



Permafrost at its limits: The most easterly evidence of existing permafrost in the European Alps as indicated by ground temperature and geoelectrical measurements

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Mountain permafrost is a widespread phenomenon in alpine regions in the European Alps. For instance, some 2000 km² or 4% of the Austrian Alps are underlain by permafrost. Up to recent times most research on permafrost issues in Austria focused on the central and highest section of the Austrian Alps. By contrast, knowledge concerning marginal permafrost zones is fairly limited. To increase knowledge about the easternmost limit of permafrost in the European Alps, a research project focusing on the Seckauer Tauern Mountains (14°30'E to 15°00'E) and particularly on the Hochreichart area was initiated in 2004 by the first author. Since then, different methods have been applied such as e.g. geomorphic mapping, numerical permafrost modelling, multi-annual BTS measurements (since 2004) or continuous ground surface and near ground surface temperature measurements by miniature temperature data loggers/MTDs (since 2004). In order to verify the temperature data and to extend the spatial knowledge about permafrost distribution beyond point information, a geoelectrical survey was carried out at the end of August 2008 by applying the electrical resistivity tomography (ERT) method along a 120 m long profile covering the upper part of the rooting zone of a (more-or-less) relict rock glacier and the talus slope above. For this survey the two-dimensional (2D) electrical surveys was performed using the Wenner-Alfa configuration with 2.5 m spacing and an LGM-Lippmann 4-Punkt light hp resistivity-meter. The ERT results indicate an active layer of 2 to 4 m underlain by a permafrost body along 3/4 of the entire profile with resistivity values between 50 to 100 kOhm.m and extending to a depth of 10 to 15 m. The permafrost body is substantially thicker at the lower part of the profile (rock glacier; first 50 m of profile) compared to most of the upper part (talus slope). Focusing on the talus slope, the permafrost body is thickest on the central section of the profile (5-6 m thickness). In contrast, at the lower part of the talus slope the permafrost body is most likely very thin (less than 1 m) whereas at the uppermost part permafrost is absent. Generally, the permafrost distribution seems to be strongly influenced by the grain size of the sediments at the study site. The ERT data are in accordance with the collected temperature data supporting that this site is the most easterly evidence of existing permafrost found in the entire European Alps at 14°41'E.