Introducing GLIMMER — a 3D thermo-mechanical ice sheet model

M. Hagdorn¹, N. Hulton¹, A.J. Payne³, I. Rutt³, G. Boulton¹

¹School of GeoSciences, University of Edinburgh, Edinburgh, UK; ²School of Geographical Sciences, University of Bristol, Bristol, UK

The Model

GLIMMER is a 3D finite-difference thermo-mechanical ice sheet model originally developed for the land-ice component of the GENIE project which aims to develop a unified Earth System Model (ESM). The aim is to provide a collaborative standard ice sheet model that can be used by other projects either as a stand-alone model or as a component of an ESM.

GLIMMER is a collection of libraries and utilities. It consists of a core library, GLIDE (General Land Ice Dynamic Elements), a safety of climatic drivers and counters, and a set of interface and visualisation modules.

GLIMMER is developed as a Fortran90 library which can be called from other models that provide boundary conditions. The interface is designed to be as flexible as possible linking the ice sheet with its environment via surface mass balance and temperature spatial fields.

GLIMMER uses the netCDF library for data I/O and complies with the CF standard for Climate and Forecast Data thus making available many standard data processing and visualisation tools.

GLIMMER development is open. The model is hosted on NeSCForge¹ and can be accessed via the GLIMMER project¹ pages.

Examples

The following examples show how GLIMMER is used and demonstrate the GMT visualisation programs.

EISMINT

GLIMMER conforms to the EISMINT benchmarks which test basic ice sheet behaviour and thermo-mechanical coupling using a radial mass balance and temperature distribution.

EIS Driver

The EIS driver is used to simulate the past European ice sheets.

GLINT

The GLINT library couples the high-resolution ice sheet model to a global climate model. GLINT is responsible for down-scaling input variables, e.g., temperature and precipitation, and up-scaling of output variables, e.g., albedo and surface elevation.

What Next?

We plan to implement the following features soon:

- adaptive time steps
- higher order stresses
- improved basal boundary condition

The development process of GLIMMER is open and we hope it will be used in ways we have not envisaged yet. Model development and use is discussed on the GLIMMER mailing list³. Suggestions, participation and contributions are most welcome.

Links

¹GLIMMER: http://glisserforge.nesc.ac.uk/
²http://www.cgd.ucar.edu/cmip/mint/cmipmetadata/index.html
³National eScience Centre: http://forge.nesc.ac.uk/
⁴http://forge.nesc.ac.uk/project/glissess
⁵http://forge.nesc.ac.uk/mailman/listinfo/glisser-discuss

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