



Geophysical investigations of alpine permafrost in the Ötztal Alps of Austria

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Variation of alpine permafrost due to climatic changes may have severe effects on the morphology, microclimate, and the hydrological regime of high alpine regions. This can result in an increase of alpine hazards, geotechnical problems, variations of hydrological discharge, and consequences for environment and tourism. We present a multi-disciplinary project focussing on permafrost in unconsolidated sediments and the related hydrological setting. The study area (Kaunertal in Ötztal Alps) is located at altitudes between 2300 and >3100 m and covers an area of approximately 5 km². Active rock glaciers and patterned ground indicate the presence of extensive alpine permafrost. Previous studies in Kaunertal highlight the internal structure, ice content and dynamics of the two rock glaciers (*Ölgrube* and *Kaiserberg*). The geophysical investigations include the detection of permafrost by seismic refraction methods. To decide if P-wave velocities between 3000 and 4000 m/s represent either permafrost or weathered and fractured bedrock we calculate Poisson's ratio from P- and S-wave velocity investigations. The Poisson ratio of permafrost in unconsolidated sediments clearly show higher values ($0,39 < \nu < 0,42$) as it is expected for bedrock (usually $\nu < 0,3$). BTS measurements are also applied. The result of both methods is used to construct a map of the distribution of permafrost. Based on this map we select areas and apply DC resistivity, GPR, seismic refraction and gravimetry to characterize the different permafrost types, study their structure, and to achieve reliable parameters for the hydrological model. In this contribution we present the results of previous

studies located in the Kaunertal as well as the first results of recent investigations including permafrost outcrops, temperature and run off measurements, geological and geophysical investigations.