Clim. Past Discuss., 8, C1936–C1940, 2012
www.clim-past-discuss.net/8/C1936/2012/
© Author(s) 2012. This work is distributed under
the Creative Commons Attribute 3.0 License.

Climate of the Past Discussions

Interactive comment on "Last interglacial temperature evolution – a model inter-comparison" *by* P. Bakker et al.

Anonymous Referee #1

Received and published: 16 October 2012

As the authors clearly summarised the paper present a model inter-comparison for the last interglacial period (130-115 ka BP). They consider seven models of different complexities, either GCMs or EMICs. The presentation is focused on temperature although other variables, such as strength of the AMOC, sea ice cover, land sea contrast, are also mentioned in relation with the temperature. It is essentially a presentation of the results. The processes involved are hardly discussed. One may also find unfortunate to limit the presentation to the variable 'temperature'. Nevertheless, we must recognize that the comparison of seven models provides already a considerable amount of information. Adding variables would have risked making the manuscript difficult to read. It is important here to highlight the important work of compilation of the results of different models. Presenting their results in a coherent way is already in itself an interesting work.

General comments

Generally speaking the paper is well organised. The abstract is informative. It provides the major points of the paper. The introduction gives a minimum framework for the study. Section 2 focuses on the simulations. It includes the description of the models. Unfortunately, one of the models (MPI-UW) is missing here. Then there is a description of the post processing of the results followed by the description of the forcings. I would suggest inverting these last two sections, i.e. first forcings, second results. The model results themselves are discussed into two different sections (section 3 – temperature and section 4 – discussion). I regret that section 3 is so long, full of a lot of details about temperature, some of them being repeated in the discussion (section 4). I was wondering whether it could be possible to combine both sections into a single section that would include a sub section on temperature, one on temperature and forcings, and the subsections in the present section 4. The "conclusions" is a summary of the major points discussed in section 3 and 4.

Sections 3 and 4. There is a long discussion about trend, evolution and their robustness. However, there is no 'definition' of what these words mean in this specific context. How are the trends and the evolution computed? On which basis is it decided that it is robust? These sections contain many words like 'in line with', 'related to', . . . They are giving a broad qualitative presentation but no quantification of what sometimes looks more like a 'feeling'. I am missing a more quantitative approach. Similarly several subsections ended with statement like 'this need more investigation' or 'this is out of the scope of the paper', which reinforces this general feeling of a very qualitative paper.

Detailed comments

Page 4669 – line 1 (Description of the Bern 3D model). "This model includes prescribed changes in the extent of the Northern Hemisphere (NH) continental ice sheets". However, nothing is said relative to the ice volume and the location of this ice remnant. Are the Northern Hemisphere ice sheets prescribed (and adjusted) at each time step of the

CPD
8, C1936–C1940, 2012

model? Does sea level change in this simulation?

Page 4671 – line 10. LOVECLIM is the only model for which the authors explicitly state the forcings, i.e. astronomical configuration and GHG. I suggest leaving it for the 'forcings' section.

The description of MPI-UW is missing.

I know that a description section is almost compulsory although it is not very informative. Therefore, I like very much the idea of table 1 and I support the idea of transferring as much information as possible from the main text to the table.

Page 4671 – line 21 (data processing). "These differences mean that the degree to which short time-scale climate variability is filtered out differs from sub-decadal (CCSM3 and KCM) to multi-decadal (all other models)". Please explain.

Page 4672 – line 21 "We will also identify ....". Do the authors mean ... trends that are directly connected to changes in insolation or GHG concentrations? Or do they mean trends that are directly connected to neither changes in insolation nor GHG concentrations?

Page 4672 – line 24. Is it annual mean insolation?

Page 4672 (line 24) – Page 4673 (line 25). The very detailed description of lead and lag between insolation at different latitude and month can be 'summarised' into one reference, i.e. BERGER A., 2001. The role of CO2, sea-level and vegetation during the Milankovitch-forced glacial-interglacial cycles. In : Âń Geosphere-Biosphere Interactions and Climate Âż, Lennart O. Bengtsson and Claus U. Hammer (eds), pp. 119-146, Cambridge University Press, New York. It is stated on top of page 122 "... variations of the daily insolation depend mainly on precession .... . As a consequence, for a given latitude there is a phase lag of about 2 kyr ... between insolation of two consecutive months".

Page 4676 line 20. ' ... the magnitude of the overall trend'. I assume that it is the

CPD

8, C1936–C1940, 2012

temperature trend for both mid and high-latitude in July. This should probably be mentioned in the text. If my interpretation is correct, the authors indicate a trend in the mid and high-latitude but no trend for the whole hemisphere. What does that mean for the low latitudes? Is there a trend opposite to the trend in the higher latitudes that compensates each other?

Page 4679 – lines13-14 and lines19. It seems slightly non coherent to say that "The relative importance of either the GHG forcing or the sea-ice feedback on the Arctic winter MWT is not easily determined" and that "the sea-ice feedback plays an important role in determining the LIG winter temperature evolution in the Arctic region". Once more, I assume that this is related with the fact that the analysis is qualitative and not quantitative. There is no information about JJA. Is JJA temperature in favour or against an important role of the sea ice?

Page 4680 – section 4.2. This section discusses in parallel and for each model three issues that does not seem to be fully related at first. There is the abrupt change in the AMOC, the abrupt temperature change in the Northern Hemisphere and the MWT anomaly. I can indeed see the correlation (again qualitatively speaking) between rapid changes in AMOC and in temperature. However, I do not understand how the timing of maximum warmth is related with these abrupt changes.

Page 4681 – line 3. I would suggest to use chronological order to discuss AMOC with FAMOUS.

Page 4681 – line 16. Could the authors elaborate more on the changes they are discussing ("changes in the sea-ice cover and the dynamics of the Southern Ocean")?

Page 4681 – line 22. "-20-30%" Which is the reference? Percentage of what?

Page 4681 – line 27. "AMOC strengthening does not seem to have a clear impact on the simulated LIG temperature evolution". As long as there isn't a simulation without AMOC strengthening, it is hard to conclude that it does not have an impact.

CPD

8, C1936–C1940, 2012

Page 4684 – lines 5-6. " the simulated MMM MWT over these regions is clearly later then the surrounding regions ". According to figure 3 and to what the authors write later (line 15 same page), this is the case only for three models. I would urge the authors not to draw general conclusion that they later minimise. Moreover, I would like to know to which extent the concluding lines of this section (Page 4685 – line 3) are valid for all the models or only for three of them.

Page 4694. The reference for the insolation is missing.

Page 4696. A typo. 115 instead of 1115.

Page 4699. It is disturbing to have each time series drawn on its own scale while a comparison is conducted between the series.

Interactive comment on Clim. Past Discuss., 8, 4663, 2012.