Geosci. Model Dev. Discuss., 1, S101–S103, 2008
www.geosci-model-dev-discuss.net/1/S101/2008/

Geoscientific
Model Development
Discussions

Interactive comment on "A description of the FAMOUS (version XDBUA) climate model and control run" *by* R. S. Smith et al.

R. S. Smith et al.

Received and published: 7 November 2008

Firstly, our thanks go to our editor and the referees for taking the time to read the ms, and for their positive remarks. In line with their comments we've made some changes to the text and figures, as detailed below.

Abstract:

"well in excess of" has been made (slightly) more precise as "approximately 120 years". Precise runtimes depend on platform, whether HadOCC is on or off, how much data output is required and the state of the queues on the computer.

the text of the revised ms. has been altered to identify millennial scale simulations of Quaternary ice ages as an explicit aim of FAMOUS development.

Introduction:

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we've added a paragraph to the discussion which expands on the dual goals of tuning towards observations as well as HadCM3. There are also now references to other "fast" GCMs in the introduction.

Section 3:

3.1 "a different solution to the original instability". This phrasing was picked up on by both reviewers as mysterious, and has been changed for clarity. The additional smoothing was actually found not to affect the instability in question but remained in place in ADTAN despite its redundancy. Atmospheric instability in ADTAN was alleviated by increasing the fourier filtering at the poles.

3.2 Calving. The comment is correct - as noted in the ms, the iceberg calving is only consistent with the "modern" configuration of FAMOUS, and would need to be retuned for paleoclimates. What to do in the case of paleo transients is less clear - possibly rescale the calving pattern in line with changing icesheet volume? A fully interactive icesheet model is required to do this in any sense correctly during transients; FAMOUS has been coupled to the Glimmer model, but the work is preliminary and well beyond the scope of this paper.

3.4. Figure4 has attracted unfavourable comment from a number of readers, all of whom suggested different ways to improve it. It has been totally redrawn, mostly in line with Referee #1's suggestion rather than Referee #3's.

3.6 Orbital Variation. This is a good comment, and we've added a warning note to this section of the ms. to make users aware of possible problems regarding the relative timescales of the climate processes they wish to study and the acceleration rate used. A high acceleration rate that may have little impact on purely atmospheric processes could, as implied by the referee, have a hugely distorting effect if used in conjunction with an ice sheet model. However, we cannot comment on whether the results are the same with and without acceleration as requested. Not only would the topic probably require an entire paper on its own merits, given the likely complex interactions of differ-

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ent acceleration rates affecting different climate processes in different ways, but also as we have not yet had a chance to use the acceleration feature.

Control run:

The surface temperature drift quoted is that of this portion of the XDBUA spinup. We expect it to reduce over the full length of a complete spinup run as the deep ocean comes fully into equilibrium with the top of atmosphere forcing, so we wouldn't actually get a 5degree drift in surface temperature over the course of a 10ky equilibrium integration. A note to this effect has been added to the text.

We feel that a small, global warm bias in the climate is preferable to the very large, single-hemisphere cold bias we had before: the remaining bias distorts large-scale temperature gradients less and is thus likely to produce more realistic climate responses. A warm bias should also reduce the problem of excessive sea-ice: sea-ice restricts communication between ocean and atmosphere for carbon fluxes as well as heat - I'd rather have a warm bias and some ocean- atmosphere coupling (even if distorted) than a cold bias with no coupling at all.

We interpret the last comment to mean that the Referee does not find the paragraphs on precipitation and oscillations convincing, although no more information is given as to why. The climatology of the model is admittedly sketched rather than deeply explored, but we feel that the level of detail present in the ms. is appropriate, so we have not expanded these sections. The section on ENSO has been changed a little to reflect new information on the mechanisms of tropical Pacific variability in the UM.

Figure 6: a comment on the remaining cold bias and prevalence of sea-ice has been added to the discussion

Fig 11: transports for ADTAN have been added.

Interactive comment on Geosci. Model Dev. Discuss., 1, 147, 2008.