

## ***Interactive comment on “MIROC-ESM: model description and basic results of CMIP5-20c3m experiments” by S. Watanabe et al.***

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The authors do an excellent job in describing the model setup and first results from an important set of simulations.

pg. 1069, line 4. please explain in more detail the phase "are launched at 70 hPa", with regards the gravity wave source. To me this implies that the QBO is forced with 2000s conditions (lines 6-9 ). It seems to me that the QBO is then unlikely to change in response to climate change - so is it appropriate for the RCP simulations? I would like the authors to explain the consequences with a few more sentences (though I note that full analysis of the QBO is reserved for another publication).

pg. 1076, line 4. Please include more detail on what "recursively adapted to each

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model" means.

pg. 1076, line 7. "carbon cycles was integrated" should be "carbon cycles were"

pg. 1076, line 8. "the resultant carbon cycle data was again" - my preference would be to use "state" rather than "data".

pg. 1076, general comment. Mention how a run is judged to be in equilibrium.

pg. 1077, line 9. "subsequent updates" - is there any reference available for this?

pg. 1077, lines 15-20. The 4 socioeconomic studies do the RCP scenarios (future climate change) not the historical period.

pg. 1078, general comment. It would be good to know if the changes observed are statistically significant.

pg. 1078, lines 11-18. this needs more explanation/description since it's not clear to me that it does match the observations particularly well. For 1900-1950 over the ocean, the model gets about 1/2 the warming and warms over Eurasia rather than the observed general cooling.

pg. 1078, line 14. "slightly smaller" - seems to be up to 50% smaller. On average, how much smaller over the ocean, land and globally?

pg. 1078, line 17. "slightly smaller" give some values

pg. 1078, line 20. The text "climatological values of" can be deleted in my opinion.

pg. 1078, line 22. "The climatological" replace with "MIROC-ESM-CHEM"

pg. 1078, line 22. "slightly cooler" - values? how about a plot of temperature difference versus latitude?

pg. 1078, general. In figure 4 there is a very large drop in temperature around the model year 1995. This is not commented on yet after this the model is consistently cooler than the observations. Can the authors comment on this? How does this affect

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later results - such as figure 10.

pg. 1079, lines 18-19. I wouldn't use the phrases "fairly well" or "basically alike" myself.

pg. 1079, line 27. "may have disappeared by the 1990s" is it there in the preindustrial control simulation?

pg. 1081, lines 15-21. but earlier it was stated that a gravity wave source term was tuned to get the right QBO period. Without understanding the mechanisms involved I would suggest that this is why the period agrees and also why the simulated QBO is more regular (since the gravity wave source term is apparently constant). Please comment on this. pg. 1082, line 14. Why do you get a positive anomaly over the Sahara?

pg. 1083, line 5. "range suggested by the IPCC (2007)", please be more specific -a full reference & quote values.

pg. 1084, lines 1-3. So does the model predict basically no grasslands? It seems that there is either trees or croplands in most non-desert regions. If so this needs to be commented on.

pg. 1084, line 20. It appears that simulated forest carbon is much less than observed, for example in South America and Africa.

pg. 1085, line 1. "linearly scaling" please give some more details of how this was done. The values suggest that you are just ignoring carbon in the lower 0.5 m of soil - i.e.  $((2511/1.5) * 1) \sim 1717$ . I am not convinced that adjusting the soil carbon pool size is justified here. It is quite possible that uncertainties in vegetation productivity, soil temperatures etc etc could easily explain the higher soil carbon content. By ignoring the bottom third of the model soil carbon you are proposing that the difference is due to under-sampling of 'real world' soil carbon and I think that needs more justification.

pg. 1087, lines 28-29. I think this sentence would be easier to read if you did not use brackets to create a double sentence. I think it is much better to have a second short

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sentence, though I realise this is a matter of personal preference.

Figure 8 caption. Mention data source - as you do for figure 6.

Figure 9 caption. Include the text rather than refer the reader back to the caption for figure 8.

Figure 19. It would be nice to see bias plots.

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Interactive comment on Geosci. Model Dev. Discuss., 4, 1063, 2011.

**GMDD**

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