Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2019-249-RC3, 2020

Open Access Earth System Science Data Discussions

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.

Jeremy Hoffman (Referee)

jhoffman@smv.org

Received and published: 7 May 2020

Turney et al. have compiled the most comprehensive data base of sea-surface temperatures spanning the last interglaciation (LIG) to date. Their results support the conclusions of several recent studies in important ways, even given their (novel) attention to potentially confounding effects present within SST reconstructions from planktonic sources (their "ocean drift") that were largely unaddressed in previous LIG work.

Understandably there has been considerable attention to the LIG as it can serve to

Printer-friendly version

Discussion paper

assess the sensitivity of important Earth systems (such as the cryosphere, which was considerably smaller than at present due to higher insolation and warmer global temperatures) to natural climate fluctuation in recent Earth history, potentially illuminating mechanisms currently unaccounted for or underestimated in present-day climate models.

Having a “living repository” of LIG datasets from the marine realm will do well to improve future (and ongoing) LIG model-data comparisons, as is highlighted by the authors. The accompanying article is appropriate to support the publication of this dataset. The dataset is highly useful, unique in its comprehensive nature, and functionally complete. This dataset is of extremely high quality.

However, Turney et al. add only marginally to the existing story about total LIG warming amplitude relative to recent climatology (their uncertainties on a global anomaly overlap with basically all previous work!) and, by their chosen study design, can’t add anything to the discussions ongoing about rates, extents, and locations of warming or sea-level change at particular times within the LIG. These stories have recently been borne a bit more out of work in modeling (Clark et al., 2020, Nature - referenced below) and a new ice-core based SST reconstruction (Shackleton et al., 2020, Nature Geoscience).

I am curious how the authors can work on an update to the manuscript that incorporates more discussion of the understanding of intra-LIG variability in sea level, temperature, and other variables, and as such, work to clearly justify just why the multi-millennial, LIG-long averages that they have generated help us to better understand those variables or model outputs. Are there modeling studies planned (lig127k PMIP?) that they can point to that would be targets for comparison with their new reconstruction? If the main SST magnitude conclusions aren’t different from previous work, and the work can’t resolve anything particularly new within the LIG time period, maybe the effort of the paper should simply focus on updating the maximum possible thermosteric component of LIG sea level and make that the centerpiece of the analysis?

Specific comments -

Lines 188-197 – Are the ocean drift correction calculations estimated using the HadISST data used to calculate the anomalies from climatology as well? How are these “life trajectory” SST averages (which presumably have some sort of standard deviation or variance across space/time) then incorporated into the SST reconstruction uncertainty? Addressing this additional source of uncertainty in the SST estimates may further complicate the story that arises from the drift-corrected SSTs, but perhaps maybe only subtly. This might be worthwhile discussing or exploring in a couple of particular locations, especially those where the signals due to drift correction are large. I would suspect that as these areas have large SST gradients themselves that estimating an "average" SST across their lifetime/drift might generate some additional uncertainty in the estimated anomaly.

Lines 63-68 – please add Clark, P.U., He, F., Golledge, N.R. et al. Oceanic forcing of penultimate deglacial and last interglacial sea-level rise. Nature 577, 660–664 (2020). https://doi.org/10.1038/s41586-020-1931-7 to references about ice sheet modeling during this time period, as well as amounts from particular reservoirs/sources of sea-level rise. Given these recent estimates of intra-LIG sea-level change (citations within), what does this "maximum" LIG thermosteric component tell us?

Discussion of the LIG-long averages and addressing the small specific considerations would, in my mind, improve the clarity of this largely incremental - however important! - addition to the body of LIG SST knowledge. I thank the authors for the opportunity to comment and look forward to reading an updated draft of the manuscript.

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2019-249, 2020.