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Selp-Potential monitoring of a huge rocky landslide (Séchilienne, The Alps, France)

O. Méric (1,2), S. Garambois (1), **Y. Orengo** (1), J.-P. Duranthon (3) and P. Pothérat (3)

(1) LIRIGM-LGIT, University Joseph Fourier of Grenoble, France; (2) Société Alpine de Géotechnique, Gières, France; (3) CETE Lyon, Ministère de l'équipement, France. (contact : Stephane.Garambois@ujf-grenoble.fr; Fax : +33 4 76 82 80 70)

Beside earthquakes, the main triggering mechanism of landslides is due to groundwater flowing inside interstices and fractures. The understanding of hydromechanical coupling effects on landslides is generally provided by hydrological investigations, surface or boreholes monitoring and numerical modelling. However, these approaches suffer from the lack of information within the unstable area at depth. In order to evaluate the potential of Self-Potential (SP) monitoring to get information on transient water flow location and properties at depth, we installed a SP network since June 2005 on the huge rocky landslide of Séchilienne (The Alps, France). It has been extensively instrumented and monitored since 1985 (surface displacements and meteorology) and exhibited displacement rates varying from 15 cm/year to 1 m/year correlated to water infiltration following rains. Geophysical methods applied on this site (electrical, seismic methods) provided interesting information about fracture density but were less sensitive to water flow. Prior to the network SP measurements, a 1 km long SP profile was recorded on a perpendicular transect and monitored five times during 8 months. It shows large SP values (more than 200 mV) and stability over time, except in the most active area, but was unable to detect transient events. The SP network consists in 24 Pb-PbCl2 electrodes deployed both at surface (in the most active area) and in a 240-m long gallery drilled within the unstable rocky zone. We present possible correlations between transient SP data anomalies, meteorological data, deduced from two rain gauges, surface displacements and small local earthquakes.