Geophysical Research Abstracts
Vol. 13, EGU2011-7136, 2011
EGU General Assembly 2011


# Impact of enhanced precipitation seasonality on Greenland Eemian $\delta^{18}$O temperature

Willem Jan van de Berg (1), Michiel van den Broeke (1), Frank Kaspar (2,3)

(1) University Utrecht, IMAU, Utrecht, Netherlands (w.j.vandeberg@uu.nl), (2) Max Planck Institute for Meteorology, Hamburg, Germany, (3) Deutscher Wetterdienst, Offenbach, Germany

Based on $\delta^{18}$O observations from deep ice cores, Greenland climate during the last interglacial (Eemian) is assumed to have been several degrees warmer than today. However, isotope excess and near-surface or mean atmospheric temperature are not simply linearly related, because isotope excess of the accumulated snow is the final result of a chain of processes. The main processes that influence isotopic fractionation are included in the condensation temperature, because the isotopic depletion of water vapor increases for lower condensation temperatures. Using six-hourly output of the regional atmospheric climate model RACMO2/GR, the spatial pattern of mean condensation temperature of precipitation over Greenland is determined. The condensation temperature is not one-to-one related to atmospheric temperature, owing to spatial variations in mean condensation elevation, precipitation seasonality and short-term variability. These processes must remain locally constant under a change of climate, if $\delta^{18}$O is to be used as a linear proxy of temperature. However, our Eemian simulations show that for central and northern Greenland, enhanced summer precipitation causes the Eemain condensation temperature to rise more than the atmospheric temperature. These changes in precipitation seasonality can alter the condensation temperature by several degrees, hence the $\delta^{18}$O excess by a couple ‰, for equal annual temperatures. This means that the warming over Greenland during the Eemian likely was 1-2 K less than can be concluded from $\delta^{18}$O data alone.