



Coupling FAMOUS, a fast version of HadCM3, to a high-resolution ice sheet model (GLIMMER) - application to Antarctica

I.C. Rutt (1,*), O.J.H. Browne (2), D.A.G. Williams (3) and A.J. Payne (1)

(1) Centre for Polar Observation and Modelling, School of Geographical Sciences, University of Bristol, UK (* i.c.rutt@bristol.ac.uk), (2) Department of Meteorology, University of Reading, UK (3) BRIDGE, School of Geographical Sciences, University of Bristol, UK

The development of FAMOUS, a fast version of the UK Met Office Hadley Centre AOGCM (HadCM3), opens up significant new possibilities for the long-term simulation of the climate system. FAMOUS simulates almost the same physics as HadCM3; however, it runs almost ten times as fast, due to its reduced resolution. In addition to allowing longer model runs, this also allows more thorough model parameter estimation and tuning. The traceability of FAMOUS to HadCM3, an established climate model, ensures that FAMOUS output is as useful and robust as possible.

The possibility of longer-term simulations presented by FAMOUS is of particular relevance to the problem of understanding the coupled climate-ice sheet system. The timescale for ice sheet evolution is hundreds to thousands of years, and the desire to explore the sensitivity of the system to different parameters renders the use of a fast GCM essential.

The ice sheet model used in this work is GLIMMER, a 3D, thermomechanical model, based on the shallow ice approximation. The model is freely-available under an open-source license, and is used by a growing international community.

The technical details of the FAMOUS-GLIMMER coupling are explained. Particular attention is paid to the difficulties of integrating a high-resolution, regional model into a GCM. We present a comparison between the climates of FAMOUS with and without GLIMMER coupling, and assess the use of anomaly coupling with GLIMMER running over Antarctica, using a 4xCO₂ climate perturbation experiment. Novel features

of the GLIMMER coupling scheme include the ability to easily couple multiple ice sheet models to a single GCM; we demonstrate the coupling of models of Greenland and Antarctica in the same experiment.