Geophysical Research Abstracts
Vol. 14, EGU2012-11134-1, 2012
EGU General Assembly 2012

A simplified model of subglacial drainage

I.C. Rutt (1), D.I. Benn (2,3), and N.R.J. Hulton (4)

(1) Department of Geography, College of Science, Swansea University, UK, (2) University Centre in Svalbard, P.O. Box 156, 9171 Longyearbyen, Norway, (3) School of Geography & Geosciences, University of St Andrews, UK, (4) School of GeoSciences, University of Edinburgh, UK

Numerical modelling of subglacial hydrology is a complex challenge, due to the lack of direct observations and the wide spectrum of presumed modes of flow, including thin film flow, various configurations of conduit, and flow though porous till. Models that incorporate the full complexity of such a system, which may comprise a time-varying combination of these flow modes, will probably be too computationally expensive to couple to an ice sheet model over medium to long timescales.

We present a simplified, semi-empirical model of subglacial water flow, which has potential for use as a component of large-scale ice sheet models, due to its computational efficiency. The model calculates subglacial water pressure by integrating the frictional resistance in the system, which evolves through time in response to ice melt and creep closure. We demonstrate how parameterisation of the flow according to Darcy's law, and calculating melt rates using energy-balance considerations, leads to a system of equations whose parameters can be tuned against field data.

To deploy the model as a component of an ice sheet model will require the combination of multiple conduits into a network model. This may be possible by simply joining together multiple instances of the present conduit model. However, it may be necessary to further parameterise the conduit model for reasons of computational cost and stability. We present some possible approaches to this problem, and preliminary results from its implementation.