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Climate of the Past Discussions

Interactive comment on "Deglacial carbon cycle changes observed in a compilation of 117 benthic δ^{13}C time series (20–6 ka)" *by* Carlye Peterson and Lorraine Lisiecki

Anonymous Referee #1

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The authors have compiled 117 time series of benthic d13C from the world ocean to investigate the deglacial evolution of mean ocean changes in d13C and changes in vertical d13C gradients. The paper provides very interesting insights into the vertical and global deglacial evolution of deep-water d13C. Particularly, for the first time, volume of ocean basins has been taken into account to estimate mean ocean d13C and the mean of specific basins and depth levels. These data products can provide important constraints for model evaluation. The findings are generally convincing, but I have some technical comments regarding the documentation of the methods/data and the correctness of the data/meta data (see points 7/8) in the supplementary files:

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Discussion paper

1) Age modelling strategy. It is not entirely clear to me, how age models have been created for the individual cores. It seems though, that the age models are all based on a graphic correlation or automated alignment (?) to the stacks provided by Stern and Lisiecki (2014). If so, it is not clear to me why the authors deliberately used a graphic correlation stratigraphy with an error of 1-2 ka, when radiocarbon dates are available, at least for some of the cores. Radiocarbon ages should provide better constraints on the posterior calendar age distributions. It seems that, at least in the tropics, the uncertainties in the reservoir ages are small enough to provide better constraints on age than ages derived from alignment of benthic oxygen isotopes. I recommend that the authors better explain, how they have obtained the age models why they have not (if not) used the individual calendar age distributions of radiocarbon ages that may exist.

2) A few more details should be added to the description of the MC/bootstrapping methods employed to estimate uncertainty. It is not clear, whether age uncertainty has also been considered when producing the stacks (i.e. through time series ensembles), and (if so) what assumption has been made regarding the distribution of age uncertainty (i.e. normally or uniformly distributed). The authors might argue that the age uncertainty is already included through the averaging of several time-uncertain time series to produce the stacks, but on the other hand the number of time series is small for some of the stacks and perhaps not representative for the error.

3) Variations in sea level affect the water depth of the core location by more than 100 m over the considered time period. If core locations are close to the boundary between the intermediate box and the deep box, a core might fall into the shallow box during the LGM and into the deep box at 6 ka. The authors should clearly describe whether water depth always refers to the modern water depth. This is particularly important for figure 2, where apparently LGM and 6 ka symbols have been plotted at the same water depth. Sea level changes should also be taken into account in the animation provided in the supplement.

4) I feel that the data base is not sufficiently documented. Would it be possible to

recreate the stacks just based on the information in the paper? Particularly, I miss information on how the data have been aligned to the stacks. Has this just been done by graphic correlation or has some automatic alignment been involved? If the age models are based on an automatic alignment the methods should be clearly stated. If it is just based on individual age markers and interpolation, these markers should also be included into the data set in the supplement.

5) It should be clearly indicated in the supplement, whether the data are given in "real" depth or in composite depth (e.g. cores GeoB1041-GeoB1214 are probably given in composite depth). While this has very little consequences for the results and implications of this paper, it might cause confusion if other people are using the data later and i.e. use age models/radiocarbon data or other data from the same cores in real depth together with data in composite depth from this study. Also note that these srecords are in many cases actually composed of two cores, a box- or muticore and a gravity core with individual water depths and positions.

6) I also recommend to document not only the references in table A1, but also the actual source (i.e. PANGAEA, NOAA, personal communication) of the data, if possible with doi. This allows to resolve possible inconsistencies later (see 7/8).

7) Is it possible that some of the sites are not labeled correctly in the data files (perhaps I am just reading it wrong)? For example, in the file "DSA_sites.xls", core GeoB1118 (column J) has some Holocene d13C values close to 1 o/oo. I cannot find these values in the data file on Pangaea (https://doi.pangaea.de/10.1594/PANGAEA.103632?format=html#download) or in the original thesis by Bickert (1992, page 187-190) (available under http://elib.suub.uni-bremen.de/ip/docs/00010668.pdf).

8) Also, latitude, longitude and water depth are apparently wrong for some core locations in the corresponding "DSA_xyz.csv" file. For example:

In file DSA_xyz.xls:

GeoB1118: Lat:-3.82, Long:-14.9, WD: 3984 m

In PANGAEA:

GeoB1118-2: Lat: -3.56, Long: -16.431660, WD: -4675.0 m GeoB1118-3: Lat: -3.56, Long: -16.428333, WD: -4671.0 m

Pangaea is correct, I checked with the original cruise report. I have not checked other files, but in DSA_xyz.xls other positions are also wrong (i.e. GeoB1211). Perhaps this is just an unfortunate accidental cell shift, but I suggest to check all data files again, to strictly label all columns of the data files to avoid confusion and to ensure that the analysis of the data has not been affected by the errors in the data.

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