



Characterizing the variability in precipitation-bearing storms over Central Greenland during the last glacial period

Mai Winstrup (1), Anders M Svensson (1), Sune O Rasmussen (1), Peter Ditlevsen (1), Sepp Kipfstuhl (2), and Eric J Steig (3)

(1) Centre for Ice and Climate, Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark (mai@gfy.ku.dk), (2) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (3) Department of Earth and Space Sciences, University of Washington, Seattle, Washington, USA

A few ice core records are of sufficiently high resolution that they are able to record individual weather events. In this study, we are looking into one of these, namely the visual stratigraphy of the NGRIP ice core record from Central Greenland. We consider the evidence these data contains on variability in past precipitation-bearing storm tracks over Central Greenland during the rapid climatic changes of the last glacial. This information has implications for the variability of past circulation patterns in the North Atlantic region and their governing climate mechanisms.

From the NGRIP ice core, Central Greenland, very detailed images of the visual stratigraphy in the core has been obtained. For the ice deposited during the last glacial period, the images show a clear banding of small-scale layers with a range of thicknesses. These layers are believed to be the result of individual precipitation events, which can be distinguished due to differences in their impurity concentrations. This assumption is justified by a qualitative comparison of contemporary Central Greenland weather data to the layering in early Holocene visual stratigraphy data. In combination with an accurate layer-counted chronology for the NGRIP ice core, the data allows us to look into the variability of past storminess over Central Greenland. This variability is quantified in terms of the changes in frequency and intensity of precipitation-bearing storms over the warm and cold phases of the last glacial period.

Preliminary investigations show that whereas the average amount of precipitation per storm event is relatively constant with climate, the frequency of storms is changing significantly: A considerably larger number of precipitating storms per year are reaching the NGRIP drill site, Central Greenland, during the interstadials. On the other hand, inter-annual variability in the frequency of major storm occurrences is observed to be largest during the cold periods. We hypothesize that the observed variation is caused by an average southward shift of the jet stream during cold periods, but with its trajectory displaying a higher degree of annual and interannual variability. This is consistent with modern evidence for a northward shift of the polar jet stream in response to global warming.