**Climate
of the Past
Discussions**

Interactive comment on "Climatic impacts of fresh water hosing under Last Glacial Maximum conditions: a multi-model study" *by* M. Kageyama et al.

Anonymous Referee #1

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General Comments

The paper is generally well framed, although I found a number of type-o's and "figure captions" in the text. When these minor issues are cleaned up, I think the paper is acceptable for publication.

One minor general issue is the use of the word "collapse" to describe the weakening and or shut down of the AMOC. I recommend that the authors clearly define this term early in their discussion. I think it would help some readers. Our community does not use the term in a consistent fashion. I note that the term is used consistently throughout the paper.

Specific Comments

1. Page 3834, Line 23 – Manabe and Stouffer 1988 is the wrong reference here. They did NOT do water hosing to find their 2 equilibria. I think the Manabe and Stouffer 1995 is the first hosing paper – I think. Manabe, Syukuro, and Ronald J Stouffer, 1995: Simulation of abrupt climate change induced by freshwater input to the North Atlantic Ocean. Nature, 378, 165-167.

2. Page 3835, top - Define "collapse" here. See General Comments above.

3. Page 3835 – Make the distinction between transient and equilibrium response earlier. The hysteresis is an equilibrium, not transient response.

4. Page 3836, Lines 5-15 - Manabe, Syukuro, and Ronald J Stouffer, 1997: Coupled ocean-atmosphere model response to freshwater input: Comparison to Younger Dryas event. Paleoceanography, 12(2), 321-336 could be referenced here too. They compare the impact of differing hosing locations.

5. Page 3838, bottom and table 1 – I would argue that the inclusion of whether or not a model uses a free surface parameterization with true freshwater fluxes (not virtual salt fluxes) is an important table entry.

6. Page 3840, line 1 – rapidly document – wrong meaning – I would just delete the phrase.

7. Page 3840, line 9 and line 23 – Figure X shows – Here and later. This makes the text much longer and harder to read. This information should appear in the figure caption only.

8. Page 3841, top – Here the time scale of the perturbation experiments seems important. Include time scale over which the response is computed here. It may help the reader to include an additional figure which shows an example of what is being discussed. I would recommend showing a model with an active AMOC and compare it to an inactive AMOC model showing the time series of the AMOC value plotted versus

time.

9. Page 3831 – therefore does not – Delete therefore.

10. Page 3842, figure 3 – Nice way to show the results.

11. Page 3843, lines 7 – 8 – This shows …simple advection – What does this mean? I would delete this phrase or add a lot more to make meaning clear.

12. Page 3845, line 8 – surprinsingly – Type-o.

13. Page 3846, line 3 – relationshipd – type-o.

14. Page 3846, line 14 and figure 6 – I recommend showing the fraction of the total AMOC response versus surface temperature change. In my analysis of models, the total heat transport by the ocean is much more similar between models than the AMOC strength. This implies that the relationship between AMOC and heat transport varies a lot from model to model…and therefore the surface temperature change when the MOC chasnges. Showing the fraction of the AMOC change MAY provide a better relationship.

15. Page 3846, line 21 – except – "Exclude" is the correct word. I think.

16. Page 3847 and figure 7 – See comment 13.

17. Page 3852, line 1 – quite encouraging – These seem to be the wrong words. The fact that the mean climate state does not seem to influence the results (comparing the LGM hosing results here to the present day hosing of Stouffer et al) is interesting. The fact that the results are similar allows one to use the physical reasoning and analysis of Stouffer et al to explain these results.

18. Page 3859, table 2 – It would help the reader if the model years of the perturbation run were shown for the CCSM-MARUM model. Saying the last 100 years, does not allow the reader to adjust the transient runs.

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Interactive comment on Clim. Past Discuss., 8, 3831, 2012.