**Ocean Science
Discussions**

Interactive comment on "The low-resolution CCSM2 revisited: new adjustments and a present-day control run" *by* M. Prange

M. Prange

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I am very grateful to Steven Griffies and the anonymous referees for their very constructive comments. Taking all their helpful suggestions into account, the manuscript has been revised thoroughly (the revised manuscript has been resubmitted). The major bones of contention were that there was no clear motivation why the reader should care about the model, the manuscript was written too technical, and referencing was not thorough enough. To eliminate these weaknesses of the manuscript, the Discussion section has been enlarged in order to "put more science" into the paper and to make clear why this model could be an interesting alternative to, e.g., CCSM3/T31 for many applications. Referencing has strongly been improved by including 45 new references.

Detailed response to Referee #2:

Referee: "The paper describes tuning and a control run of a version of the NCAR coupled climate model. It is highly technical and does not address any particular scientific question. It is well written and presented but I found the paper hard to read because of the lack of motivation caused by the missing scientific question."

$\rightarrow$ I hope the revised manuscript is easier to read. The introduction has been revised completely devoting some energy now to motivate the importance of the AMOC in paleoclimate modelling. Moreover, some new scientific aspects have been included through the little model intercomparison in the new Section 5.3, e.g.: "By contrast, CCSM3/T31's simulation of the summer low-level wind and precipitation fields over North Africa reveals several critical shortcomings. The northerly winds penetrate too far south, while the southerly monsoon flow is too weak (cf. Figure 31). The most crucial problem in the CCSM3/T31 control run is the location of the tropical precipitation band. The model does not adequately simulate the summer migration of the rain belt onto the African continent. Instead, tropical precipitation maxima reside over the Guinea coast and over the Gulf of Guinea. A similar problem was identified by Meehl et al. (2006) in the high-resolution (T85) version of CCSM3. Meehl et al. (2006) hypothesized that the simulated warmer-than-observed SSTs in the Gulf of Guinea are responsible for the excessive rainfall south of the Guinea coast. The comparison between CCSM2/T31x3a and CCSM3/T31 corroborates this hypothesis, since the Gulf of Guinea warm bias is much more pronounced in CCSM3/T31 than in CCSM2/T31x3a (cf. Figure 28)."

Referee: "The paper is also quite long because all kinds of different aspects of the model performance are discussed. This could also be seen more positively as a general analysis of the model performance. I am not familiar with the NCAR models and thus I don't know how much of this is already described elsewhere. Maybe the paper could be radically shortened and reduced to those aspects of the model that were actually changed (like the MOC and some related variables)."

$\rightarrow$ A control run of CCSM2's low-resolution version has never been published before. It is therefore necessary to discuss all the different aspects of the model performance.

Referee: "I also agree with one of the other reviewers that the flux adjustment is problematic. First of all it seems to be very large (50% of the freshwater flux into the Arctic). In case the author makes revisions I suggest to include information on the integrated freshwater adjustment amount in Sverdrups."

$-$> In the revised manuscript some additional information concerning the freshwater flux adjustment are included (Section 4.1): "In this stable climatic mode, the northern high-latitude freshwater flux correction totals 0.107 Sv (averaged over the last 100 years of the integration period); 69% (i.e. 0.074 Sv) of this amount is due to river runoff, while 31% (i.e. 0.034 Sv) is due to precipitation over the ocean. For comparison: Actual climatological river discharge into the Arctic Ocean is about 0.1 Sv (e.g. Prange and Gerdes, 2006)."

Referee: "I also don't see much of a point in a 20% increase in model speed."

$-$> The 20% cost saving argument has now been removed from the abstract and the conclusions (although I kept a little remark at the end of the discussion section). Instead, a new section has been included in the discussion (Section 5.3). Here, examples are shown where CCSM2/T31x3a has a better simulation skill than CCSM3/T31 (North Atlantic hydrography, West African monsoon). It is argued that depending on the phenomenon under investigation and its geographical location, CCSM2/T31x3a may be superior to CCSM3/T31 or vice versa. This is probably a much better motivation for many readers than the 20% cost saving point. The conclusions have been modified accordingly.

Interactive comment on Ocean Sci. Discuss., 3, 1293, 2006.

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