<u>Response to comments from reviewers</u>

Key
 – Reviewers' comments
 – Authors' response

Referee #2

This manuscript presents an ambitious and valuable update to the venerable LR04 stack by compiling a much larger dataset and introducing new regional (Atlantic and Pacific) stacks. The study's goals are highly relevant for Quaternary paleoclimate and stratigraphy. The paper is generally well written and organized, and the figures are informative. In its current form, however, several aspects need clarification or further development to maximize the manuscript's clarity, transparency, and utility. In particular, the methods and rationale for certain chronological choices should be explained in more detail, comparisons to previous work should be expanded, and some figures and data descriptions require improvements for clarity. I recommend major revisions to address the issues raised above before the manuscript is accepted for publication in EGUsphere/Geochronology.

Comments:

1. The manuscript would benefit from a clearer description of the cores and data that went into each stack. Currently, information on the 224 cores (sources, locations, water depths, new vs. previously published records, resolution, etc.) is scattered or only in the supplement. I recommend adding a summary table or a dedicated subsection in Methods describing the core selection criteria and dataset characteristics.

Response #15 – We agree with the reviewer. This is also brought up by Reviewer 1. See Response #2 for how we plan to better describe the cores in our compilation.

2. Given the prominence of LR04 and ProbStack, the manuscript should more fully compare the new stacks to these earlier benchmarks. The text does note that the new global stack includes ~50% more data than ProbStack, but there is little quantitative or visual comparison in the paper. I recommend adding some discussion (and possibly a figure or table) comparing the new global stack in terms of mean trends, variability, and age offsets.

Response #16 – We agree with the reviewer. We plan to add a figure comparing the new stacks to LR04 and ProbStack. See Response #4 for more details.

3. Can anything be done to retain more signal variance? While a smooth stack yields a high signal-to-noise ratio for orbital-scale trends, the manuscript should caution that some climatic signals (e.g. abrupt events, smaller excursions) might be blunted. I encourage the authors to

highlight this limitation so that users of BIGSTACK understand the potential need to cross-check against individual records for fine-scale events.

Response #17 – We agree that the smoothing of the BIGSTACKs is a limitation that should be better communicated to the readers. We will explain in the revised manuscript why the stacks are so smooth (due to BIGMACS's use of Gaussian Process Regression), and discuss the implications of this smoothing for their scientific applications. See Response #4 for more details.

4. Figs. 5–7: Please add clear labels or legends identifying each colored curve.

Response #18 – Will do.