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Effects of climate change on the activity of shallow slides in the Ubaye Valley, South French Alps.

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The objective of this work is to present some results gained on the impacts of climate change on the activity of rainfall-controlled landslides developed in the black marls of the Ubaye Valley (South French Alps), and to propose a method for assessing the impacts of climate change on landslide frequency.

First, the long-term relationships between climate characteristics and the activity (pore pressures variations, velocities) of the landslides for the last 50 years are analyzed 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);

Second, several meteorological parameters (air temperature and humidity, wind speed, snowfalls and rainfalls, direct and scattered solar radiation, infra-red atmospheric radiation and cloudiness) are simulated for the Ubaye Valley at hourly time step with the Météo-France 'Safran' model for both the 20^{th} and the 21^{th} century. Based on prior studies (IMPEX) of the mesoscale impact of a climate change scenario (A2) over the Alps, the different meteorological series have been modified and homogenised in order to be representative of the expected climate of the end of the 21^{st} century through appropriate desaggregation procedures.

Third, these meteorological time series are introduced in a process-based model of transient slope hydrology and stability in order to analyze the present and forecast the future activity of these landslides for the A2 climate change scenarios.

The levels of confidence of the simulated meteorological data and the slope stability simulations are evaluated. Results of all slope stability simulations for the 21^{st} century indicate a decrease in landslide activity in the Spring period; at the opposite, the frequency of landslides is identical to the one observed in the 20^{th} Century in the Summer and Autumn periods.