Geophysical Research Abstracts,
Vol. 11, EGU2009-5067, 2009
EGU General Assembly 2009


# Looking Inside – using a traditional method for permafrost investigation with a new application: 3D Geoelectrical Imaging

C. Kneisel and A. Bast

Department of Physical Geography, Würzburg, Germany (kneisel@uni-wuerzburg.de)

Many important problems in periglacial geomorphology, such as warming-induced permafrost degradation, concern subsurface properties and processes that take place some metres below the surface. Periglacial environments can be highly variable regarding surface and subsurface conditions. These often heterogeneous surface and subsurface conditions call for methods that are able to resolve the shallow subsurface.
Geophysical methods are used to gain information about the physical properties and the structure of the subsurface and are particularly suitable for geomorphological investigations since the knowledge of structure, layering and composition of the subsurface at different scales are key parameters for geomorphological problems.
For the study of alpine and subarctic mountain permafrost with small-scale heterogeneity of surface and subsurface characteristics (ranging from permafrost with low ice content to massive ground ice) 2D electrical resistivity tomography has proven to be an especially well-suited and multi-functional method. ERT is a comparatively fast method to image the subsurface and infer permafrost characteristics even on rugged alpine terrain with rough surface conditions. Up to now an efficient 3D geophyiscal mapping of the subsurface in mountainous environments with rough terrain on a larger scale has not been possible. As a realistic compromise, results of several 2D geophysical surveys at close distance can be merged to build up a quasi 3D image of the subsurface characteristics and lithology. This approach is currently in progress in several studies in the Swiss Alps and that will become increasingly important in the near future. Recent advances of 3D geoelectrical imaging surveys from the recently exposed Muragl glacier forefield are presented. The results are compared with surface and subsurface temperature data and geomorphological mapping. The combined approach allows a better understanding of the permafrost dynamics comprising aggradation, degradation or preservation of mountain permafrost in the discontinuous zone. 3D geoelectrical imaging has the potential to improve the understanding of the geomorphology of contemporary permafrost environments. The limits of interpretation are discussed and future application perspectives for the study of permafrost-related periglacial landforms and periglacial process are highlighted.