

Dear Editor,

We thank Anonymous Referee #1 for investing their time in evaluating our manuscript again. We are very happy with the positive evaluation and are very happy to discuss the remaining points here and in a revised manuscript.

Review van der Weijst et al ' Pliocene evolution of the tropical Atlantic thermocline depth. This is a revised manuscript submitted to Clim. Past. Discuss in 2020 which I also reviewed. For this revised manuscript the authors carried out further planktonic foraminifera Mg/Ca measurements and also show the carbon isotopes (new Figures 3 and 4). Thermocline trends inferred from DMg/Ca, Dδ18O and Dδ13C more or less go in a similar direction between 2.8 and 3.5 Ma at Site 959, with a deepening in the later part (slight offset between oxygen isotopes and carbon and Mg/Ca).

Overall I am happy with the changes implemented by the authors and would like to see the manuscript published.

However, there are a couple of issues that I would like to authors to reflect on first:

Having studied Figure 6, I am not convinced with the following statement (Lines 22-23): 'The tropical thermocline depth evolution of the tropical Atlantic differs from the Pacific, which is characterized by gradual basin-wide shoaling across the Pliocene'. If you compare trends between the Pacific and Atlantic in Figure 6, they seem to more or less the same between ~ 4.2 and 2.8 Ma, with a shoaling between 4.2 and ~3.4 Ma, followed by a deepening until 2.8 Ma. The big contrasting thermocline changes occur earlier between ~4.2 and 5.2 Ma, where that of the Atlantic is deepening and that of the Pacific shoaling. I encourage the authors to make this clear in a further revised manuscript.

Author reply:

This is a fair point and this needs further clarification in a revised manuscript. The Atlantic-Pacific contrast that we want to point out in this paper is that of the long-term thermocline evolution throughout the Pliocene. This longer timescale is relevant in the discussion of the potential link between tropical thermocline depth and global climate trends. It must indeed be clear to the reader that the Pliocene thermocline evolution in the Atlantic was considerably different than in the Pacific, but that the trends were not consistently opposite (in anti-phase). This was already described in Lines 20-25 (e.g. "periodically divergent Pacific and Atlantic thermocline movements" in Line 25), but we will carefully reconsider passages of the MS that discuss the difference between the Atlantic and Pacific thermocline evolutions and adjust phrasing to make this point clearer.

Lines 181 to 191. I think that in this part of the discussion the authors should reference the work the work by LeGrande and Schmidt (2006, GRL), where slopes and intercepts for the various regions have been quantified. If using the basin-specific equations create any differences, please discuss this in your further revised manuscript.

Author reply:

We thank the reviewer for pointing to the paper of LeGrande and Schmidt (2006), which describes the exact same range (0.1-0.3‰/salinity unit) for the tropics as the paper of Conroy et al. (2017) that we cite in line 184, but it also includes data from the tropical Atlantic. We will therefore indeed cite this work here. In the ideal case, this paper would have provided regional slopes for the east and west tropical Atlantic but this is unfortunately not the case. The provided slope for the entire tropical Atlantic is 0.15‰/salinity unit, which falls within the range that we considered in Figure 5 (0.11-0.22‰/salinity unit), additional calculations with this slope will not change the discussion.

Please provide details about the LOESS smoothing.

Author reply:

We will specify in the MS that the data were LOESS smoothed in PAST (Hammer et al., 2001) using a span of 0.5.

Figures in general:

Consider making your figures (especially 4 to 7) more compatible for colour-blind individuals.

Author reply:

We will select more appropriate colours for the vertical bands.

Figures detailed:

Figure 4: why are the axes and labels coloured in a and b? Your colour scheme only fits with c!

Author reply:

The axes were coloured in an attempt to make it easier to compare the raw records in 4a and b to the smoothed Δx records in 4c, but it seems that this may have had the opposite effect. The axes in 4a and b will therefore be changed to black.

Figure 5: why are the axes and labels coloured in a and b? The colour scheme only fits with c. Is this figure actually needed? A lot of data is duplicated from Figure 4.

Author reply:

The axes in 5a and b will also be changed to black, consistent with Figure 4. We prefer to retain both figures to separate results (Figure 4) from discussion (Figure 5) and avoid an overwhelming figure where all records are combined.

Figure 6: Data from ODP Site 959 and 1000 have considerable gaps. Can you stipple this in the smoothed records to reflect this? Specifically at site 959 between 3.5 and 4.4 Ma there isn't that much data.

Author reply:

We will stipple the lines as suggested.