Geophysical Research Abstracts
Vol. 15, EGU2013-11019, 2013
EGU General Assembly 2013
© Author(s) 2013. CC Attribution 3.0 License.

A statistical-dynamical approach to represent Greenland ocean-ice sheet interactions

Mahé Perrette (1), Reinhard Calov (1), Andrey Ganopolski (1), Alex Robinson (2,3,1)

(1) Potsdam Institute for Climate Impact Research, RD1: Earth System Analysis, Potsdam, Germany (mahe.perrette@pik-potsdam.de), (2) UCM Universidad Complutense de Madrid, Madrid, Spain, (3) Instituto de Geociencias (IGEO), CSIC-UCM, Madrid, Spain

An understanding of the dynamics of the Greenland ice sheet is fundamental, because of its potential to contribute strongly to future sea level rise. In recent years there has been a discussion about the role of the ocean in the Greenland ice sheet's present and future mass balance. The ocean interacts with the ice sheet's outlet glaciers via the water circulation in the fjords and considerably affects melting at the termini of the outlet glaciers. Processes related to this interaction are difficult to represent in Greenland-wide ice-sheet models because grid resolution of such models is typically 10 km, whereas large fjords are more commonly only 1 to 5 km wide. Local refinement techniques (e.g. finite elements with adaptive mesh) can be a way of addressing that problem but are still computationally expensive to run.

Here we propose a simpler, statistical-dynamical approach suited for large ensemble simulations over 100- to 1000-year integration times, in the EMIC spirit: the fjord-outlet glacier system is restricted to its most fundamental dynamics, controlled by a handful of parameters describing the major characteristics of the system. The model has a generic structure, i.e. it is designed such that it applies to every Greenland outlet glacier. Some of its parameters are fixed by using the (little) available observational data – e.g. for Helheim, Kangerdlugssuaq and Jakobshavn Isbrae – other parameters may vary depending on location. It is not our aim to simulate every single small outlet glacier in its full accuracy; but we aim to represent, on average, important characteristics like ice discharge and general advance/retreat rate on a regional scale over major catchment areas. Aspects of the coupling strategy with the 3D ice-sheet model (SICOPOLIS) are discussed, e.g., critical issues such as the treatment of mass balance. Preliminary design and results will be presented.