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Simultaneous seismic and geotechnical monitoring for the characterization of superficial deformations of the mudslide in Super-Sauze, French Alps

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To characterize superficial deformations of the mudslide in Super-Sauze, southern French Alps, seismic and geotechnical monitoring techniques have been applied simultaneously during a field campaign in July 2009. Based on the method nanoseismic monitoring (Joswig, 2008), we installed three seismic mini-arrays with an aperture of 25-30m, each one consisting of one three-component central-station and three outer vertical-component stations. We identified two different deformation processes caused by the movement of the mudslide: fracture processes within the slope material and superficial fissure development (Walter & Joswig, 2009). The spatiotemporal occurrence of deformation processes identified by nanoseismic monitoring has been verified with geotechnical monitoring systems.

GPS devices as well as a small wireless ad-hoc, multi hop sensor network (WSN) have been installed in the slope area. The network consist of 7 connection points, called nodes, that transfer data from different sensors via radio signal directly or over other nodes (Multi Hop) in real-time to a data collection point (gateway). To determine the varying deformation processes, like toppling, spreading, falling and sliding, 6 nodes were equipped with micro-sensors (each with 3-axis acceleration sensor, 2-axis tilt sensor and barometric pressure sensor). In order to monitor the deformation of a recent fissure, one node was equipped with a position-sensor (draw wire displacement transducer). Laboratory tests for the different sensors showed that tilt movements can be detected with an accuracy of +/- 0,06° and a resolution of >0,1°, accelerations with +/- 0,008g and >0,02g and displacements with +/- 0,1mm and >0,1mm. The analysis of data recorded by barometric pressure sensors is quite difficult due to the high natural pressure fluctuations in mountain areas, anyway, the detection of fluctuations of >0,5m was possible.

Except the displacement transducers, the geotechnical sensors didn't detect any significant changes. To quantify the temporal occurrence of seismic signals caused by fissure development, the displacement transducers have been installed near by some of the seismometer stations. Fissure opening of 1,5mm in a time period of 5 days has been detected by the displacement transducers. We didn't observe a continuous fissure development, but rather a few periods with significant, abrupt displacements. Seismic events should have occurred before the fissure opening can be observed at the surface.

First findings of the simultaneous observation of superficial deformations at the mudslide in Super-Sauze by seismic and geotechnical monitoring techniques will be presented.