



Permafrost thermal response to the extreme winter and spring temperatures of 2005/2006 on the Arctic islands Svalbard

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Svalbard is a group of islands in the Northern North Atlantic sector of Arctic between 74-81 deg N and 10-35 deg E. About 60 % of the islands are covered by glaciers. Svalbard is within the zone of continuous permafrost. At the coasts the thickness of permafrost is less than 100 meters, but increases to more than 400 m in the mountains.

Results from ground temperature monitoring on Svalbard indicate that the permafrost has warmed considerably during the last decades. In the continuous permafrost in Svalbard, the observed temperature rise in permafrost is not likely to pose an immediate threat to natural and human systems. However, the Svalbard region is predicted to warm considerably more than most of the rest of the world. Downscaled temperature scenarios for Svalbard indicate a significant warming during the 21st century, leading to a warming of the cold continuous permafrost, which is likely to increase the thickness of the active-layer, leading to possible thaw settlement and slope instability.

A heat wave that affected Svalbard during the winter and spring 2005/2006 produced record breaking temperatures particularly during January and April. The air temperature on Svalbard airport (Svalbard lufthavn) in January and April was 12.6 deg C and 12.2 deg C above the 1961-1990 average, respectively. The monthly mean temperatures are the highest ever measured in April for the homogenized Svalbard airport series, which starts in 1911. April 06 was warmer than any previously recorded May, and January 06 was warmer than any previously recorded April. The mean temperature for December-April 2005/2006 was -5.9 deg C (8.7 deg C above the 1961-1990 average) - the warmest since records began in 1911 and 2.9 deg C warmer than any other December-April in this period.

This study seeks to analyse the effect that the extreme event of 2005/2006 had on the thermal regime on the continuous permafrost on Svalbard. Ground temperature data from a 102 m deep borehole located at Janssonhaugen, western Svalbard (78deg 10min N, 16deg 28min E, 270 m a.s.l.), is used in the analyses. This boreholes was established in May 1998 under the European PACE (Permafrost and Climate in Europe) project.