Geophysical Research Abstracts
Vol. 15, EGU2013-6785, 2013
EGU General Assembly 2013

Response of the Greenland Ice Sheet to Insolation Changes

Uwe Mikolajewicz (1), Florian Ziemen (4), Miren Vizcaino (2,3)

(1) Max-Planck-Institut f. Meteorologie, Hamburg, Germany (uwe.mikolajewicz@zmaw.de), (2) Department of Geoscience and Remote Sensing, Delft University of Technology, The Netherlands, (3) IMAU, Utrecht University, The Netherlands, (4) Max-Planck-Institut f. Meteorologie, Hamburg, Germany

The Greenland ice sheet is expected to be of importance for the climate of the North Atlantic and its surroundings. Several model studies have shown that there could exist multiple steady states of the Greenland ice sheet under present days boundary conditions. This might have severe consequences for the potential reversibility of the impacts of anthropogenic climate change.

In this study we use an ice sheet model interactively coupled to an AOGCM. The ice sheet model SICOPOLIS in a 10 km Greenland setup is coupled using an energy-balance scheme to a coarse resolution version of the ECHAM5/MPIOM AOGCM. Under preindustrial conditions this model has two steady states, one very similar to the current Greenland ice sheet, one much smaller with a an ice sheet covering the southeastern mountain regime plus two smaller ice sheets at the northern margin. It is obvious, that the stability of these states depends on the atmospheric CO_2 concentration.

Here the effect of insolation is investigated. As a first test, the stability of these states under two different insolation regimes is tested. Both states are stable under a forcing with low summer insolation (115kybp). For a state with strong solar forcing like in the early Holocene (9kybp) the present mode of the ice sheet is not stable.

A set of transient simulations using the insolation starting from 25kybp with fixed atmospheric CO_2 concentrations has been performed. First results indicate that the insolation signal can trigger transitions from the present to the weakly glaciated mode.