Thermal State of Frozen Ground in a Changing Climate During the IPY

Abstracts from the Third European Conference on Permafrost 13-17 June 2010

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Editors: Jordan R. Mertes, Hanne H. Christiansen and Bernd Etzelmüller

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Distribution and Structure of Permafrost in Two Alpine Talus Slopes, Valais, Swiss Alps

C. Scapozza[1], C. Lambiel[1], L. Baron[2], L. Marescot[3] & E. Reynard[1]

[1]*Institute of Geography, University of Lausanne, Lausanne, Switzerland*

[2]*Institute of Geophysics, University of Lausanne, Lausanne, Switzerland*

[3]*Risk Management Solutions (RMS), Zurich, Switzerland*

1 INTRODUCTION AND STUDY SITES

In order to determine the spatial extension and the characteristics of the permafrost within alpine talus slopes, geophysical measurements were carried out in several sites of the Swiss Alps, proposing a model of the permafrost distribution in talus slopes located within the Alpine periglacial belt (e.g. Lambiel and Pieracci, 2008). According to this model, permafrost appears likely in the lower part of the slope, whereas it is generally improbable upslope. In order to validate this model, two periglacial talus slopes located in the western part of the Swiss Alps (Valais) have been studied thanks to destructive borehole drilling and electrical resistivity tomography (ERT) profiles: Les Attelas talus slope, composed of paragneiss, (Verbier area, 2600-2800 m a.s.l.) and the Petit Mont Rouge talus slope, composed of dolomites and limestone (Arolla area, 2600-2700 m a.s.l.).

2 RESULTS AND DISCUSSION

Three boreholes have been drilled along an upslope-downslope transect in the two talus slopes. For both sites, frozen sediments are present only in the two lowest boreholes, whereas the upper borehole does not present ice (Fig. 1 – for more details, see Scapozza *et al.*, submitted). The stratigraphy is confirmed by ground temperatures registered in the boreholes.
In both sites, an upslope-downslope ERT profile has been measured in summer 2009. These two profiles show a difference in inverted resistivities between the lower and the upper part of the slope. In the Attelas talus slope, a resistive body with values higher than 15 kΩm (with maximal resistivities higher than 50 kΩm) and a thickness of about 15-20 m is present in the lower part of the slope, with resistivities that decreased with increasing elevation. In the Petit Mont Rouge talus slope, maximal resitivities are comprised between 100 and 200 kΩm in the lower part of the talus slope (between 54 and 82 m), and higher than 200 kΩm in the protalus rampart (between 88 and 116 m). In the uppermost part of the profiles, the resistivities are lower than 5 kΩm for the Attelas talus slope, and lower than 15 kΩm for the Petit Mont Rouge talus slope.

These results confirm that, in the two studied sites, the presence of permafrost is probable in the lower parts of the talus slope, whereas it appears to be improbable in the upper parts. The borehole data allowed validating the stratigraphy obtained from the ERT profiles, both for the distribution of frozen sediments in the talus slope and for the depth of the detected structures.

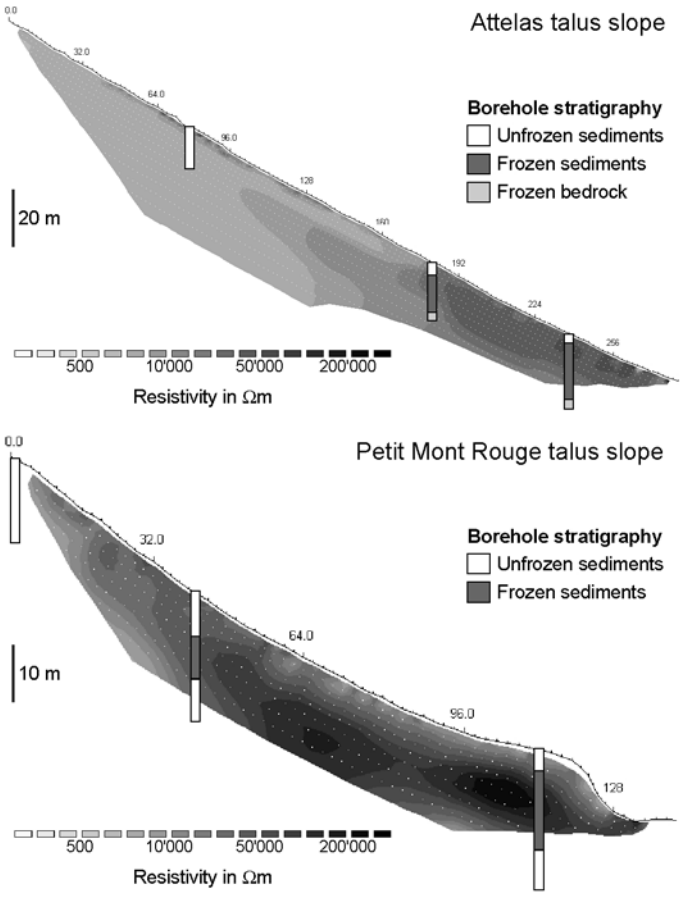

Figure 1. Inverted ERT profiles and boreholes with stratigraphy along an upslope-downslope transect.

References

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