Geophysical Research Abstracts
Vol. 12, EGU2010-6091, 2010
EGU General Assembly 2010

Stable water isotopes on time scales from hours to decades at the new deep drilling project in NW Greenland – NEEM

Hans Christian Steen-Larsen (1), Valérie Masson-Delmotte (2), Jesper Sjolte (1), Sigfus J. Johnsen (1), Bo M. Vinther (1), James White (3), and Arny E. Sveinbjörnsdottir (4)

(1) Centre for Ice and Climate, Niels Bohr Institute, University of Copenhagen, Copenhagen OE, Denmark (hanschr@gfy.ku.dk), (2) Laboratoire des Sciences du Climat et de l'Environnement, CEA Saclay Gif-sur-Yvette cédex, France, (3) Institute of Arctic and Alpine Research, University of Colorado, Boulder, USA, (4) Institute of Earth Sciences, University of Iceland, Reykjavik, Iceland

We present here the first results to come out of the stable isotope program under the new deep drilling project in NW Greenland – NEEM (77.45 N 51.05 W, 2484 m a.s.l.). During the seasons of 2007, 2008, and 2009 shallow cores were drilled and precipitation and atmospheric water vapour were collected.

From interannual correlation with climate indicators, we find that the water isotopes from the ice/firn cores are highly correlated with sea ice extent in the Baffin Bay region. This opens up for the possibility of reconstructing past sea ice extent in the Baffin Bay region before satellite remote sensing was introduced. Furthermore we surprisingly find that regional climate in terms of coastal temperatures are only very weakly correlated to the isotope content in the ice/firn. The NAO signal is very weakly presented in the isotope record. Atmospheric models point to a dominant summer seasonality of snowfall at NEEM, which provides an explanation for the lack of coherency with winter signals in terms of coastal Greenland temperature but also with winter NAO. Using the isotope record as a proxy for site temperature we find that the mean annual temperature at NEEM as increased by $\sim$1.3 degrees C over the last 40 years.

From the precipitation samples, which were collected on event and sub-event basis, together with the collection of atmospheric water vapour we learn that the large majority of the water vapour comes from the local snow surface and not from external sources. This finding indicates that a large exchange of water is occurring between the snow surface and the lower part of the atmosphere. Such an exchange could have a large effect on post depositional processes affecting the climate signal as it is being buried in the firn. To interpret the hydrological cycle of the precipitations and of the mean annual cycle we use simple distillation modeling.

The work presented here will form the basis for future interpretations of the deeper parts of the NEEM ice core, which is expected to hit bedrock in July 2010.