

Interactive comment on “Pliocene three-dimensional global ocean temperature reconstruction” by H. J. Dowsett et al.

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Review of the manuscript "Pliocene three-dimensional global ocean temperature reconstruction" by Dowsett, Robinson, and Foley. This manuscript presents a logical next step within the framework of the PRISM project by adding a deep ocean temperature component in order to reconstruct a 3D temperature reconstruction of the world's oceans during the Piacenzian. The manuscript is well written, clearly explaining this next step in the development of providing a modeling base for possible future warm climates. Below are points which require some more attention, as well as some minor comments at the end of this review.

Major comments:

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The use of ostracode Mg/Ca is still a proxy which is not used very often. Although it is very interesting and seems to provide realistic results I'd like to see some more discussion on this proxy. Now, it is only mentioned that the results and methods are discussed in previous papers. But I think, as this is the major addition from this paper into a 3D PRISM ocean temperature reconstruction it deserves some more attention.

Firstly, a comparison with other bottom water temperature estimates like Mg/Ca on benthic foraminifera would significantly add to the quality of the ostracode data. A recent study by Khelifi et al. (Geology, 2009), for example, presents high resolution benthic foraminifer Mg/Ca data for NE-Atlantic Site 548, showing higher temperatures by up to 3°C for the Piacenzian, suggesting that these are caused by intensified outflow from the Mediterranean.

Secondly, the potential influence of a carbonate ion effect on ostracode Mg/Ca is needed. For benthic foraminifera it is now pretty well constrained that there is a carbonate ion effect on the Mg/Ca, especially when temperatures are less than about 4°C (Yu and Elderfield, 2007; Raitzsch et al., 2008). Although the papers which are cited here on the methods do state that "initial results do not indicate a significant carbonate ion effect" (Dwyer and Chandler, 2009 and refs therein), the data from this study originate from the N-Atlantic and Ceara Rise which are both characterized by saturated conditions with respect to carbonate. Here, however, additional data from many sites with much lower saturation states, like most Pacific sites, are included, which could potentially have been influenced by a carbonate ion effect.

The title says that a global reconstruction is made. However, the number of sites outside the Atlantic is very low. This would make a global reconstruction not very reliable for the Indian and Pacific oceans, obviously indicating that a lot of additional data is needed. It might be better to restrict the reconstruction to the Atlantic which has a good coverage, and only hinting towards the other oceans.

Minor comments:

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Abstract: include that the Mg/Ca paleothermometry is applied on ostracodes.

p.1909, line 3-5. It already says that specific steps are listed in the Appendix, so I would remove all these steps from the text.

Line 10: $4 \times 5 > 4^\circ \times 5^\circ$

P.1912: line 8-10: this sentence is confusing. It now reads like if the movement of the GSR caused the NH-glaciation.

Chapter 6.2: This chapter is really short and could use some more explanation like it was done in 6.1. So, AAIW was displaced upwards?

P.1914, line 6: replace “and” with “but”

Line 17/18: References concerning Panama are missing: Haug et al., 2001; Steph et al., 2005

P.1922, line 20: abbreviation for Geochem. ... seems to be incorrect.

Table 1/2: footnotes and the references are missing

Figure 1 caption: “d18O” > “ $\delta^{18}\text{O}$ ”

Figure 2: the different parts are pretty small and hard to read. The figure would be a lot clearer when it is spread out over two pages.

I'd like to point out that I have made this review before reading any online reviews or comments.

Interactive comment on Clim. Past Discuss., 5, 1901, 2009.

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