

Interactive comment on “Changes in column inventories of carbon and oxygen in the Atlantic Ocean” by T. Tanhua and R. F. Keeling

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We thank the reviewer for the positive review and the useful comments on the manuscript. The main concern of Reviewer #1 is the low C/O₂ ratio for remineralization of organic matter that we used. Thanks to this comment, we realize that we did a mistake in the manuscript; for the calculations we actually used the ratio of 0.69 for the C/O₂ ratio, which is the ratio from (Anderson and Sarmiento, 1994). It is also the ratio that is used for several of the applications of back-calculating techniques to calculate anthropogenic CO₂, for instance the ΔC^* technique (Gruber et al., 1996). We however realize that the uncertainty in the C/O₂ ratio can be significant.

We therefore added a short paragraph at the end of section 2.1: "In a study where the contribution of anthropogenic carbon was considered, Körtzinger et al. (2001) found a
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slightly higher ratio (0.75). This is similar to the factor “a” in the TrOCA method (0.78) found by Touratier et al. (2007) that also considers mineralization of organic matter in the alkalinity budget. The uncertainty in the C/O₂ ratio introduces uncertainty in the calculation of $\Delta \text{DIC}_{\text{abio}}$, particularly for areas that where we find large storage rates of AOU, see section 3.1."

We also point out (at the end of section 3.1) that “The difference between storage rates of DIC and DIC_{abio} in this region would be even large if we adopt the higher C/O₂ ratio of Körtzinger et al. (2001), i.e. the DIC_{abio} storage rate for region A would be $-0.20 \text{ mol m}^{-2} \text{ y}^{-1}$ rather than $-0.14 \text{ mol m}^{-2} \text{ y}^{-1}$ ”. The uncertainty in C/O₂ ratio is obviously particularly important for Regions A and B where we see large changes in AOU.

We made all the editorial changes the review suggested, although we don't completely agree with the statement that “Figures 3, 4, 8, and 9 are redundant”. It is true that information is contained in Table 1 and Figures 5 and 10, but we feel that the maps and the histograms are useful to the reader to understand spatial variability and distribution of the storage rates. One could also argue about which figures would be redundant (if any); i.e. it might be more useful to keep the figures of DIC and oxygen (i.e. Figures 1, 3, 6, and 8). rather than the figures on DIC and DIC_{abio} , as the reviewer suggest.

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