

## ***Interactive comment on “Assessing the impact of Laurentide Ice-Sheet topography on glacial climate” by D. J. Ullman et al.***

### **Anonymous Referee #2**

Received and published: 4 October 2013

This paper examines the sensitivity of climate to ice sheet specification for time slices at LGM and 14 ka. Though this question has been previously studied in “ice”-“no ice” type sensitivity experiments, this paper is unique in comparing two ice sheets that span the uncertainty in current reconstructions. Other strengths of this paper are its extensive references and thought-provoking discussion section.

Like the first reviewer, I found the paper’s comprehensiveness to make it a time-consuming read and less impactful than would be if it were more succinct. I agree that section 4 contains the key results to the main question that the paper is trying to answer – on my first read, I ended up skimming section 3 to get to the meat of section 4. It seems like the main points section 3 is trying to make (and this is a little unclear since there is no wrap-up at the end of the section) are that (1) the GISS

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model provides reasonable simulations of LGM and 14ka climate, (2) proxy evidence is not yet spatially-extensive or certain enough to distinguish whether the L or the 5G reconstruction yields more realistic climate conditions. To me, an argument for point 1 could be assembled in a new, more concise section 3 that highlights a few of the things the model seems to do well and a few of the things that it doesn't do as well, rather than the current comprehensive examination of many climate variables point-by-point. The information presented for the second point more logically fits in section 4, and by moving it there would help to eliminate some of the overlap that exists between the two sections. You can consider this an option D in addition to the first reviewer's Options A-C, which I think are great suggestions, too.

#### Other major comments

Please show statistical significance for anomaly plots. Could be done through stippling, or just not coloring the non-significant regions.

Regarding interactive comment on relation to PMIP3 simulations. I, too, am a little confused about how these simulations relate to PMIP3. It sounds like the 21ka-5G and the 21ka-L simulations were the GISS contribution to PMIP3 LGM simulations. One was r1i1p150 and the other was r1i1p151? I had originally assumed that there was a third simulation using the PMIP3 ice sheet that was then contributed to PMIP3. I think it would be useful to give the CMIP5 ensemble names (r1i1p150 and p151) in the paper.

#### Minor comments

Pg. 3245, line 14: Change "extend" to "extent"

Pg. 3245, Line 25: Why the maximum reconstruction? Isn't the purpose to use a minimum reconstruction?

Pg. 3247, line 20: "Additionally, cold surface temperatures drove sea ice growth requiring an expansion of the land mask." Don't understand why this required a change to the land mask – aren't land masks fixed based on the desired sea level?

Pg. 3248, line 17: Missing “ka” after “21”

Pg. 3250 Lines 15-20: There is also the synthesis by Bartlein et al. 2011 Climate Dynamics 37:775. Some of their sites suggest warming in Beringia at LGM, though of course there is the no-analogue issue.

Pg. 3252, Line 28: Word missing “with some of the in the tropical. . .”

Pg. 3255, Line 25: Delete “-L” from “21ka-L”

Table 2: Dykoski misspelled.

Figure 2a, 3a, 4a, 6a: The white color is not aligned with zero, so that some regions of cooling are unintuitively colored yellow.

Figure 2e, 3e: How is atmospheric jet speed defined? I assume it is a wind speed at 200 mb height or something like this?

Figure 5 caption: The caption mentions uncertainties for the 21ka simulations? I don't see these. Or, maybe, the sentence should say: “Longitudinal transects of SST anomalies averaged across the Atlantic and Pacific basins for the 21 ka simulations, with comparison to published MARGO data and uncertainties.”

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Interactive comment on Clim. Past Discuss., 9, 3239, 2013.

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