**Climate
of the Past
Discussions**

Interactive
Comment

# *Interactive comment on* "The last interglacial (Eemian) climate simulated by LOVECLIM and CCSM3" *by* I. Nikolova et al.

**Anonymous Referee #1**

The article of Nikolova et al. is a detailed evaluation of two climate model simulations for the Eemian, at 127ky BP. The simulations are part of those studied in Lund et al CPD 2012, but the analysis here goes beyond the evaluation of surface temperature provided in that study in including precipitation and sea ice, monsoon and ENSO variability. Some of these aspects have been examined before, but the fact of comparing two models with rather different climate but practically the same forcing data is clearly the strong point of this study and makes it an interesting article for the modelling community. There are nonetheless numerous weaknesses and imprecisions that need to be improved before publication. I consider these improvements imply a minor revision of the paper only. The article is very well structured and referenced, but there are numerous language errors that need to be corrected, of which I will mention just a few below.

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General comments:

The abstract is focussed on the common results of the two models. But there are considerable differences in the results, which seem to be avoided. In contrast, they should be linked to the differences in the models themselves to improve understanding.

It is good practice to test the statistical significance of the climate anomalies. This may alter some of the conclusions drawn by the authors (e.g, changes in southern ocean temperature consistent with reconstructions, unimportant precipitation changes in mid-latitudes).

Sea ice and vegetation changes are extensively discussed in the article. What is the role of snow cover changes in the models? This effect is potentially as important as the other two, but not at all adressed in the article.#

Specific comments:

pp / ll 5294/21-22 [credit to both models and recostructions] The comparison to re-constructions is discussed in the text, but in a quite hand waving, inaccurate manner. There are no figures or tables to support this conclusion, with numbers and error bars on timing, location, and variable.

5296/10-14 [127kyr] The authors mention the uncertainties in duration and variability of MIS-5. But you do not give a single reason why 127kyr BP was chosen. What are the particularities of this period?

5296/14-16 [models] The model choice is obviously guided by availability. But a comment on why a comparison between these two models is particularly interesting or why you do it would be useful.

5297 [section 2.1/2.2] The order of the sections on LOVECLIM and CCSM3 should be consistent with the order in the figures.

5297/15-16 [ice sheets] It is still common practice to prescribe present-day ice sheet

topography. But what is the uncertainty introduced by this on the atmospherice circulation and the freshwater input to the North Atlantic? Aren't these important for some of the results?

5297/5-5298/1 [resolution] The resolutions of the models, except for vertical resolution of the atmosphere, are not that different for representing two different types of models. Some readers may find that striking.

5298/3-4 [vegetation] I understand CCSM3 is using the same vegetation input as in a configuration for the PI. Did you ever test what is the effect of using the BIOME4 127k vegetation on temperature? Is the feedback not critical for the dramatic vegetation changes you find?

5299/4-7 [underestimated warming] Why do static ice sheets lead to an underestimation of warming? Can you quantify the effect?

5299/13-15 [cold N/S] Can this explain the smaller warming? Are the temperature-related feedback less important?

5303/17-19 [AMOC] What is the effect on AMOC in your models?

5304/3-6 [Atarctic] The authors mention the ice core based temperature anomaly estimates, but these need to be compared to a model estimate - visual interpretation from the figure is difficult and not precise enough. Why don't you mention, for example, the anomaly at the closest model grid point?

5306/14-17 [TEJ] What is the mean change (over the relvant region)? What is it in LOVECLIM?

5306/28-29 [IMI] What is the mean change? Is it significant?

5307/24-26 [data] I get the impression further data is as much needed in the NH as in the SH.

5308/6-8 [Mid-Holocene] Why is this relevant for this study? Needs to be explained.

5309/10-12 [Chinese vegetation] What is the vegetation type on the plateau in your models for MIS-5?

5311/19-26 [ENSO amplitude] Is ENSO indeed stronger? Needs to be more clear. What is the change in the amplitude (e.g., in the difference betwwen 10th and 90th percentile)?

5311/28-5312/2 [correlation to SST variability] This is very vague. Did you compute a correlation coefficient?

Figure 2,4,6 Are these differences statistically significant? When comparing to reconstructions, marking the relevant zones in the figures would be very useful.

Figure 3 A plot for LOVECLIM should be added for completeness. The color scale should be common with Figure 5 and centered at 0.

Figure 7 Are these differences statistically significant?

Figure 8/9 Give LOVECLIM results as well. Any differences? In Fig.9, mention the model level in the caption.

Figure 10 The caption needs to be more precise. Is this the MIS-5 anomaly or mean MIS-5? Bad quality plot. Wouldn't all the be contained in a line plot at 400 hPa?

Figure 11 Several points are not in the plot window. I wonder how much information can be drawn from this plot. Wouldn't a histogram in comparison to PI be a better figure to show?

Figure 12/13 Would it not be better to show both models in a same figure with the same scale and on the models resolution, maybe with a second, more detailed plot for BIOME4? Where does the huge fraction of boreal forest in the southern hemisphere come from in BIOME4?

Minor comments:

5294/13-15 [El Nino] Needs to be rephrased. 5294/16 ... and on the Arabian Peninsula 5295/4 [IPCC] proper citation should be used. 5295/11-12 to general. 5295/17-19 unclear. 5296/1 [last time] The Arctic received considerable warming last summer. Needs to be more precise. 5300/16 [Exceptionally] doesn't work here. 5303/11 (up to -2 and -3 g/kg, respectively) 5304/20-22 Hard to uderstand what the authors mean exactly. Needs to be rephrased. 5308/3-4 [Similarities] Which similarities? 5310/3 The mean annual cycles (?) 5313/1-2 on the one hand

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