Geophysical Research Abstracts
Vol. 14, EGU2012-8873, 2012
EGU General Assembly 2012

Thermal initialisation of ice-sheet models

G Hiess and R. C. A. Hindmarsh
British Antarctic Survey, Science Programmes, Cambridge, United Kingdom (rcah@bas.ac.uk, +44 1223 221 226)

Ice-sheet forecasting relies upon good estimates of the state variables, which include velocity and thinning rate. It has been recognised that a proper thermal initialisation is an important ingredient. Two methods exist; (i) spin-ups through multiple glacial cycles; or (ii) steady solutions using current topography, accumulation rate etc..

We investigate (ii) from a theoretical viewpoint, seeking to understand how parameter uncertainty affects the fidelity of the thermal initialisation. Principal amongst these is the poorly known geothermal flux. Our approach is to carry out synthetic runs with known input parameters, and then attempt retrievals with estimated parameters. Our principal concern is correct estimation of temperatures near the base of ice-streams, and in particular estimating their width, as defined thermally, correctly.

Our synthetic runs are carried out for a wide range of input parameters, varying basin size, bed geometry, geothermal flux and accumulation rate, quantifying the dependence of ice-stream width on these parameters.
Our retrieval approach consists of computing balance velocities, using these to estimate the basal parameters, and using this flow to calculate the steady temperature field. The computed parameters are then compared with the forward model, and the retrieval errors quantified. We make qualitative statements about the influence of parameter mis-specification on ice-sheet state, and how this affects ice-sheet forecasts.