

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

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### Overall comment

This is a very well written and honest attempt by the USGS' PRISM Paleoclimate Group to effect the first 3-D global ocean temperature reconstruction for the mid part of the Piacenzian Age of the Pliocene Epoch. It builds on the extensive previous work of the PRISM Group to produce, amongst other deliverables, a global dataset of Sea Surface Temperatures, and a global dataset of land-based vegetation cover. Construction of a global deep ocean dataset is therefore a logical progression for the PRISM Group in providing essential data of 'ground truth' for climate modellers running AOGCMs. There are well-tested proxies for reconstructing deep ocean temperatures in the Neogene, one being the use of Ca/Mg palaeothermometry from the carbonate carapaces of the

deep ocean benthonic ostracod Krihe. It is information from this ostracod that forms the basis of palaeotemperature data used in this paper from 27 deep ocean localities.

### General comments

**Abstract** - The abstract should clearly state exactly how many localities are being used to construct the deep ocean database. Implicit in the title of the paper is that this is a global dataset, but the opening word of the abstract, 'snapshot', suggests a smaller deep ocean dataset, and this comprises 27 localities according to Table 2 (compared with 86 localities for the PRISM SST dataset). Coverage of the Indian Ocean and parts of the Southern Ocean and Pacific Ocean is quite sparse, with a much more extensive coverage of the Atlantic. This information needs to be upfront in the manuscript so that the reader has a sense of the developing deep ocean dataset, and of those areas where more data are needed. I would suggest that the abstract quotes, at the very least, the first line of the main body of the text in section 4 thus 'Data from 27 DSDP and ODP sites, representing conditions ranging from 1000 m to 4500 m water depth, are used in our bottom water temperature analysis.'

Following on from my comments on the abstract, a general comment about the future development of the deep ocean PRISM dataset would be useful. To some readers 27 localities may not look extensive, but a micropalaeontologist will see immediately that this represents a large body of work. I think its worth emphasising this.

**Section 4, Bottom Water Estimates** – In this section some comment on the efficacy of the Krihe (ostracod) palaeothermometry technique would be useful. For example, how does it compare with reconstructions using foraminifer-derived data from the deep ocean? Is there any non-ostracod palaeothermometry data from the selected ostracod-bearing sites that could be used for comparison (or a multi-proxy study).

**Section 5.2, 3-Dimensional ocean temperature reconstruction** - This section is a key element of the paper and is of major importance to climate modellers and oceanographers. In reading it though, I think there needs to be some additional discussion on

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the efficacy of the small number of available sample localities for suggesting, for example, warmer NADW evident at sites 552, 610 and 607. This is important, because a little later in the text a ‘discrepant’ cooler water signal at one site (659) is dismissed as lacking sufficient data. How are the relative merits of the data being assessed here?

## Minor comments

Page 1904, line 2, use of the terms Piacenzian Stage and Pliocene Epoch mix the terminology of chronostratigraphy (Stage) with geochronology (Epoch). What is meant here though is time, so it should be the Piacenzian Age (not Stage) of the Pliocene Epoch (see also line 20 where the correct form is used).

Page 1908, line 21, The phrase ‘mid-Pliocene’ creeps into the text here. I would prefer mid-Piacenzian warm period, as this is used elsewhere widely in this manuscript. This mid-Piacenzian interval of warmth has nevertheless been widely referred to in the literature as the ‘mid Pliocene warm period’, but I guess this phraseology is changing as the Gelasian Stage (traditionally placed in the Pliocene) is now incorporated into the base of the Pleistocene Epoch (the base of which is taken at about 2.54 Ma). This means that Figure 1 (of page 1926) also needs slightly revising (or further explanation of the changes to the chronostratigraphy given in the figure caption), as the Pliocene now consists of just two stages, the Zanclean and Piacenzian.

Page 1922, References, line 20 is a duplication of the reference details already given in lines 18 and 19

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