Improving Permafrost Simulation in the Austrian Alps – Preliminary Modelling Results and New Field Data

B. Ebohon & L. Schrott
Department of Geography and Geology, University of Salzburg, Salzburg, Austria

1 INTRODUCTION

Alpine permafrost responds very sensitive to climate change. Thus, detailed knowledge about permafrost characteristics is a very important prerequisite concerning alpine hazard and risk assessments.

In the year 2008 a pilot study was performed to give an overview of possible and probable permafrost distribution in the Austrian Alps. Improving the preliminary approach it should be tested, if a statistical empirical model on a larger scale with a higher resolution will deliver appropriate results.

2 PILOT STUDY

First modelling outcomes show that in Austria approx. 2 % (1600 km²) of the federal territory can be assigned to mountain permafrost (Ebohon & Schrott, 2008). Based on an adapted topoclimatic-key, that results from the relation between slope, altitude and aspect, the possible and probable distribution of permafrost was calculated with the empirical statistical models PERMAKART (Keller, 1992) and PERM. Although a small scale regional map (50 m resolution) has a limited accuracy, it allows approximations of the permafrost distribution but there are still some unsolved problems.

3 APPROACH AND METHODS

3.1 *New tasks*

For the area of the "Hohe Tauern" range (Fig. 1) more precise adjusted lower limits of permafrost will be developed. With newly gathered field data statistical analyses will be carried out and interrelated with the topoclimatic-key. In addition relevant parameters like the short wave solar radiation as well as surface conditions will be included in the modell. Based on the adapted topoclimatic-key, the new simulation will show an index of permafrost occurrence between 0 and 100, which replaces "hard" lower borderlines of the subdivision "probable", "possible" and "no permafrost". All queries will be applied on a DEM with a resolution of 10 m to enhance the accuracy of the simulation.

3.2 *Research area and data gathering*

In three test sites (Glorer Huette, Obersulzbachtal, Kitzsteinhorn) UTL data logger were installed at different heights and aspects to measure the ground surface temperature during sub-snow-conditions. Furthermore, geophysical- (DC-resistivity and ground penetrating radar) and BTS measurements were performed in 2009 at various altitudes, settings and aspects.

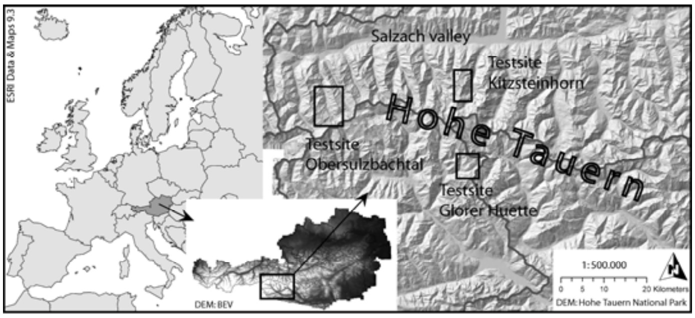

Figure 1. Research area and local test sites

4 CONCLUSIONS

BTS- and geophysical measurements contribute to a better ground truth and allow an enhancement of the topoclimatic-key. Additionally, detailed geomorphological mapping of permafrost related landforms will be used to validate the model. The resulting map will be implemented in a web GIS making data accessible to the general public and providing an important tool for decision makers concerning infrastructure in high mountain areas. A project description, news and results of the pilot study can be seen via www.permalp.at.

References

Ebohon, B. & L. Schrott (Kane, D. & K. Hinkel eds.) 2008. Modeling Mountain Permafrost Distribution. A New Permafrost Map of Austria. *Proceedings of the Ninth International Conference on Permafrost*. Fairbanks – Alaska. 397-402.

Keller, F. 1992. Automated mapping of mountain permafrost using the program PERMAKART within the geographical information system ARC/INFO. *Permafrost and Periglacial Processes*, Vol. 3 (2): 133-138