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High arctic snow avalanche observations and modeling in Svalbard 2007-2009

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Systematic snow avalanche observations, carried out by the Norklima CRYOSLOPE Svalbard research project 2007-2009, represent the first comprehensive study of periglacial slope processes and especially snow avalanches in a high arctic maritime landscape. The main focus is on snow avalanche types, their spatial distribution, timing and associated controlling meteorological and snow pack conditions. Another focus is on the classification of the snow pack in central Svalbard in terms of thickness, hardness, stratigraphy and most persistent weak layers that cause avalanching.

As a result of increasing population and tourism, snow mobile transportation and other recreational use of the steep terrain has increased, especially during the last 10-15 years in Svalbard. Such winter activity takes place in a high relief, almost vegetation free landscape, affected by snow avalanches.

We present results from the 3 years project period, as well as the methods used to collect observations on snow avalanches, the snow pack and the meteorological data along the most intensively used 70 km snow mobile tracks around Svalbard's main settlement Longyearbyen. This enables us to identify the main factors controlling snow avalanches. We have recorded the amount of traffic along the main snow mobile tracks in our snow avalanche affected study area by use of radar, for avalanche risk evaluation. We also exemplify the high arctic maritime snow climate as an important additional type of snow climate, and emphasize its characteristics.

Along with the field work, numerical modeling of avalanche activity has been developed and tested during the winter 2008-2009, on a weekly basis. The modeling includes topography, geomorphology and vegetation as input data, along with daily meteorological observations on air temperature, wind, cloud cover and precipitation from two meteorological stations at different altitudes. Examples from this modeling experiment will be presented together with the collected, contemporary field observations for verification of the modeling.