Geophysical Research Abstracts
Vol. 14, EGU2012-9384, 2012
EGU General Assembly 2012

50 years of snow stratigraphy observations

C. Johansson (1), V. Pohjola (1), C. Jonasson (2), and T.V. Challagan (3)

(1) Departemnt of Earth Sciences, Uppsala University, Uppsala, Sweden , (2) Abisko Scientific Research Station, Swedish Polar Research,981 07 Abisko, Sweden, (3) Sheffield Centre for Arctic Ecology, Department of Plant and Animal Sciences, University of Sheffield, Sheffield S10 5BR, UK

With start in autumn 1961 the Abisko Scientific Research Station (ASRS) located in the Swedish sub Arctic has performed snow stratigraphy observations, resulting in a unique 50 year long time series of data. The data set contains grain size, snow layer hardness, grain compactness and snow layer dryness, observed every second week during the winter season.

In general snow and snow cover are important factors for the global radiation budget, and the earth's climate. On a more local scale the layered snowpack creates a relatively mild microclimate for Arctic plants and animals, and it also determines the water content of the snowpack (snow water equivalent) important for e.g. hydrological applications.

Analysis of the snow stratigraphy data, divided into three consecutive time periods, show that there has been a change in the last time period. The variable most affected is the snow layer hardness, which shows an increase in hardness of the snowpack. The number of observations with a very hard snow layer/ice at ground level increased three-fold between the first two time periods and the last time period. The thickness of the bottom layer in the snowpack is also highly affected. There has been a 60% increase in layers thinner than 10 cm in the last time period, resulting in a mean reduction in the thickness of the bottom layer from 14 cm to 11 cm. Hence the living conditions for plants and animals at the ground surface have been highly changed.

The changes in the snowpack are correlated to an increased mean winter air temperature. Thus, continued increasing, or temperatures within the same ranges as in the last time period, is likely to create harder snow condition in the future. These changes are likely to affect animals that live under the snow such as lemmings and voles or animals that graze sub-Arctic vegetation in winter (e.g. reindeer that would potentially require increased supplementary feeding that incurs financial costs to Sami reindeer herders). Any decrease in lemmings and vole populations is likely to have cascading effects on biodiversity, particularly predators such as arctic foxes and snowy owls.