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Biogeosciences Discussions

Interactive comment on "An upgraded carbon-based method to estimate the anthropogenic fraction of dissolved CO_2 in the Atlantic Ocean" *by* M. Vázquez-Rodríguez et al.

Anonymous Referee #1

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Since I have not done the actual computations of anthropogenic CO2 inventory in the water column using the "back-calculation" techniques, I found this to be a real interesting article with good review of what have been done in the past and what are the problems that cause the uncertainties in the estimates of anthropogenic CO2 content. I think it is a good idea to get better estimates of preformed properties from data obtained below the surface mixed layer for the improvement of anthropogenic CO2 estimates. The choice of the subsurface depth should vary as a function of ocean basins and latitudinal zones because of various mixed layer depth and the mechanism of deep water mass formation. Is 100-200m depth used in this article for the whole east basin of Atlantic? There are a lot of detailed efforts in dealing with problematic Cdis term in

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the “back-calculation” method (more appropriate reviewers should be people who have done the actual calculations, such as Sabine, Gruber, Lee and Matsumoto etc.) I was expecting that the uncertainty would be cut way down after this new method is applied. However, I got the impression that the Cant uncertainty using this improved method is near 5 umol/kg on average, which is also the general uncertainty from previous computing methods. For example, Lee et al. (2003) had 6 umol/kg, which is almost the same. In the end, the comparison of results from this improved method with those from previous computations, as shown in Fig. 6, indicates that they are all very similar except in the Nordic Seas and the Southern Ocean. In the northern hemisphere, the Cant inventory began to drop off north about 50N. All three estimates have a similar trend, except this method maintains high value further north. In the Southern Ocean, it really makes a big difference south of about 50S. This feature is a direct result from the new treatment of Cdis in this study. I am not sure if previous C* results were derived from I06 cruise data which are used for this study. Does the availability of new data have anything to do with the difference shown in Fig. 6. If not, this improved C* method could provide fresh information for other sections of Southern Ocean regarding its capacity to store more anthropogenic CO2. I also noticed that the discussion of this article is only limited to Eastern Basin of the Atlantic Ocean. Since the ocean dynamics in Western Basin is very different from the Eastern Basin, it would be very interesting for these authors to make the same calculations in the Western Basin for comparison with the previous results. Although the ratio of Cant inventory between east and west is used to estimate the Atlantic total inventory, it would be much more convincing if the actual calculated results from the western basin are used. The other question is about the applicability of this improved method beyond Atlantic Ocean. Can it be used for the Pacific and Indian oceans? The future further improvements as listed in the conclusion are great, but it would be more desirable to test the current method outside of Atlantic Ocean.

Interactive comment on Biogeosciences Discuss., 6, 4527, 2009.