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Debris flow occurrence future changes in high populated mountains (French Alps).

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The growth of tourism in recent decades, the dense population and more than 100 large ski areas create a high potential for damage to people, settlements and associated infrastructures in the French Alps. Increasing demographic pressures in mountainous regions and recent catastrophic events have renewed interest in various gravitational hazards predetermination in European countries.
Results of the models considering the A2 hypothesis (IPCC 2007) showed that the most significant climatic trends for the end of the century will be a decrease in intense rainy events and an increase in temperature. As it is known that debris flows are often triggered by intense rainy events, a change in global climate in the future could have an impact on the frequency of this process.
Our approach is to link the current (1960ies-2000ies) or future climate and the occurrence of debris flows based on statistical modeling. Regional climatic scenarios were computed from the ARPEGE model developed by the Centre National de Recherches Météorologiques of Météo-France. We developed new models using the simulated current climatic data with debris flows. Then we compared the probabilities of the occurrence of debris flows in the current period and in the coming century. Probabilistic models for the end of the twenty-first century were computed by interchanging meteorological parameters used in the statistical models established for the current period by meteorological data simulated for the future period.
The future changes should have impacts on the occurrence of debris flows. We expect a decrease in about 10-30% of debris flows occurrence probabilities. From a spatial point of view, the increase in temperature should result in a shift of the 0°C isotherm to a higher elevation which, in turn, should result in a 20% reduction of the number of slopes affected by the process compared to the current period.