

## ***Interactive comment on “An Internally Consistent Dataset of $\delta^{13}\text{C}$ -DIC in the North Atlantic Ocean – NAC13v1” by Meike Becker et al.***

**A. Olsen (Referee)**

are.olsen@gfi.uib.no

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Review of "An Internally Consistent Dataset of  $\delta^{13}\text{C}$  in the North Atlantic Ocean" by Becker et al.

This dataset is an important asset to ocean biogeochemistry, hopefully it may also inspire to global efforts. I have no problem recommending this for publication provided the following is dealt with.

Major issues

The consistency analysis relies on the use of crossovers and inversion. As Becker et al. states in the discussion paper, this is not always easy to do for  $^{13}\text{C}$  because of the limited spatial data coverage, and they had to increase the maximum crossover

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distance to 3 degrees, compared to the 2 degrees, which is commonly used for DIC, alkalinity and nutrients, for instance. However, there certainly exists alternatives, several authors, including papers cited by Becker et al., have used Multilinear Regressions (MLR) to determine the ocean Suess effect. Such MLRs can also be used to evaluate data consistency, for example by developing MLRs using data from deeper than 1500 m. This is relatively easy to do, for example by developing an MLR based on the 33MW1993 core dataset, or based on all data in the set, and finding the biases when the MLR is used to determine  $^{13}\text{C}$  from each individual cruise. If the biases are of the same direction and magnitude as those determined with the crossover and inversion this would certainly add confidence to the adjustments. If satisfactory MLRs cannot be determined using data from >1500 m, I am certain that an MLR derived from data from the full water column would also reveal biases, when applied on data from deeper than 1500 m only.

This dataset is not very large, consisting of data from 29 cruises. A table listing all cruises, dates, PIs, and peer-reviewed citations for each would certainly be worthwhile and possible to include.

According to Table 1, some of the new data were analysed up to 8 years after the samples were collected, and some data sets were analysed over a period of approximately 2 years. There is a potential effect of storage on  $\delta^{13}\text{C}$  samples, so it would very useful with some analyses of the effect of storage time on dataset accuracy, did you find any correlation between bias and time between collection and analysis in these data, or with scatter?

The collection miss the data from the Nordic Seas cruise 58GS20030922 (used in Olsen et al., 2006), these are available through CDIAC, for instance through GLO-DAPv2 cruise summary table, please include, these are probably the most extensive Nordic Seas  $^{13}\text{C}$  data available.

Issues with datafile

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The data that were deemed bad are still available in the data file, but flagged 9. I suggest to remove them, this was done both in CARINA and GLODAPv2, and it is better to be on the safe side; flags are frequently ignored. Make sure the original data are available in the cruise data files at CDIAC.

In the datafile the "nosamp" and "cast" columns are empty. There is no point of including "nosamp" if there are no values. The "cast" column can be critical to any merging efforts, please make sure these numbers are included.

The "maxsampdepth" is largely empty, this is trivial to fill, please do so.

Cruise 13, station 83, maxdepth is -82, this cannot be right, please correct.

Minor issues

Table 3, Fig 4 & 5 has units after a backslash "/", please use parenthesis.

line 6, "making basin wide estimates".. of what, please specify

line 6, please include an "and" before "studying"

line 14, please delete "absolute", or revise, "absolute" can be understood in terms of by absolute magnitude (i.e. neglecting any negative sign)

line 15, Captial "T" in "the"

lines 24-30. I like this list of uses of 13C data. However, the abstract gives more, for instance 'help to describe the exchange between the ocean and the atmosphere', these should be mentioned in the main text as well, with citations to examples of these applications (I am curious about this example, and other readers may be so as well).

line 28, Olsen et al., 2010 did not use  $\delta^{13}\text{C}$  data, but please feel free to include a citation to Olsen and Ninnemann, 2010 instead.

line 30-33, please include specific example for this application (citation is sufficient).

line 37, 'for basin-wide carbon flux estimates', please be more specific, what is meant,

air-sea fluxes? can this be done?

line 55, delete "the"

Fig 1., the data points are hard to see, please remove bathymetry.

line 60, please insert an "and" between "crossover" and "inversion"

line 64, well, I am sure that the dataset is also important for studying isotope dynamics below 1500 m, for example spatial variations should be present.

line 66, replace "were" with "we". Please also specify "long", how many years?

line 79-80. I do not understand this, what other extensively quality controlled C-13 data sets are there to ensure consistency with?

line 89, please replace "was" with "were"

line 92, please replace "which" with "that"

line 103, please include citations to GLODAPv2 (Olsen et al., 2016) and CARINA (Key et al., 2010)

line 104, please insert commas after "cruises" and "74DI20120731"

line 104, Carina in caps.

line 114, please specify which profiles were compared, 13C vs 13C or 13C vs other parameters? Please provide one or two examples of profiles with outliers. It would certainly be useful to include property-property figures in the primary QC step, for example AOU vs 13C.

line 116, Tanhua et al describes several types of crossover analyses, please specify which was used, e.g. 'running crossover'.

line 133, you may want to add that 120 nm was the commonly used distance in CARINA; PACIFICA, and GLODAPv2 so readers understand where this number comes

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from.

line 136, the standard deviation .. of what, please specify.

Fig 3, please specify what the various vertical lines indicate, in the caption.

line 169. I do not completely understand, according to Table 4 in the supplement the crossover difference between the 06MT19941012 and the 33MW1993 cruise is not significant, still 0.07 is -indirectly-stated in the text. Please also clarify what it takes for a crossover to be significant.

line 193, "data" are plural, hence write "these data are" not "this data is", check all places where "data" is mentioned.

line 202, should be "these cruises, which", not "these cruises, that", please consult rules for which vs. that and also comma use ("which" should be preceded with comma, "that" shouldn't)

line 215, again, which vs. that.

lines 219-224. This passage is a bit confusing, please clarify. As I understand it, the 2002 Thalassa cruise data were not adjusted, but it had crossovers, why doesn't these data show up in Fig. 5?

line 227, this is not correct; the 58GS2003 cruise can be used and is available at CDIAC.

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