falls,. The site was chosen as an experimental location and had been instrumented since 2003, thanks to a collaboration between INERIS, LAEGO, Geosciences Azur and Geosciences Besançon Laboratories.

The Tinee valley is a narrow valley in Southern mountainous areas. As a result, the slope is especially prone to high temperature variations (20 degree maximum), heavy rainfall events during storm periods (100 mm/day maximum), occasional squalls of wind (45 m/s maximum) and regular regional seismic activities (45 local earthquakes listed by RéNass, French national seismic network). These exogenic parameters can be considered as the factors inducing slope degradation and movements.

In August 2003, a network of five microseismic stations, constituted by four geophones (40 Hz – 1 kHz) and one 3D accelerometer (0.1 Hz – 10 kHz) was installed on a vulnerable part of the *Rochers de Valabres* slope. Since November 2005, the slope monitoring has been enhanced by a geotechnical network, that continuously collects deformation and located displacement measurements.

The up to date available temporal data are microseismic events as well as meteorological variables. The system has recorded approximately 3500 high frequency microseismic events, the occurrence of which seems to follow a random process. However, microseismic crisis, characterized by an average number of 200 recorded signals, regularly appear. This crisis occurrence, which can be associated with the possible slope instability, can be correlated with climatic variations.

In order to quantify the relative influence of each of the explanatory climatic variables, several statistical techniques have been applied on the temporal data.

The use of descriptive statistical technique, like the analysis of the principal components (ACP), combined with discriminate factorial analysis (AFD) showed the contribution of the climatic variables and separate microseismic events in specific groups.

Moreover, in order to imply time dimension, time series analysis may be an appropriate method. However, the occurrence of microseismic activity is sporadic and the database of the collected values usually contains long sequences of zero values. Because of the occasional breakdowns of the network, the time series also appeared in sequences. In this case, the application of the “Zero Inflated Models” may be the most appropriate technique and can be applied to our temporal data. The first thought about how to treat this data show the high potential of this kind of method that are however tricky to run.