Geophysical Research Abstracts, Vol. 8, 09982, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09982

The potential of volcanic eruptions for permafrost aggregation: Hekla volcano in Iceland

A. Kellerer-Pirklbauer (1), H. Farbrot (2) and B. Etzelmüller (2)

(1) Institute of Geography and Regional Sciences, University of Graz, Austria, (2) Department of Geosciences, University of Oslo, Norway (andreas.kellerer@gmx.at)

The presence of a tephra (volcanic ejects) layer reduces the amount of ablation of the underlying snow by shielding it from insolation and atmospheric heat. This influence is similar to the effect of a supraglacial debris layer on glacier ice surfaces; already a thin layer of debris is sufficient to cause substantial ablation reduction. This study describes the effect of tephra on the ablation of the underlying winter snow cover and on possible permafrost aggregation at Hekla volcano, SW Iceland. Hekla (1491 m a.s.l., 63°59'N 19°40'W) is a prominent, elongated, little glaciated strato-volcano and one of the most active volcanoes in Iceland. The last eruption occurred in winter 2000. At its initial phase, a generally thin tephra layer (predominantly dark tephra composed of pumiceous fragments with a low density and a high porosity) was deposited on snow. Observations on the changes of the H-2000 tephra-covered surface in the Hekla area were made during various field visits in 2001 and 2005. Interestingly, sub-tephra layer ablation seems not to act evenly. It is assumed that differential ablation and redistribution of tephra particles cause the formation of an uneven, hummocky terrain with a polygonal topography, called dríli in Icelandic. This dríli-landscape has been used to estimate the altitudinal lower and upper limits of (intensive) sub-tephra ablation processes 15, 17 and 65 months after the eruption as an indictor for the occurrence of buried 2000-snow as well as possible permafrost formation and occurrence. Field studies will be presented and compared to regional permafrost modelling results. This example demonstrates that the combination of a permafrost favouring climate and a thin layer of tephra is sufficient to reduce the sub-tephra snow ablation substantially, possibly even to zero and, thus, may cause land and permafrost aggregation.