



The decline of mountain permafrost and the occurrence of recent large debris slides in Iceland

Thorsteinn Saemundsson (1), Jon Kristinn Helgason (2), and Halldor Petursson (3)

(1) Faculty of Earth Sciences, University of Iceland, Reykjavik, Iceland (steinis@hi.is), (2) Met Office - Avalanche Center, Sudurgata 12, Isafjordur, Iceland (jonkr@vedur.is), (3) Icelandic Institute of Natural History, Borgum við Nordurslod, Akureyri, Iceland (hgp@ni.is)

During the last decade several, somewhat unusual, debris slides have occurred in Iceland. Most of these slides occurred in the Tröllaskagi peninsula in central north Iceland as well as in the eastern part of the island, and their starting zones are all located above 750-800 m. In most of them large blocks of frozen sediments have been observed in the slide material.

The temperature rise which has been observed in Iceland during the last decades has led to discussions about the present permafrost condition in Iceland and the possible decline of mountain permafrost. Recent studies at the Orravatnstrústir palsa site, in the highlands north of the Hofsjökull icecap give clear indications of decreasing of the permafrost during the last decade or so (Saemundsson et al. 2012).

In 2011 and 2012 two large debris slides occurred in northern Iceland. In 2011 a huge slide fell from the Torfufell Mountain in the Eyjafjörður area and in 2012 another one fell from the Móafellshyrna Mountain in the Fljót area. In both these cases the slides originated at about 750-800 m a.s.l. and large chunks of frozen sediments transported down the mountain sides.

The Torfufell debris slide fell on the 14th of October 2011, after exceptionally warm summer and unusually rainy fall. The slide originated along a 200 m long fissure at 800 m.a.s.l in a NW facing slope. Big blocks of frozen sediments located within the landslide debris material were traced back to crown of the landslide.

The, Móafellshyrna debris slide fell on the 20th of September 2012, occurred after an unusually warm and dry summer with record amount of sunshine hours, followed by month of intense precipitation and earthquake activity in N-Iceland. The slide originated in a 200 m wide cirque at 750 m height in the NW slope of the mountain where a frozen solid debris cone slid or crept off a 100 m high rock face into a steep water saturated talus slope. The frozen sediments at 750 m height give clear indication of mountain permafrost in loose sediments at this altitude in the northern part of the Tröllaskagi peninsula.

The primarily causes of these debris slide activity is primary thought to be related to precipitation. The thawing of the mountain permafrost can have played a significant role as a triggering factor, as demonstrated by large blocks of frozen sediments observed in the debris. Questions about the permafrost condition and possible decline of mountain permafrost have to be been addressed in relation to risk assessment.

Reference:

Saemundsson, Þ., Arnalds, O., Kneisel, C., Jonsson, H.P. & Decaulne, A. 2012: The Orravatnstrústir Palsa site in central Iceland – Palsas in Eolian Sedimental Environment. *Geomorphology* 167-168, 14-20.