Geophysical Research Abstracts
Vol. 14, EGU2012-9889, 2012
EGU General Assembly 2012

Permafrost simulations in the Dolomites using Alpine3D

W. Steinkogler (1,2), M. Bavay (1), M. Lehning (1,2)

(1) WSL- Institute for Snow and Avalanche Research (SLF), Davos, Switzerland (steinkogler@slf.ch), (2) École Polytechnique Fédérale de Lausanne (EPFL), School of Architecture, Civil and Environmental Engineering (ENAC), Lausanne, Switzerland

Permafrost is a strong indicator for climate change and an important structural fact for Alpine infrastructures. Therefore, its spatial distribution and temporal evolution are of great interest for scientists and practitioners. The effects of permafrost degradation due to climate change on slope stability, and thus debris flows or rock falls generated in high alpine regions, seriously affects mountain communities. Simulations as will be presented in this work can aid to identify, simulate and forecast impacts of climate change scenarios on permafrost areas. The potential permafrost distribution in the Veneto region (Italy) was calculated for a spatial resolution of 150 m by applying the hydro-meteorological model Alpine3D and the one-dimensional model of vegetation, snow, and soil SNOWPACK.

Information on land use and soil characteristics served as input data and for the initialization of the model, which was then run for 12 years with the meteorological data provided from up to 44 automatic weather stations inside or close to the investigation area as driving variables. Sub-surface temperatures calculated by the model served as indicators for the likelihood of permafrost. According to the sub-surface conditions the areas situated within the potential permafrost realm are further subdivided into different zones. Areas were defined as class 'permafrost likely' as long as they are < -1°C for the whole calculation period. Areas which are < -1°C for at least 50 % of the calculation period are classified as 'permafrost possible' based on the assumption that a short term warming would not be able to totally remove existing permafrost.

Our calculations for the Veneto region show that only a comparatively small fraction of the total investigation area is likely to have permafrost under the given climatic conditions. For the whole Veneto region (21283 km^2), a total area of 2.2 km^2 is of class 'permafrost likely' and additionally 5.3 km^2 are of class 'permafrost possible'.