Geophysical Research Abstracts
Vol. 14, EGU2012-882, 2012
EGU General Assembly 2012

Subglacial Drainage Pattern of the Northeast Greenland Ice Stream

N. B. Karlsson and D. Dahl-Jensen
University of Copenhagen, Niels Bohr Institute, Centre for Ice and Climate, Copenhagen, Denmark (nabjka@gmail.com)

The Northeast Greenland Ice Stream drains a significant portion of the Greenland Ice Sheet and thus influences the mass budget of the ice sheet. The ice stream has clearly defined margins and initiates closer to the ice divide than any other Greenlandic ice stream. Towards the margin of the ice sheet, the ice stream splits into three outlets; Nioghalvfjerdsbræ, Zachariae Isstrøm and Storstrømmen. The observed ice flow velocities suggest that some degree of basal sliding is taking place and evidence of basal melting from radio-echo sounding data supports this hypothesis. However, to date very little is known about the distribution of subglacial water under Northeast Greenland.

Recent observations have shown that while Zachariae Isstrøm continues to speed up, Nioghalvfjerdsbræ shows no significant speed-up and Storstrømmen is slowing down. Some of the changes in speed coincide with fluctuations at the margin of the glaciers (e.g. the loss of the ice shelf buttressing Zachariae Isstrøm), and it seems likely that these changes will influence the glacial flow upstream of the grounding line and thus the subglacial drainage pattern.

In this study we use a vertically integrated, 2D-plane ice flow model based on the shallow ice flow approximation to predict the response of the current surface topography to mass balance and gravity. We are considering time-scales of 100-500 years, and the model predicts changes in elevation of less than a few metres per year for most of the drainage basin. We then calculate the corresponding large-scale changes in subglacial drainage pattern using the hydrologic pressure potential. We show that the changes in surface elevation are sufficiently large to cause a change in subglacial drainage pattern and, depending on the location of the water source, to divert subglacial water between the three main outlet glaciers.