Geophysical Research Abstracts,
Vol. 11, EGU2009-7855, 2009
EGU General Assembly 2009

The 1958-2008 Greenland ice sheet surface melt and the mid-tropospheric atmospheric circulation

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With the aim to study the impact of the mid-tropospheric circulation on the Greenland ice sheet (GrIS) surface melt simulated by the regional climate model MAR, we developed an automatic Circulation Type Classification (CTC) based on the 500hPa geopotential height from reanalyses over the 1958-2008 summers. This CTC shows that the dominant mode of the regional atmospheric variability around the GrIS is linked to the North Atlantic Oscillation (NAO) and that the surface melt anomalies are highly correlated to the general circulation. It explains notably why a record surface melt was observed during the summers 2007 and 2008. In addition, the climate conditions occurring the 27th August of 2003, where the GrIS temperature was 10^{o}C higher than the normal, were the consequence of an almost unique 500 hPa circulation in the 50 last years.