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Mountain permafrost and climate change - scenarios for the Alps based on a regional climate model

N. Salzmann, M. Hoelzle, F. Paul and W. Haeberli
Department of Geography, Glaciolgy and Geomorphodynamics Group

The occurrence of permafrost is mainly a result of the atmospheric conditions and the ground properties and in mountain areas of the topography. Thus, alpine permafrost is very sensitive to climatic changes. In complex mountain environments with its rough topography, the hazard potential of slope instabilities, such as rock falls or debris flows, are strongly related to changes in the thermal regime of the ground. Therefore, the calculation of scenarios about future changes in the spatial occurrence and temporal development of alpine permafrost temperatures is urgent, especially in densely populated areas like the European Alps. The calculation of scenarios requires that alpine permafrost models were run with data output from climate models. Such coupled climate-impact approaches offer new and promising perspectives in the field of hazard assessments and infrastructure planning. However, the many differences between, errors in and uncertainties of the two model types cause a broad range of uncertainties, which probably even increase with a coupling. Furthermore, due to the coarse spatial resolution of the RCMs (about 50km) on the one hand and the sparse distribution of climate stations at high elevation sites in the Alps on the other hand, the calculation of permafrost scenarios in complex mountain topography is also a problem of spatial scales and spatial interpolation. In a first part of this contribution we present and critically analyse different permafrost scenarios for the Corvatsch area (Upper Engadin, Switzerland). Two different alpine permafrost models were run using downscaled output from the limited area model CHRM (Climate High Resolution Model) of the Institute of Atmospheric and Climate Science (IAC), ETH Zurich. In a second part, spatial interpolation strategies are discussed in order to may be calculated permafrost scenarios irrespective to a nearby climate station.