



## **Permafrost distribution mapping and landscape evolution in a small cirque glacier forefield of the Turtmanntal, Swiss Alps: application of DC-resistivity, refraction seismics and BTS measurements**

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Permafrost distribution in a small cirque glacier forefield in the Turtmanntal (central Swiss Alps) has been analysed using DC-resistivity, refraction seismics and measurements of the base temperature of the winter snow cover (BTS). The study area is characterised by a prevailing northwest exposition and altitudes from 2600 to 3000 m asl. Due to relatively low solar radiation and a mean annual air temperature of approximately  $-2^{\circ}\text{C}$  at 2850 m asl we assume that permafrost distribution is discontinuous. Nevertheless, we suppose that the area represents one of the most favourable positions for the development of permafrost in the Turtmanntal.

Survey locations were chosen where important factors controlling permafrost development are assumed to be favourable. Thus, geophysical measurements have been carried out for example on wind exposed ridges (e.g. moraine ridge), recently deglaciated areas and areas with coarse grained ( $d > 50$  cm) surface material. A number of temperature dataloggers (UTL-1) have been placed in all subunits of the study area showing typical combinations of permafrost factors. Additionally, the distribution of glacial and periglacial landforms has been analysed to explain the present mapped permafrost distribution and its relationship to the late Holocene landscape evolution of this cirque.

The survey reveals a distribution pattern of permafrost being highly variable in space. Though characteristic landsurface properties (e.g. surface material; ridges and furrows) can be associated with the permafrost distribution, it is rather a combination of factors that influence the permafrost distribution on this small scale. Development of permafrost following the glacier retreat has not been observed in the cirque.