Geophysical Research Abstracts
Vol. 15, EGU2013-11590, 2013
EGU General Assembly 2013

Translating hydrologically-relevant variables from the ice sheet model SICOPOLIS to the Greenland Analog Project hydrologic modeling domain

Dorothée Vallot (1), Patrick Applegate (2), and Rickard Pettersson (3)
(1) Uppsala University, Sweden (dorothee.vallot@gmail.com), (2) Pennsylvania State University, (3) Uppsala University

Projecting future climate and ice sheet development requires sophisticated models and extensive field observations. Given the present state of our knowledge, it is very difficult to say what will happen with certainty. Despite the ongoing increase in atmospheric greenhouse gas concentrations, the possibility that a new ice sheet might form over Scandinavia in the far distant future cannot be excluded. The growth of a new Scandinavian Ice Sheet would have important consequences for buried nuclear waste repositories. The Greenland Analogue Project, initiated by the Swedish Nuclear Fuel and Waste Management Company (SKB), is working to assess the effects of a possible future ice sheet on groundwater flow by studying a constrained domain in Western Greenland by field measurements (including deep bedrock drilling in front of the ice sheet) combined with numerical modeling.

To address the needs of the GAP project, we interpolated results from an ensemble of ice sheet model runs to the smaller and more finely resolved modeling domain used in the GAP project's hydrologic modeling. Three runs have been chosen with three fairly different positive degree-day factors among those that reproduced the modern ice margin at the borehole position. The interpolated results describe changes in hydrologically-relevant variables over two time periods, 115 ka to 80 ka, and 20 ka to 1 ka. In the first of these time periods, the ice margin advances over the model domain; in the second time period, the ice margin retreats over the model domain. The spatially-and temporally dependent variables that we treated include the ice thickness, basal melting rate, surface mass balance, basal temperature, basal thermal regime (frozen or thawed), surface temperature, and basal water pressure. The melt flux is also calculated.