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Field-scale infiltration experiments to understand landslide hydrology and mechanics: multi-source results obtained on the Super-Sauze and Laval landslides.

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The role of preferential water flows in triggering landslides is complex and ambiguous. First of all, preferential flow is well known to increase groundwater recharge and decrease the time delay between rain event and landslide response. Secondly, fissures can also drain landslide areas, lowering the groundwater table locally. On the mechanical part, fissures reduce the overall mobilised shear strength.

Therefore, a coupling between Darcian unsaturated and saturated flows and preferential flows is essential to forecast the pore pressure distribution and its time delay to the meteorological input signal adequately. To better understand these relationships, two hillslope hydrology experiments have been set up during several days on an active mudslide (Super-Sauze) and a shallow slide (Laval) in the South French Alps.

These landslides are respectively characterized by nearly saturated conditions within most of the year, with groundwater levels located nearby the topographical surface for Super-Sauze, and by unsaturated conditions within most of the year and the build up of positive pore pressures at the toe essentially during the winter and spring season for Laval.

The field scale infiltration experiment consisted in applying rain on representative plots of the landslides of about 120 m^2 (7 x 14 m) over a 4 days period. The rain water consisted in water enriched in bromide and rainfall intensities of 15 $mm.h^{-1}$ were applied. Geophysical (apparent electrical resistivity, P-wave velocity), hydrological (soil water content, soil suction, groundwater level, water discharge) and hydrochemical parameters (water quality, water conductivity) were observed before, during, and after the rainfall experiments at several locations within the experiment plots. The kinematics of the landslide was monitored by terrestrial laser scanning. The spatial variation in soil temperature at -20cm was also monitored at a high temporal frequency with a distributed fiber-optic temperature system.

The objective of this work is to present the setup of the experiments and the preliminary analysis of the multi-parameter monitoring data. Some research directions are presented in order to model the hydrology, the chemical signature of the flows, and the mechanics of the experimental plots.