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# The GACH2C research project: Assessing the influence of climate change on the activity of landslides in the Ubaye valley and the Trièves Region (southeast France).

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An important issue in climate impact research is the assessment of the effects of climate change on geomorphic processes and hazards, such as landslides. Effects of past, present and future climate characteristics can be assessed by field evidence, landslide monitoring or by mechanistic models (through the use of climate parameters simulated by general circulation models -GCMs). However there are a series of problems related to that approach. First, the uncertainty in future climate parameters is high, especially if the time context is greater than weather records or because of the low-resolution of the downscaled simulated time series. Then, the climate-landslide coupling is complex, because climate is related to landslides via the nonlinear soil water system. Physically based models of rainfall-induced landslides have been therefore used to understand this complex interaction and to derive thresholds for the hydrological triggering system under different conditions. However, landslide triggering systems show complex responses in relation to geotechnical, hydrological, and climatological properties, and more research is needed to understand these relationships. Hence a three year

project (2005-2007) has been funded by the French Research National Fund within the framework of the Incentive Concerted Action '*Hazard and Global Change*'. This abstract describes the motivation and objectives of the GACH2C project.

GACH2C (*Glissements Alpins à Contrôle Hydrologique et Changement Climatique – Rainfall-Induced Landslides and Climate Change*) seeks to develop a multidisciplinary methodology to analyse quantitatively the impacts of climate change on the activity of fine-grained landslides in the French Southeast Alps. The project focuses on well-known landslides developed in the black marls of the Ubaye valley (Super-Sauze, La Valette, Poche and Pra-Bellon) and in the varved clays of the Trièves (Saint-Guillaume, Mas d'Avignonet) representative of several landslide mechanisms. The project uses a standard scientific approach associating field observations and monitoring, laboratory experiments, and modeling. The project is build along three main axes:

(1) Analyzing the long-term relationships between climate characteristics and the activity (pore pressures variations, velocities) of the landslides for the last 50 years on the basis of climatic records (observed, or simulated with General Circulation Models) and detailed reconstitution of the landslide velocity patterns (through stereo-photogrammetric analyses);

(2) Enhancing our understanding of the mechanism of the landslides by developing and testing new geophysical monitoring techniques (hydro- and geochemistry, seismic noise based methods, multi-temporal resistivity and seismic tomography, self potential, very-high resolution remote-sensing) and by a field experiment of human-induced slope failure at the Super-Sauze landslide**;**

(3) Developing, testing and validating hydro-geochemical and hydro-mechanical numerical models in order to analyze the present and forecast the future activity of these landslides for several climate change scenarios.

The project results should allow to gain a better knowledge of the past, present and future dynamic of the studied landslides in order to assess the hazard at several time scales.