



Observing the isotopic water vapour above the snow surface in Greenland – it's implications for post depositional effects

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As part of the isotope surface program at NEEM– the new deep drilling project in NW Greenland (77.45 N 51.05 W, 2484 m a.s.l.) – a water vapour analyzer was deployed during the field season of 2009. We believe that these are the first measurements of the isotopic composition of the water vapour in the atmosphere to come out of a deployment of a laser spectrometer on the Greenland Ice Sheet.

The measuring campaign lasted three weeks during May and June and was carried out in the clean air zone upwind from the NEEM camp. A 13-meter tower was erected and a system was set up to take in air from five different levels of respectively 1, 3, 7, 10, and 13 meters height above the snow surface. The air was measured for 15 minutes at each level before shifting to the next level. The isotopic water vapour was measured in continuous mode using a Picarro WS-CRDS analyzer.

The results show that large fluxes of vapour between the lower atmosphere and the snow surface are occurring. This creates gradients in both the humidity but surprisingly also in the isotope ratio with height. At three meters height a diurnal cycle of up to 8 ‰ in $\delta^{18}\text{O}$ is observed. The exchange of vapour between the snow surface and the atmosphere can have a large effect in the post depositional processes and is therefore needed to be understood in order to properly interpret the climatic signal in the ice cores.

We will discuss ways of interpreting the measurements in respect to the post depositional processes and external moisture being brought onto the ice sheet. Furthermore will we look at future possibilities to enhance our understanding of the water vapour above the Greenland Ice Sheet and planned activities for the season of 2010.