



Recent changes in the lower atmosphere over the Greenland ice sheet

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There is general consensus on the finding inferred from observations that the atmosphere over the Greenland ice sheet (GrIS) has warmed recently. However, the magnitude and spatial distribution as well as the possible causes of this temperature rise remain under discussion. Here we discuss the present-day climate (1957-2008) of the GrIS as simulated using the regional atmospheric climate model RACMO2/GR at a high horizontal resolution of 11 km. Owing to the implementation of a snow model in the surface scheme, the model is well capable of simulating realistic near-surface characteristics of the GrIS, such as the surface mass balance.

RACMO2/GR supports a significant increase in summer and spring temperatures over the entire ice sheet since 1990. The downwelling longwave radiation, the net solar radiation and the sensible heat flux increased over the same period, leading to a substantial increase in melt.

The temperature variability and changes observed in Greenland and over its adjacent oceans can be linked to changes in the Arctic atmospheric circulation, the variability of which is dominated by the North Atlantic Oscillation (NAO). The GrIS near-surface temperature is negatively correlated with the NAO index. Our analysis shows that along the southwestern coast and in the interior of the ice sheet, the recent temperature changes can be partly explained by changes in the NAO.