

Interactive comment on “Lessons from a high CO₂ world: an ocean view from ~ 3 million years ago” by Erin L. McClymont et al.

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We thank the reviewer for the positive and constructive comments on the manuscript. Here we reply to the reviewers comments:

Reviewer comment 1) The references for the original data for each Site are provided on the Pliovar webpage, which is a very informative tool. However, from past experience with "local" data bases, I am wondering for how long this link will be maintained, i.e. can the authors guarantee that this link still exists in 5 or 10 years. So I would like to see a "paper" version as Table S1, especially since the age model related information is not necessarily "hidden" in the references listed in Tables S3 and S4.

REPLY: The reviewer raises a valid concern. After the submission of our data

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to PANGAEA, and whilst this review was in progress, we were subsequently required to provide full references for all data sources. As a result, the information stored on our PlioVAR webpage will also be available via PANGAEA if this manuscript is accepted for publication. Our revised PANGAEA link is: <https://doi.pangaea.de/10.1594/PANGAEA.911847> This has now been corrected in the placeholder statement in the submitted manuscript (line 482).

Reviewer comment 2) p. 5 line 152: correct site to state after saturation

REPLY: This has been corrected.

Reviewer comment 3) p. 6 line 183: I suggest to include a short comment clarifying that the pre-industrial period selected has no overlap with the Little Ice Age.

REPLY: There are several definitions in the literature for the timing of the Little Ice Age. Our selection of the years 1870-1899 CE as pre-industrial overlaps with the final decades of the most broadly defined LIA (1440-1920 CE; Owens et al., 2017), but after the time of the greatest cooling and before the onset of 20th century warming (Owens et al., 2017; PAGES2k Consortium, 2017). We have added a line to clarify this in the main text (lines 205-206).

Reviewer comment 4) p. 11 line 355: since there is evidence for the existence of Mediterranean Outflow Water (MOW) during the Pliocene along the southern Iberian margin, one should expect the Azores Current, whose existence is linked to the formation of MOW in the Gulf of Cadiz (see for example Oezgoekmen, T.M., Chassignet, E.P., Rooth, C.G.H., 2001. On the connection between the Mediterranean Outflow and the Azores Current. *Journal of Physical Oceanography* 31, 461-480), also to be present. Nowadays, the subtropical surface waters in the Gulf of Cadiz seem to be more derived from the Azores Current and its northern branches extending into the Gulf of Cadiz and towards the SW Iberian margin than the southward gyre recirculation (Portugal Current). So besides the southward recirculation you would also have the direct cross-North Atlantic basin transport between 32 and 36N and those waters

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might be warmer than the southward recirculation. Most models do not resolve the MOW, so the (heat) transport associated with the Azores Current might also not exist. I also suggest to include (Iberian margin) behind Gulf of Cadiz because not every reader will know where the Gulf of Cadiz is located.

REPLY: Thanks to the reviewer for highlighting the link between the Azores Current, Mediterranean Outflow Water, and potential influences on the sea-surface temperatures at site U1387. We agree that the position and temperature of the Azores Current could be an important contributor to differences between model outputs and data, and future work could investigate similarities and differences between models for these two systems. We have edited the text to flag the potential influence of the cross-basin transport by the Azores Current, noting also here that our original statement about the local complexity of ocean circulation in this area still stands (lines 384-386). We have clarified in the text that site U1387 is in the “Gulf of Cadiz, Iberian margin” (lines 385-385).

Reviewer comment 5) Fig. S5: mention in the figure caption what the gray envelope represents.

REPLY: This has been corrected (the gray envelope represents the range of sea-surface temperatures recorded at each latitude). This figure is S6 in the revised manuscript.

Reviewer comment 6) Fig. S2 and S3: with the start of IODP (2003-2013) program Site names include a letter to identify the platform with which they were drilled. So correctly, it should say U1313, U1337, U1387 and U1417.

REPLY: This has been corrected.

Literature cited: Owens, M.J. et al. (2017) The Maunder minimum and the Little Ice Age: an update from recent reconstructions and climate simulations. *Journal of Space Weather and Space Climate*, 7, article A33, doi: 10.1051/swsc/2017034. PAGES2k

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Consortium (2017) A global multiproxy database for temperature reconstructions of the Common Era. *Scientific Data* 4:170088 doi: 10.1038/sdata.2017.88.

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