

Interactive comment on “A Last Glacial Maximum World-Ocean simulation at eddy-permitting resolution – Part 2: Confronting the paleo-proxy data” by M. Ballarotta et al.

Anonymous Referee #1

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Ballarotta et al. use an eddy-permitting ocean model to perform a model-data comparison for the Last Glacial Maximum oceanic surface state. The eddy-resolving model is compared to two coarser-resolved models. All models are compared to sea surface temperature data from the MARGO reconstructions as well as sea-ice reconstructions. The major finding is that the eddy-resolving model does not perform any better than the coarser resolved models in the model-data comparison.

The paper as it is needs some substantial revision/improvements. The authors may consider combining the two papers, where the palaeo-data comparison can form an additional part in the basic evaluation paper. Alternatively, the model-data compari-

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son should be extended. The paper clearly demanded a big modelling effort, and the overall conclusion is important for the palaeo-modelling community. The introduction, description of the methodology and results are adequate (except for some smaller issues - see below), but need to be read within the context of the companion paper. Importantly, I urge the authors to provide a more detailed discussion of the results. This should include a discussion of palaeo-data uncertainties, general problems when comparing models with data, previous sea-ice modelling attempts for the LGM, and also touch upon model-data comparisons for the deep ocean. From what I understand from the companion paper, the simulated positive AMOC cell is substantially shoaled and reduced, and the negative AMOC cell at depth quasi non-existing, which would be interesting to be discussed in the light of palaeo reconstructions (see Tagliabue et al., 2009, Hesse et al., 2011, and Lynch-Stieglitz et al., 2007 for a review).

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some general comments:

consistency: introduce abbreviations at first occurrence and only once (e.g. PMIP: p.330, l.14 & l.26l; same for LGM)

English language can be improved and be more concise

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more detailed comments:

p.330

l.2-5: First sentence is too long for my liking; a shortened version (maybe two sentences) would encourage the reader to keep reading...

l.5: The sentence starting with "consequently" does not build logically on the one before

l.8: avoid use of passive: instead of "it was found" put "we found"

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l.18: "proximity to present day" is too vague; for why LGM is useful, see Mix et al, 2001 p.331

l.4: "on the other hand" should be preceded by "on the one hand", which is missing

l.10-12: add IPCC reference to reference list

p.332

l.3: first time I came across NEMO... might be useful to spare a quick description/explanation

l.6: "more or less closely" is not very meaningful

l.8: replace "as regards" with "with regards to"

l.28: the Taylor diagram shows the "centred" RMS difference, which is different to the "standard" RMS difference - see Taylor, 2001

l.28: since there are four items listed in the preceding sentence "The former quantity ..." is ambiguous; I suggest: "The model skill ..."

p.333

l.25: RMSE not introduced - would be helpful for readers

p.334

l.4: "but" not adequate as merely the results are described

l.23: "The conclusions..." - what does this refer to? where are these conclusions?

p.335

l.18: sentence starting with "For the boreal summer..." - do you have a reference that you can compare your modelled sea-ice in the Labrador Sea, the central North Atlantic and the Norwegian Sea to?

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p.336

l.22/23: Please be more specific on the key areas by providing examples

p.337

l.8: "A summary of the overall results is that this investigation indicates ..." could be shortened to "A general result is ..."

l.12/13: remove "as regards model performance"

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Tables:

Table 1: A short description of the abbreviations for the various frequencies would be helpful; also cite Peltier (2004) as reference for the ICE-5G bathymetry

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Figures:

Taylor diagrams: what is the role of the two straight black lines that are drawn at an angle of ca. 10 degrees with respect to the x and y axes? I find them distracting and would suggest to remove them unless they have a purpose (which I may have missed); in order to better assess the correlation, it would be useful to have faint straight lines from the origin to the arc locations of $r = 0.2, 0.4, 0.6, 0.8$ etc.; another suggestion is to normalise the standard deviation in each figure, so that annual, summer and winter conditions can all be displayed in one Taylor diagram instead of three;

Fig. 6 & Fig. 7: instead of only plotting the MARGO locations, it would be insightful to have the associated SST values superposed; also, in Fig. 6 right now it is difficult to see all the locations - I'd suggest to adjust the colour bar appropriately;

Fig. 8 & Fig. 9: Why are the locations of the Gersonde et al. (2005) reconstructions important? In the figures right now they do not tell us anything about the reconstructed

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sea-ice...

Interactive comment on Clim. Past Discuss., 9, 329, 2013.

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