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Climate of the Past Discussions

Interactive comment on "Paleometeorology: visualizing mid-latitude dynamics at the synoptic level during the Last Glacial Maximum" *by* M. B. Unterman et al.

Anonymous Referee #4

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This paper reports on a T170 atmospheric simulation of Last Glacial Maximum climate for doing "paleometeorological" analyses of synoptic scale dynamics in the ice ages. The high spatial resolution and hourly output are what set this simulation apart. The main purpose of the paper is to present the potential of using animations to visualize the synoptic scale features of the simulation, and to point out some key differences between the LGM storm tracks and the present day storm tracks (particularly the tracking of North Pacific storms into Alaska and the decrease in Atlantic storm intensity).

The opportunities offered by this simulation for investigating atmospheric dynamics in an altered climate are very exciting. The authors intend to publish detailed papers

on specific aspects of the simulation (e.g., effects of diurnal heating, wave-wave interactions), so I understand that this paper is more "technical" and meant primarily to introduce the simulation to the community. However, I feel the paper would be much stronger if the authors included a better justification and illustration of the benefits of their visualization approach. The authors probably will not want to address these issues in future papers that have a dynamical focus; moreover, including a discussion of these issues here would add some technical substance to the paper.

Some specific points to address:

(1) What do we gain in this visualization approach? The animantions are appealing and no doubt valuable for the intuition they provide, but in order to justify the huge amount of data required to generate them, I feel that some concrete statements/examples of their benefits – or at least their potential benefits – are required.

(2) Is it possible to compare the storm tracks to those from a lower resolution CCM3 simulation? (i.e., What would we miss in lower resolution animations?)

(3) How do the storm tracks compare to Eulerian mean features such as EKE in the T170 climatological run? What happens if you "degrade" your temporal resolution (i.e., exclude output to create 4 hourly data or 6 hourly data, or 12 hourly data)? In other words, what is the minimum temporal resolution required to get the same storm tracks as for the hourly data? (This point is not so much related to the animation issue, but an important question that this simulation has the unique potential to address.)

(4) Related to point (3), the hourly output SLP field (Fig 1) has no (or a seriously shifted) Icelandic Low compared to the climatological output SLP field. The explanation provided by the authors is not entirely satisfying, because even though the climatological simulation shows interannual variability (Fig 2), there is an Icelandic Low each year. Since this is related to the position of the storm tracks, an expanded discussion on this discrepancy would be nice.

(5) The authors could use the answers of (2) and (3) to provide some constructive comments to the modelling community. For example, what conclusions can or can't be drawn from standard atmospheric output from the Paleoclimate Model Intercomparison Project (PMIP2), which is monthly output at approximately T42 resolution?

Other comments:

(6) Section 1: The justification for going to such high resolution and saving hourly output is a bit vague. Perhaps some more background to set up the problem would help. Also, deciding on some messages (see points 5) to the modelling community and introdcuing these here would help to give the paper more weight.

(7) Section 2: All three simulations used in the study should be clearly described in the Methods section.

(8) The authors might include Dohonoe and Battisti 2009 (JClim), a follow-up to Li and Battisti 2008 that includes a more in-depth analysis of the reasons for reduced Atlantic storminess in the CCSM3 LGM simulation.

Interactive comment on Clim. Past Discuss., 5, 1883, 2009.