Clim. Past Discuss.,
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Climate of the Past Discussions

Interactive comment on "Plateaus and jumps in the atmospheric radiocarbon record – Potential origin and value as global age markers for glacial-to-deglacial paleoceanography, a synthesis" *by* M. Sarnthein et al.

Anonymous Referee #1

Received and published: 24 January 2020

Sarnthein et al. present a revision to the plateau tuning method of deep ocean radiocarbon reservoir age estimation that re-evaluates the age model of the reference Suigetsu 14C record. In addition, the authors present a synthesis of the published research utilizing the plateau tuning method. Because this paper is both a synthesis paper and a presentation of new research, I found it a bit difficult to review. The authors have gone to great lengths to try to organize the paper in a way that helps to wrangle the many topics presented, but I think this paper would benefit from being split into two papers. The first of which could focus on the switch to the U/Th timescale and

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Discussion paper

the methods and implications that go along with this and the second paper could be a true synthesis paper that summarizes the state of plateau tuning along with its pros and cons. Perhaps these papers could even be presented as companion papers and released as a part 1 and part 2.

Overall, the paper could be simplified to enhance accessibility by deleting some of the unnecessary words (hence, thus, moreover etc.). The authors do a great job of laying out the state of the field and the problems in methodology that exist among current techniques of age model development and the ways plateau tuning can provide a solution to some of these problems. The introduction does a nice job explaining oceanic radiocarbon and the crux of the reservoir age issue. I think it is very important that they have used the introduction to address some of the criticism that has been raised with the plateau tuning method. However, I think this is an area that could be expanded a bit more to address a few more points such as other explanations for marine 14C plateaus, including local shifts in air-sea gas exchange or upwelling, and if so, how can we account for these.

The shift to the U/Th modeled Suigetsu chronology helps address some of the problems associated with the Suigetsu varve counted age model, but it would be helpful to address why using the Suigetsu record for plateau tuning is preferred to Intcal. It seems that correlation directly to Intcal may be more conservative.

If the paper is split into two separate papers, figures S2 and S3 should be included in the main text of the synthesis paper. I found these figures particularly helpful for visualizing the geographic spacing of Plateau tuned records and their findings. More detail included for sections 3.2-3.3 would also be welcome along with a picture/diagram of the Zoophycus burrow.

Specific notes: Figure 1: It isn't clear in the figure caption what the difference is between the top and bottom panels.

Figure 7: Please include the references for the records used in this figure. It would also

be helpful if I could match the data points in the x-y plot to the data points on the map, perhaps using symbols or colors? Also, I'm not sure inclusion of the surface currents in panel b or in figure S3 are helpful, they make it a bit more difficult to see where the cores are located and to read the reservoir age differences- especially because the currents are available in figure S2.

Lines 601-603: Include the unit the corresponds to the foraminifera habitat depths.

Section 3.4, Lines 656-663: Might be good to mention the interspecies 14C differences from Lindsay et al., 2015

Sections 3.5.1 and 3.5.2: In a few spots it would be helpful if the results from plateau tuning studies were more clearly emphasized. This would nicely highlight the important role that this technique has played in our understanding of LGM and HS1 MOC. This is done very nicely in section 3.5.3.

Figure 9: This figure is a bit small and hard to see. The overlapping arrows can also be a bit confusing. Overall, I find that this figure is critical for visualizing the findings from sections 3.51-3.5.2, it might be helpful to also include the modern MOC for comparison.

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