

## ***Interactive comment on “The PRISM4 (mid-Piacenzian) palaeoenvironmental reconstruction” by Harry Dowsett et al.***

### **Anonymous Referee #1**

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The manuscript by Dowsett and co-authors presents the new PRISM4 reconstruction of environmental conditions during the mid Piacenzian. The data sets have global reach, and combine and update previous syntheses of sea surface temperature and vegetation, alongside land and sea ice extent. For the first time the PRISM synthesis includes soils and lakes, as well as new paleogeography calculations. The paleogeography calculations incorporate a number of important characteristics, including the potential impacts of glacial isostatic adjustment and Earth’s dynamic topography on the Earth surface relief. It is important that these variables are taken into account in reconstructions and models of past climates which pre-date the large glacial/interglacial cycles of the Quaternary period, since using modern topography (shaped by those large ice sheets) could influence both regional climates and the inception or expansion of ice sheets. The manuscript is well-written, dealing with each of these new considerations

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in turn, and outlining how the assumptions for the modelling components may be supported by existing data where available. The PRISM4 synthesis is a valuable contribution to how we understand past warm climates, and previous versions have proved to be fundamental to robust data-model comparisons. The new information outlined here moves this forward by explaining and incorporating some additional likely influences on late Pliocene climate, which are important if we are to better understand the controls and feedbacks operating at this time.

Although it is definitely valuable to show the PRISM4 reconstruction at a global scale (Figure 3), both the text (e.g. Discussion section 4.1) and the figures themselves indicate that there are some strong regional impacts of the new paleogeography which are not clearly visible on Figure 3. This is particularly for the North Pacific and Antarctic regions, where the projections in Figure 3 make it difficult to see the changes in land-sea distribution, orography, and ice-sheet extent, yet Figures 4, 5 and 7 demonstrate the impact of the new calculations and show that there are strong regional effects. Likewise, the Greenland ice sheet configuration in Figure 3E is difficult to identify. Since the configuration of the Bering Strait and Canadian archipelago are discussed (and are considered to have impact on other climate variables – page 9-10) I recommend that either a polar projection (northern hemisphere) or North Pacific projection is added to the manuscript, containing some of the information of Figure 3 (e.g. SST, biomes, land ice) and perhaps a comparison of the information contained in Figures 4A and 4H or Figure 7 (i.e. the overall impact of the new paleogeography). The authors might also consider whether a similar projection for Antarctica would help their discussion of different evidence for ice elevation change and/or retreat (page 11) since this is very difficult to see in Figure 3. Figure 8 demonstrates that regional-scale information can be very valuable for being able to see the patterns in the data more clearly (although Figure 8 does not seem to be plotted on the new paleogeography?).

Page 11 lines 21-25: I found the insertion of the Yamane et al. (2015) discussion confusing, lying between a statement about reduced ice at the Wilkes Land margin

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and a subsequent note (line 26 onwards) about areas of ice sheet retreat. The text may flow better if the evidence for increased ice elevation in some areas is stated before discussing the Wilkes Land retreat?

Page 12: there is a good discussion about the different issues which can be associated with using a variety of biological proxies. Does the PRISM4 reconstruction include all of these different proxies, or have certain proxies been selected? For sites with multiple SST data, how did the authors incorporate the results into the synthesis in Figure 3 where the proxies did not give the same values? Table 1 is cited for the original data sets, but this table redirects you to the synthesis paper from the information on the original data can be determined. It doesn't make it easy to know which proxies have been incorporated into the syntheses.

Figure 2 caption: what is 'DOT' ? I couldn't find the term used elsewhere in the text.

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