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Climate of the Past Discussions

Interactive comment on "A model-data comparison of the Holocene global sea surface temperature evolution" *by* G. Lohmann et al.

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Paper: "A model-data comparison of the Holocene global sea surface temperature evolution" by G. Lohmann, M. Pfeiffer, T. Laepple, G. Leduc, and J.-H. Kim, Clim. Past Discuss., 8, 1005-1056, 2012. www.clim-past-discuss.net/8/1005/2012/ doi:10.5194/cpd-8-1005-2012

Response to the reviewer 2

First, we would like to thank the reviewer for the useful and constructive comments. We respond first to the reviewers' major comments.

1) Data sets a. Correct. We provide now the bibliography of the data sets and include an extra table. There we provide the source of information for our paper. In a similar

way, we include now the information of the PMIP3 model results.

b. We deliberately avoid to give the authors' comment of potential seasonal bias. Instead, we want to elaborate from the analyses which season is fitting best to the model trends.

c. Aliasing: The number 10 within 6000 years is arbitrary, but we have chosen this number to estimate the trends (including their errors).

In the new figures, it is now clear that PC17 has 10 values. We also calculated the uncertainties in the trends (Figs. 1-4) and evaluate their residuals (standardized residuals of the fit relative to the fitted values) as shown in Figs. 5-8. Across the cores, no clear common pattern in the deviations from linearity is visible which would ask for a non-parametric analysis.

2) Correct. The data with more than 2°C are mainly at high latitudes. We expect that the alkenone method has its limitations in these areas. We include a sentence in the new manuscript. 3) We evaluated the ocean model component of ECHO-G in simulating the seasonal cycle in SST for the core locations (Figs. 9-12). If the recorder system changes over time, the system may record another time of the year in the mid-Holocene compared to PI. Your are right. To make an example, a time shift of 30 days mean that a seasonal correlation centred on JJA is then centered on JAS or MJJ. We included this into the methods section. Also some formulations were modified as suggested.

Minor points: 1) we want to keep the title as it is 2) We reformulated the sentences. For example: 1025: "Paleoclimate information gathered from model-data comparisons are difficult to be put into a context which goes beyond a description of observed model-data discrepancies, as both climate models and proxy reconstructions are imperfect and have very different characteristics." 1027: "It means that refining Mg/Ca interpretation in light of the foraminiferal seasonal preferences may theoretically be undertaken by field studies."

3) We include now the recent compilations in the introduction: A recent compilation of land proxy data and models (Branonnot et al., 2012) shows mean annual temperature anomalies of 2-5 K during the mid-Holocene over large parts of northern and middle Europe, parts of northern Asia, as well as southern Africa. In the Mediterranean and the subtropical regions, the data shows a cooling of 1-2 K, as seen from pollen and plant macrofossil data (Bartlein et al., 2011). Furthermore, we included more information in the discussion and conclusion section. 4) The environmental conditions are not systematically known. We try to avoid a discussion of individual cores, although we are aware that paleoclimatologist may have core-specific knowledge about habitat depth and seasonality. 5) This is indeed confusing that there is a significant negative relation for Mg/Ca. We guess that the relatively small sample size und unknown environmental effects are responsible for this inverse relationship. We modified the sentence. 6) We modified the sentence and add: This suggests that the nutrient supply from deeper waters is an important influence on the alkenone production as hypothesized by Ohkouchi, et al., 1999.

7) Thanks, modified 8) Modified 9) Thanks, a valid suggestion. We moved the section and introduced more subsections. 10) We also evaluated Mg/Ca and want to leave the formulation. 11) Done. 12) The matches are featureless because they do not reflect large-scale pattern. We inserted this into the manuscript. 13) Good suggestion, adopted: Comparing the reconstructed Holocene temperature trends to the model levels of the upper 100m does not remove the discrepancy between models and proxies.

14) We followed your suggestion.

15) Done.

16) Done.

17) Done.

18) Because the signal would be smoothed.

19) Ok, we reformulated the sentence.

20) Done.

21) Done.

22) Done.

23) Done.

24) Done.

25) Done.

26) Done.

27) Done.

28) Done.

29) We modified the color scale.

30) Right. More information is now given in the caption. The number of points may not be identical because of missing values or the values are out of range in the vertical.

31) Done, now we state explicitely the meaning of the triagles and diamonds.

32) Re-done.

Final remark: we included also the PMIP3 data into our compilation and made an additional figure.

The figures for the reply are enclosed as supplement.

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References:

Bartlein, P.J., Harrison, S. P., Brewer, S., Connor, S., Davis ,B. A. S., Gajewski, K.,

Guiot, J., Harrison-Prentice, T. I., Henderson, A., Peyron, O., Prentice, I. C., Scholze, M., Seppä, H., Shuman, B., Sugita, S., Thompson, R. S., Viau, A. E., Williams, J., and Wu, H.: Pollen-based continental climate reconstructions at 6 and 21 ka: a global synthesis, Clim. Dynam., 37 (3), 775 – 802. DOI 10.1007/S00382-010-0904-1, 2011.

Braconnot, P., Harrison, S., Kageyama, M., Bartlein, P., Masson-Delmotte, V., Abe-Ouchi, A., Otto-Bliesner, B., and Zhao, Y: Evaluation of climate models using palaeoclimatic data, Nature Climate Change 2, 417–424 (2012) doi:10.1038/nclimate1456

Ohkouchi, N., Kawamura, K., Kawahata, H., and Okada, H.: Depth ranges of alkenone production in the central Pacific Ocean, Global Biogeochem. Cycles, 13, 695–704, 1999.

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/8/C2958/2012/cpd-8-C2958-2012-supplement.pdf

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Interactive comment on Clim. Past Discuss., 8, 1005, 2012.