

Interactive comment on “A multi-model CMIP6 study of Arctic sea ice at 127 ka: Sea ice data compilation and model differences” by Masa Kageyama et al.

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Received and published: 15 May 2020

This response is supplied as a supplementary material.

Please also note the supplement to this comment:

<https://www.clim-past-discuss.net/cp-2019-165/cp-2019-165-AC3-supplement.pdf>

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-165, 2020>.

C1

Reviewer #2

Kageyama et al. present the results of CMIP6-PMIP4 LIG simulations from 12 models and analyse them in terms of Arctic sea ice changes. They also present a new compilation of LIG sea-ice proxy data which they compare the model results with. While the discrepancies between simulations and proxy data, as well as within proxy data and within simulations, prevent any unambiguous identification of LIG sea-ice changes, the author provide valuable insights into the parameters that may influence sea-ice dynamics through their analysis of inter-model differences.

I find the manuscript well-structured and written in a concise and convincing way, and I only have minor concerns about how the proxy reconstructions were transferred into values of sea-ice concentration and duration (as described below). I thus recommend this manuscript for publication with minor revisions.

We thank the reviewer for this careful review.

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Major comments about proxy data (mostly section 2.2):

I really like the author's cautious approach to provide common and clear definitions, based on sea-ice cover duration and sea-ice cover concentration, of ice-free / seasonal/ perennial sea ice that facilitate data-data and model-data comparison. However, it is not always clear for me how such values have been obtained for the proxy data:

- For dinocysts: the explanation is very clear, but I miss the info on how the min and max values have been obtained (are those the min and max values of the 5 [?] best analogues? The minimum and maximum monthly sea-ice cover durations? The range of variability within the LIG time slice? Other?).

The minimum and maximum values are given according to the range of estimates within the LIG time slice. This is added in section 2.2, in which the last sentence in the paragraph about dinocyst data now reads:

"The error of prediction for sea-ice concentration is $\pm 12\%$ and that of sea-ice cover duration through the year is ± 1.5 months/yr. Such values are very close to the interannual variability in areas occupied by seasonal sea-ice cover (cf. de Vernal et al., 2013b)."

- For other proxies:

> I understand the authors attributed values of 0.15 and 0.95 for min and max sea-ice concentration at sites where sea ice was interpreted to be perennial, but I miss the info on how those values were defined for other sea-ice categories (or what are the sea-ice states corresponding to the 3 other min-max SIC combinations: 0.3-0.95, 0.3-0.6 and 0.1-0.3).

> The rationale for the attribution of min and max sea-ice cover durations is also not clear to me (in section 3.3 the authors mention they "define perennial sea ice to have at least 9 months of coverage", but I am confused because sites with min-max sea-ice concentrations of 0.15-0.95 have either min-max sea-ice cover durations of 9-12 mth/yr for IP25 or 3-11 mth/yr for faunas).

- Regarding the sites with PIP25-based interpretations, have the attributed min-max range of sea-ice concentration values been compared to some sea-ice concentration quantifications based on the calibrations recently proposed (Wao et al., 2015, <http://dx.doi.org/10.1016/j.gca.2015.01.029>; Smik et al., 2016,

Fig. 1.

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