

Interactive comment on “Implication of methodological uncertainties for Mid-Holocene sea surface temperature reconstructions” by I. Hessler et al.

Anonymous Referee #1

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Review of “Implication of methodological uncertainties for Mid-Holocene sea surface temperature reconstructions” by Hessler et al (CPD, 10, 1747-1782, 2014)

General

The manuscript describes a comprehensive data set for Mid-Holocene sea-surface temperatures (SSTs). It completes previous attempts by Kim et al (2004), based on alkenone-derived SSTs, and Leduc et al (2010), based on SSTs reconstructed from alkenone and Mg/Ca records. Here, SST reconstructions based on planktonic foraminifera census counts and dinocysts have been added. The resulting synthesis might appear to be disappointing because it proves that there is no consensus from

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the different proxies and that the variability within a given period of 1000 years can be much larger than the mid-Holocene vs. present-day anomaly, and thus that mid-Holocene SSTs cannot be used for model benchmarking. However, I consider that this message, by itself, to be very important. Without such a synthesis, modellers could continue using data based on a single SST-indicator, which is clearly not adequate. I would rather see the results from this study as an incentive for improving our understanding of each SST-proxy and for directly modelling those.

The manuscript is clearly written and illustrated. In particular, each paleoclimate indicator is briefly described, tests of consistency are clearly presented and will be very useful as indicator of future progress and the limitations of the data set are clearly illustrated. I really appreciate the approach of the authors who do not try to oversell the data set but point to its limitations and the challenges related to it. The challenge of modelling the indicators themselves could actually be emphasized at the end of the manuscript as it is clear that it will be essential to understand the different messages from the data.

On the technical side, the maps are a little small when printed out but are very clear displayed on a computer screen. It would be good if the technical editor could ensure the largest possible figures for the final version. There are a few typos and sentences to be clarified, as listed below. Also, I found that the supplementary material was wrongly described (wrong number of tables and figures in the supplementary material described provided at the beginning of the corresponding document) or that Figures are missing. Can the authors please check this out?

Once this is clarified, in my opinion, the manuscript will be ready for publication.

A few suggestions for additional references and points of discussion

LGM SST model-data comparisons have also been performed within the Paleoclimate Modelling Intercomparison Project: Otto-Bliesner et al (2009) are cited for the tropics, Kageyama et al (QSR, 25 (2006) 2082–2102) could be cited for the North Atlantic.

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Kageyama et al (Climate Dynamics, 40 (2013) 2469–2495) can also be cited for attempts to model foraminifera for the LGM, based on the FORAMCLIM model described in Lombard et al (Biogeosciences, 8 (2011) 853–873). All these works actually use the pre-industrial state as the reference climate for the models, which could prove inadequate for the mid-Holocene, since the Mid-Holocene anomalies are shown to be so sensitive to the reference climate. This could be pointed out for modellers.

About the interpretation of the alkenone based SST reconstruction, Barton et al (Progress in Oceanography 116 (2013) 167–178) discuss the interpretation of alkenone-derived SST recent trends off the coast of Morocco. They find that a possible explanation to the cold trend over the last decades could be that coccolithophorids could actually be living at deeper and deeper depth, hence giving information on temperatures, but not SSTs. This could be added in the discussion, I think.

Clarifications

Fig. 4, legend: if the whiskers indeed show the maximum and minimum values, why then do the outliers showed by the diamonds show even larger/smaller values? (the whiskers on a box plot usually show the 10-90th or 5-95th quantiles, don't they?)

Fig. 6, legend about the dotted lines: each line is defined by the anomaly = +/- the standard error. Stating this would be clearer than the current description, I think.

Minor comments and typos

Page 1759, line 11: remove “the” between “of” and “choosing”

Page 1760, lines 11-12: sentence could be clarified by indicating precise latitudes/sites where these behavior occur (i.e. by guiding the reader on Fig 6.)

Page 1760, line 13: “there are insufficient points” could be replaced by “There is an insufficient number of points”

Page 1764, line 4: sensor → sensors

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Page 1765, line 19: provides → provide

Page 1780, middle of caption of Fig 4: “rom each record” → “from each record”

Page 1782: foraminifera → foraminifera

Interactive comment on Clim. Past Discuss., 10, 1747, 2014.

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