

Interactive comment on “Early Pliocene deepening of the tropical Atlantic thermocline” by Carolien Maria Hendrina van der Weijst et al.

Anonymous Referee #2

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In this manuscript van der Weijst et al. compare planktonic foraminifera stable isotope data (new and from other authors) to examine the evolution of the eastern equatorial Atlantic thermocline between ~2.8 and 5.6 million years ago. Previous work by Steph et al. (2005) showed a sudden deepening of Caribbean thermocline ~ 4.5 Ma, but this was interpreted to represent a local rather than regional phenomenon. The new record of van der Weijst et al however also shows a sudden stepwise deepening of the thermocline around the same time, suggesting that the changes apply to a much wider area. The authors discuss various processes that may have been responsible for these changes, but conclude that it is not clear what mechanism, or combination of mechanisms, was responsible for this deepening. The data are very interesting, I encourage the authors to take into account the comments below in a revised manuscript. 1. The

C1

modern thermocline depth in the eastern equatorial Atlantic is rather shallow (as illustrated in figure 2). If the thermocline depth was deeper during most of the Pliocene, when did it become shallow again? And are the implications in terms of being a potential analogue for our future climate? 2. What is known about local hydrography? Is there a possibility that the locations of river mouths has shifted over time in the area. 3. In the Caribbean Steph et al. (2007) show large $\delta^{18}\text{O}$ fluctuations in *G. sacculifer* (and on average heavier values) between 3 and 5 Ma than at Site 959. What does this relate to? Temperature or salinity? The surface record at ODP 959 seems more similar to that of ODP 925 (Ceara Rise), although at Ceara Rise there was a gradual decrease from around 4.7 to 4.4 Ma. 4. Can there be a straightforward comparison between thermocline reconstructions of the Caribbean and eastern equatorial Atlantic, given that at least today there is a salinity maximum in the Caribbean thermocline?

Methods: The authors picked *Globigerinoides ruber* to reconstruct conditions in the surface ocean, and *Neogloboquadrina dutertrei/ humerosa* to represent subsurface water conditions. What is not clear from the text is why two different cleaning methods were applied at the two labs. Where the *dutertrei* specimens contaminated with organic material?

Discussion: Page 8 first paragraph: references are missing here and in the caption of Figure 6

Small issues: Abstract: Line 19 delete ‘is’. Page 2 line 33: I am not sure what Haywood et al., n.d. stands for. Does this refer to the manuscript in review, or personal communications, either way it needs to be referenced properly?

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C2