Microseismic activity analysis for the study of the rupture mechanisms in unstable rock masses

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Rockfalls are common instabilities in alpine areas and can cause significant damage. Since high mountains have been affected by an increasing number of these phenomena in the last years, a possible correlation with permafrost degradation induced by climate change has been hypothesized.

To investigate this topic, a monitoring system, made of 5 triaxial geophones and 1 thermometer, was installed in 2007 at the Carrel hut (3829 m a.s.l., Matterhorn, North-western Alps), in the frame of the Interreg IIIA Alcotra project n. 196 "Permadataroc".

The preliminary data processing relates to the classification of recorded signals, the identification of the significant microseismic events and the analysis of their distribution in time and space. The first results indicated a possible correlation between clusters of events and temperature trend, and a concentration of events in specific sectors of the rock mass.

Research is still in progress. The recording of data for a longer period is planned to fully understand seasonal trends and spatial distribution of microseismic activity, and possible relations with permafrost degradation. Nevertheless, the preliminary observations prove that the monitoring system can detect noises generated by rock slope deformation. Once fully developed, this technique could become a helpful tool for early warning and preliminary stability assessments.

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