Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03388, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03388
EGU General Assembly 2008

A record negative Greenland ice sheet surface mass balance rate in 2007

X. Fettweis (1), H. Gallée (2), M. Tedesco (3), E. Hanna (4), M. Erpicum (1)

(1) Département de Géographie, Université de Liège, Belgium (xavier.fettweis@ulg.ac.be, Phone: +32 4 3665468, Fax: +32 4 3665722), (2) LGGE - Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France, (3) Dept. Earth and Atmospheric Sciences, City College of New York, USA, (4) Department of Geography, University of Sheffield, UK.

Results made with the regional climate model MAR show a record surface melt (592 km^3/yr = a global sea level rise of 1.6 mm/yr) of the Greenland ice sheet (GrIS) during summer 2007 compared with 1970-2006. This record melt, detected also in the microwave satellite data, is associated with very low snowfall (508 km^3/yr) inducing a negative Surface Mass Balance (SMB) rate of -65 km^3/yr. Such a negative simulated SMB rate is unprecedented in the recent Greenland history. The summer 2007 is associated with a positive SST anomaly and a negative 2006-2007 GrIS winter accumulation. Sensitivity experiments carried out by the MAR model evaluate the impacts of these anomalies on the Greenland climate and SMB. The main impacts of a warmer SST anomaly in the MAR model are more precipitation over Greenland due to an enhanced evaporation above the ocean and, an increase of surface melt induced by the advection of warmer oceanic air ($>0°C$) into the continent by the atmospheric part of MAR. A negative winter accumulation anomaly exposes ice and old snow (with a lower albedo) earlier than previous years in the ablation zone which significantly increases the melting given the albedo feedback. Finally, the ECMWF and NCEP reanalyses show an anomalous advection of warm air masses over the GrIS in summer 2007.