



## Climate change and rock-fall events in high mountain areas: The example of the rock falls in 2007 at Mt. Mittlerer Burgstall, central Austria

A. Kellerer-Pirklbauer (1), G.K. Lieb (1), and M. Avian (2)

(1) Institute of Geography and Regional Science, University of Graz, Graz, Austria, (2) Institute of Remote Sensing and Photogrammetry, Graz University of Technology, Austria

Landslides occurring at high mountain areas which are generally underlain and stabilized by permafrost or at slopes that are affected by retreating glaciers are getting more frequent in recent years. In 2007, a number of rock fall events occurred on the southern flank of the mountain Mittlerer Burgstall (2923 m a.s.l.), a former nunatak that was surrounded by the Pasterze Glacier, the largest glacier of the Eastern Alps (ca.  $17.5 \text{ km}^2$ , N $47^{\circ}46'$ , E $12^{\circ}42'$ ), during the Little Ice Age. Geomorphological mapping, permafrost distribution modelling, ground temperature data from a shallow borehole on the summit plateau, airborne laserscanning (LiDAR) data, and photogrammetry have been used for assessing the rock fall events. Permafrost modelling indicates that the entire area of detachment is located at lower margin of discontinuous permafrost. Temperature monitoring in the shallow borehole support the permafrost modelling results. Geomorphological mapping as well as the analysis of two digital terrain models (DTM) derived from aerial photographs of 2003 and high resolution airborne LiDAR data from 2008 reveal the following evidences. The entire area of detachment covers some  $2700 \text{ m}^2$  (length 90-100 m; width 25-30 m). The areas of transportation and deposition cover some  $85,000 \text{ m}^2$  including parts of the large tongue of Pasterze Glacier located at the foot of the rock fall scar. The volume of all rock falls which happened during 2007 at this site is about  $35,000 \text{ m}^3$ . The reasons for the rock falls in 2007 are a combination of glacier retreat, permafrost degradation, unfavourable geological conditions as well as a warm winter 2006/2007. The continuation of the multidisciplinary monitoring program at Mittlerer Burgstall will help to understand the driving forces of the rock falls in more detail and possibly enable to predict future rock fall events at the Mittlerer Burgstall.