

Interactive comment on “Measurements of the stable carbon isotope composition of dissolved inorganic carbon in the Northeastern Atlantic and Nordic Seas during summer 2012” by M. P. Humphreys et al.

M. P. Humphreys et al.

m.p.humphreys@soton.ac.uk

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We thank the reviewer for their insightful comments, which have improved the manuscript. Our responses to specific points are provided below. We hope that we have sufficiently addressed all of the issues that were raised.

“Page 59, line 18 - Does this statement represent a slight over-simplification? E.g if one knows the ^{13}C to ^{12}C ratios AND one makes some assumptions about advective mixing, one can estimate last exposure to the surface? E.g. in Olsen et al. they could

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distinguish Arctic sources from North Atlantic sources but had to invoke advective inputs to account for actual ^{13}C values?” - We agree, and have re-worded this statement to include a caveat about advection and prevent over-simplification.

“Page 60, line 9 – The underway samples do not have an assigned sample depth at least in the xlsx file. Specify sample depth of the inlet location?” - We have added the nominal sample depth (5 m) for the underway supply to this section. We will investigate getting this added to the data held by BODC. We have submitted these data to CDIAC as well now, and have included an underway depth of 5 m in that version.

“Page 61, line 5 – Having handled a lot of sample bottles I think I understand what they intend here, but I doubt that I could have introduced precisely 1 ml of headspace? Explain this a bit more - how and why?” - The air headspace was introduced by removing 1 ml of seawater from the full sample bottles by pipette. We have re-worded this sentence to make this clearer. The 1 % by volume headspace is recommended best practice for DIC measurements (Dickson et al., 2007), and we have added a brief explanation of this.

“Page 63, line 10 – Do the MatLab libraries represent a useful resource here?” - The MATLAB scripts are specific to the output from the Thermo Scientific Delta V mass spectrometer and contain some components that are specific to these cruises. We do plan to adjust them to make them more generically applicable and then make them publicly available.

“Page 66, line 13 – I find table 3 and the logic behind it very useful. But the language here seems a little confusing: “a further significant reduction to the maximum SD”. ‘Significant’ in this sentence has a qualitative connotation compared to the very careful quantitative use elsewhere?” - We have re-worded this to prevent the conflicting usage of ‘significant’.

“Page 67, line 13 – this statement about .080 permille applies only to the JR271 cruise, e.g. in Table 4, but not to ‘both’? But the T-test described later in this paragraph, to

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evaluate differences due to container types, applies only to the D379 data, again from Table 4?. We need some clarity here?” - We have re-worded this section to clarify these points. As you note, we had also mistakenly quoted the wrong numbers from the table in some cases; these errors have been fixed.

“Page 67, line 25 (final paragraph) - not sure what these authors want readers to conclude from this paragraph? Among the best measurements? Better than most? Not much worse than others given large variation in sample handling and measurement techniques? If they have, as apparently they do, very good data, both absolutely and relative to prior measurements, they could say so?” - We believe that the quality of these measurements is comparable to other similar studies. We have added a concluding statement to confirm that our precision is good, falling within the range of previously-published results.

“Figure 1 – Use some color? The gray shades do not provide enough contrast to my eye” - We have added colour and changed the symbols on the map for clarity. We have also added nearby data from the Schmittner et al. (2013) compilation.

“Figure 3 – Some confusion here. The bold black line indicates the mean ‘gradient’. The thin solid lines then represent the replicate calibration standards which contribute to the mean? And the dashed lines represent data excluded, by criteria described on page 64?” - Your interpretation is correct, but we have re-worded the caption to hopefully make this clearer.

References

Dickson, A. G., Sabine, C. L. and Christian, J. R.: Guide to best practices for ocean CO₂ measurements, PICES Special Publication 3., 2007.

Schmittner, A., Gruber, N., Mix, A. C., Key, R. M., Tagliabue, A. and Westberry, T. K.: Biology and air–sea gas exchange controls on the distribution of carbon isotope ratios ($\delta^{13}\text{C}$) in the ocean, *Biogeosciences*, 10(9), 5793–5816, doi:10.5194/bg-10-5793-

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2013, 2013.

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