Submitted Abstract

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Abstract

Several recent studies show that changes in the climate system, such as temperature increase and extreme precipitation events, strongly influence gravity-induced hazards. As part of the Climate Change Impacts on Alpine Mass Movements research program, we are developing a framework for modeling mass movement risk as it is altered by climate and socioeconomic factors. In a first approach, we modeled avalanche risk in central Switzerland for the current climate situation and three avalanche hazard scenarios. For each of these scenarios, we considered different 3-day increases in snow depth for avalanche formation derived from meteorological stations. For the modeling, we applied the RAMMS::LSHIM Large Scale Hazard Indication Mapping algorithm, which combines an automatic delineation of potential release areas from a high-resolution terrain model with a forest layer to represent the spatial distribution of avalanche impacts for each of the selected scenarios.
To model potential climate change impacts on avalanche hazard, we use downscaled data from CH2018 climate change scenarios. We compare the stations used for the first approach with the stations used for downscaling. A medium and a extreme snowfall scenario are derived from the CH2018 data, for the first- and the second half of the century, respectively. In order to determine the snow depth distribution for the future scenarios we use the multi-purpose snow and land-surface model "SNOWPACK". The resulting altered avalanche hazard situation is simulated using the RAMMS::LSHIM method, and risks are analyzed with the CLIMADA probabilistic Python-based risk assessment platform. High-resolution building layers are used to identify monetary values and assign vulnerabilities. The results are risk maps depicting changes in avalanche risk based on the combination of hazard, exposure and vulnerability information. These maps enable the evaluation of appropriate risk management options, thus contributing to decision support and highlighting areas where climate change adaptation measures may be required.