Geophysical Research Abstracts
Vol. 14, EGU2012-10527, 2012
EGU General Assembly 2012

Simulating the mass- and energy balance of Freya Glacier (NE-Greenland) using the physically based snow model AMUNDSEN

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Climate change will increasingly influence terrestrial and aquatic ecosystems in many regions all over the world. The arctic environment is known to be both, particularly affected and extremely sensitive to changes in the earth's climate system. An increase in temperature, which may be accompanied by an increase in precipitation as predicted for some regions in northeast Greenland over the next 100 years, severely affects the temporal storage of water in the snowpack in winter and the melting of snow and ice masses in spring and summer. Increased precipitation in combination with an increase in snow/ice melt results in an increased influx of freshwater and sediment to the oceans contributing to sea level rise and affecting the the thermohaline circulation in the sea surrounding Greenland. Besides the snow/ice reaction on changing climate conditions, the presence of snow/ice feeds back on the climate system itself.

To analyze ongoing changes in arctic ecosystems numerical models represent a valuable supplementary source of information to sparsely available field measurements as they are capable to deliver spatially distributed and detailed knowledge on meteorological and hydrological conditions in arctic areas. The FreyEx project continues research that has been initiated in the framework of the preceding projekt GlacierMEMO by using the distributed snow/ice model AMUNDSEN to simulate snow accumulation, distribution, sublimation and surface melt at Freya Glacier, a small valley glacier in the north of Clavering Island (NE-Greenland). The results of GlacierMEMO have indicated a strong need for i) additional meteorological data in the area of interest and ii) a modification of the standard method implemented for the remapping of meteorological parameters in AMUNDSEN. To close these gaps, in the framework of the project FreyEx, an additional energy balance station has been installed on Freya Glacier. The remapping algorithms, particularly that for the interpolation of precipitation, are currently enhanced and adapted to the local conditions at Freya Glacier in order to allow a more accurate simulation of the local mass- and energy balance. In our poster contribution we present new results of our modelling efforts at Freya Glacier together with a description of the data and methods applied.