Geophysical Research Abstracts, Vol. 9, 04654, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04654

Regional climate change around Greenland - from sea-ice to permafrost and ice sheets. Results from a transient simulation at 25 km resolution for 1950-2100

M. Stendel, J.H. Christensen, G. Adalgeirsdottir, N. Kliem, M. Drews
Danish Meteorological Institute, Copenhagen, Denmark (mas@dmi.dk, +45 3915 7460)

Simulations with global climate models (GCMs) clearly indicate that major climate changes can be expected within the next 100 years. According to present-day observations, substantial changes in sea-ice occur in particular around Greenland. Both extent and thickness of sea-ice as well as its seasonality have shown a clear declining trend during recent decades, which has been accompanied by a considerable increase in air temperature along the coasts of Greenland. However, it is difficult to assess the implications for ecosystems and society in the vulnerable Greenlandic environment. A main reason for this is the coarse resolution of contemporary climate models used in these investigations. Even relatively high-resolution regional climate models (RCMs) have so far been unable to give a realistic representation of the Greenland ice sheet and its dynamics. This makes it impossible to obtain a detailed assessment of the role of a changing climate near Greenland.

Following the recommendations from the ACIA assessment, high resolution regional and local climate simulations coupled with ice sheet dynamics should be performed in order to test whether more detailed predictions of climate change can be provided for the Arctic region. We present here results from a transient climate change experiment with the HIRHAM RCM, covering the period 1950-2100 at a horizontal resolution of 25 km. In addition, a further nesting experiment has been conducted, in which a fully three-dimensional coupled ocean-sea ice model is forced by the regional atmospheric model. This model has a horizontal resolution of 20 km, which allows addressing the impacts of climate change on near-shore ocean circulation and stratification. We present results from mass balance change calculations in the Greenland Ice Sheet and from permafrost dynamics based on the simulated atmospheric forcing.