

Interactive comment on “Anthropogenic carbon distributions in the Atlantic Ocean: data-based estimates from the Arctic to the Antarctic” by M. Vázquez-Rodríguez et al.

Anonymous Referee #2

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The manuscript of Vazquez-Rodriguez et al. compares different methods to reconstruct excess, anthropogenic carbon (Canth) using data from the Atlantic Ocean. The manuscript is timely as several different methods to reconstruct Canth have been published and these methods are increasingly applied. It is important to compare the different methods using the same input data to assess the uncertainties in the reconstruction of Canth in a systematic way.

I recommend the publication of the manuscript after the following comments have been taken into account.

A) In general, I believe that more details and figures are needed to provide a compre-

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hensive overview of the agreement/disagreement among reconstructions.

1) I miss a formal statistical comparison among the different Canth data. In the climate and biogeochemical modeling community Taylor diagrams are frequently used to assess the agreement between two different data sets, e.g. observation versus model results. I suggest that the data sets are compared using statistics. 2) The discussion on vertical and horizontal gradients and how they differ should be improved. This is of relevance for both ocean inversion studies and for ocean model validation. One possibility may be to show averaged vertical profiles for different regions, e.g. those used in recent ocean inversion studies, and the top ~1500 m. Another way to highlight agreement and disagreement among the reconstructions might be to present the difference in the distribution between an individual reconstruction and the average of all reconstructions in a figure similar to figure 1. 3) How do the surface values of Canth compare among reconstructions? It is suggested to complement figure 3 by an additional panel showing the Canth concentration for the surface ocean together with the Canth concentration in equilibrium with the atmospheric CO₂ concentration.

B) The role of seasonal and interannual variability in Canth reconstructions is not discussed. Perhaps a few words could be given on the uncertainty introduced by variability.

C) Further comments 1) line 12 to 23 on page 1426 belong to the method section and should be moved. 2) line 15, p 1426: provide equation to describe how the temporal adjustment has been done

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