Thanks to the authors' diligent and continuing efforts to address the reviewer's comments, I find that the manuscript is much improved since it was first submitted.

However, I still have recommendations, some related to potential clarification of new additions, and others pointing out the few but important sentences where the authors could make a more compelling case. In particular, I do not share the same view as the authors in their concluding remarks, as they are formulated now. I am detailing these recommendations below.

General comments

1. I find that some of the vocabulary related to climate models used in this paper is not always adequate or precise.

>   - L10: '13 climate models that were included… are used to investigate...' → '13 climate model simulations...' or 'outputs'. Otherwise the formulation implies that the authors ran the simulations themselves.

>   - L12: 'the model simulations are compared with existing proxy records...' → 'the simulated variables are compared…' or 'the variables of interest in simulations are compared'

>   - L19: 'LGM precipitation anomalies are simulated differently between models' → 'models show   different…'. Otherwise it could imply that the precipitation processes are represented differently in the models.

>   - L15: 'models do not have a robust response' → 'model simulations do not show a robust response'

>   - L181: 'Many modelling studies have focused on the LGM as this period is one of the main 'entry card' experiments for PMIP'. The relevancy of this statement is questionable, as it reverses cause and consequence. There are scientific reasons why modellers are interested in simulating the LGM climate (which is why it has been defined as an entry card in PMIP).

>   -L211: 'Evidence' is a slightly strong word for a simulated change. I would use a synonym (e.g. 'signs') to avoid confusion.

2. Although the authors have clarified the knowledge gap, the way it is formulated is not very compelling.

>   - L8: 'remain uncertain': According to what: proxy studies?

>   - L8-9: 'including the [list] of changes]': Is there a way to clarify the scientific problem you are tackling? This formulation using a list introduces a disconnection between your variable of interest. On the contrary, the emphasis could be on how these variables are connected (why you want to examine them together in the same paper), which tell us something about the processes.

>   - L60: 'Questions about the climate of Australia include [list]'. Same as before, this is not a very compelling way to phrase a scientific question. Perhaps a more efficient way of telling the reader this would be to do it later in the paragraph, by explicitly relating this statement with L65-66 which mentions processes.

3. I remain unconvinced by the perspectives.

- L20: 'suggesting that caution is required when interpreting model output'. While true, this is also an obvious statement, so probably a wasted opportunity to teach something new to the reader. I find your new element of conclusion about different land-sea mask over Sahul to be much more insightful for modellers, and possibly worth a mention in the abstract.

- L22: 'is required to determine the drivers… and to identify the most plausible set of LGM simulations'. This statement puts on the same level a process-understanding objective ('determine the drivers') and a second part implying in its formulation that the end goal is to exclude some models based on their performance to get some kind of realistic ensemble. I would argue that the whole point of a multimodel comparison study is not to elect Mr. Best Model Out There (for all models are wrong, although some may give better results than others depending on the variables we are looking at) or exclude outliers, but really to use the model evaluation and the evidenced biases to learn something about the processes and determine how the model representation could be improved. **Same remark for L792-793**

- L780-781: I do not understand what the authors mean by this statement. Isn't quantitative model-data comparison a way of caracterizing model biases (and thus the 'uncertainty')?

- L789-790: Please justify this statement, as it is the first mention of a potential use for future climate. Alternatively, this could be justified in the introduction when outlining the aim of the present study.

4. The addition of the different LGM land-sea masks is indeed interesting to see. I have a few related recommendations.

- Figures 1, 4 and 9: I wonder if the use of an interpolated contour for the LGM land-sea mask makes the most sense. Possibly, a sharp delimitation (without interpolation) between the wet and dry grid cells would let the reader see more clearly the model mesh and resolution. However, it might deteriorate visibility.

- For consistency, Figures 1, 4 and 9 should also plot the pre-industrial land-sea masks in thin lines, and not just the high-resolution modern topography.

- L360 'the thin black lines indicate modern coastlines': Same, we cannot assume that the pre-industrial land-sea mask from individual model will follow well the high-resolution modern coastlines.

- L544-546: There is no mention of the sharp precipitation gradient that some models simulate at their coastlines (but not others). This could be worth mentioning.

- L755-756: As evidenced by the different land-sea mask, the model response may also be related to different boundary conditions (and not just a different model response to the change in boundary conditions).

Specific comments

L52-53: 'of lower temperatures… that cooled the climate'. This is more or less a repetition of the same element.

L58: 'While many studies'. Proxy studies or modelling studies? Please specify.

L58: 'globally and in the Northern Hemisphere'. Is this an 'and/or'? This sounds a bit contradictory.

L73: 'have begun to explore' → 'have explored'

L75: A link word and a recapitulation of the originality of the study would be welcomed to contrast this study with previous ones. Something along the lines of: 'Hence, the present study used the most recent PMIP3 and PMIP4 simulations to investigate climate changes over the Australian region specifically'.

L137: Mentioning the Gray et al., 2023 paper (and contrasting its conclusions to Kohfeld's) would be welcomed here.

L193-194 and L205-207: It is a bit confusing for the reader to switch abruptly (without link words) from the description of previous studies to the aims of the present study.

L199-204: Mentioning the changes in simulated SH westerly winds in the Gray et al., 2023 paper would also be welcomed here, as it is the most recent study.

Table 1 legend: The sentence related to length of simulation should be deleted (as the column was also deleted).

L252: Please delete 'minor'.

L257: 'PMIP3 ice-sheet configurations' → 'the PMIP3 ice-sheet configuration'

L262: 'with CMIP5 CNRM-CM5 having the smallest expander land area'. It is difficult to see why this statement is relevant here. Possibly, quantifying the range of the difference of surface area between PI and LGM (in km²), from the model with the smallest difference to the one with the largest would be more meaningful.

L296 'According to the PMIP protocols' and L297 'see Kageyama et al., 2017 for details of the spin-up protocol'. Why are you mentioning the recommendations (which are not always thoroughly followed) instead of the spin-up duration that was actually done for PMIP4 simulations (in Kageyama et al., 2021)?

L246: 'Otherwise' → 'Hence' or synonym