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Interactive comment on "A global mean sea-surface temperature dataset for the Last Interglacial (129—116 kyr) and contribution of thermal expansion to sea-level change" *by* Chris S. M. Turney et al.

Anonymous Referee #1

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General comments

Turney et al. 2020 present an updated version of the Turney and Jones 2010 data compilation. As such, there is nothing too exciting about it but the inclusion of many new records, the effort to quantify ocean drift for all sites, and the resulting thermal expansion contribution to sea level are useful contributions and merit publication. There are similar data compilations (especially Hoffman et al. 2017) already to be found in the literature, with the main additional contribution of this work is the inclusion of more records and the quantification of ocean drift. Still, it is useful to see slightly different

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Discussion paper

approaches yielding generally similar results. The discussion of LIG sea surface temperatures is thus justifiably short, but the thermal expansion section could be fleshed out a bit more.

Specific comments

Turney et al. 2020 note that there are issues with previous approaches with regards to the reference period for all reported data, and they go on to express their anomalies as relative to modern instrumental observations. This seems like a reasonable thing to do, but it is difficult to estimate the effect of this change in referencing on the final data. It would be helpful and I would recommend to try to quantify the difference that arises from different referencing approaches, i.e. modern instrumental, preindustrial, or 20th century. This would allow closer comparison of this compilation to the works of Hoffman et al. 2017 and Capron et al. 2014.

As noted above, section 3.5 on thermal expansion could be substantially improved in my opinion. As already mentioned by Paolo Scussolini, the recent work of Shackleton et al. 2020 should be taken into account. Further, the methodology for computing the thermosteric contribution from sea surface data could be more detailed. It is stated that the top 700m of each grid cell is assumed to have changed according to the SST change. This seems like a fairly arbitrary depth that stems from the IPCC estimate for modern ocean warming (McKay et al. 2011). With the temperature anomaly estimates being very close to zero the volume used to calculate the thermisteric component is fairly irrelevant. Still, I would appreciate more justification or some sort of sensitivity of the final sea level numbers to the assumed ocean volume. Probably it's insignificant given the temperature dependence of the expansion coefficient, but would be interesting to see the thermosteric component if e.g. half the ocean volume warmed by the stated amount.

Finally, I have some issues with Table 1. The column headings need clarification, e.g. which latitude band does <45°S refer to? 23.5°S to 45°S, 0° to 45°S or some-

thing else? Same for <50°S. I'm not sure what the intention was with the order of the columns, but I would suggest going from the far north to the south and not switching back and forth between N and S. Furthermore, if Mean/uncorrected SST <45°S is 0.2 and Mean/uncorrected SST <50°S is 2.7, then the 45°S to 50°S latitude band must be very very warm (5+ degrees). Looking at Figure 4 or 5, this is not so. So something is off or I'm not understanding what is being shown in which case it should probably be described more clearly.

Technical corrections

Line 19: I recommend spelling out +6-11m as it is done in the main text to avoid confusion.

Line 58: Buizert et al. did not measure LIG CO2 concentrations, I would suggest removing said citation.

Line 231: Should it say Figures 4 and 5?

Line 250: delete 'enable'.

Line 292: The NEEM community paper is a pure data paper, I don't see how that reference supports the preceding sentence.

Line 297: Buizert et al. also did not measure LIG sea level, hence that citation is inappropriate.

Line 410+: The bibliography also needs a bit of work. There are lots of links to nature.com supplementary information that should be removed and inconsistent usage of DOIs, some as full links, some as the number only.

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