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Biogeosciences Discussions

Interactive comment on "Satellite observations reveal high variability and a decreasing trend in CO_2 fluxes on the Scotian Shelf" *by* E. H. Shadwick et al.

Anonymous Referee #3

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Preamble:

This review is special: it is the first time I'm sending my review to Biogeosciences (with delay, sorry for this), after reading the manuscript and two reviews (Rev1 and Rev2) previously posted. I have to specify that I've not been influenced by Rev1 and 2. I agree with most of their comments and would have asked almost the same questions; therefore, I am only addressing few questions not commented by Rev1 and 2.

General Comment:

Authors use in-situ data (pCO2, fluo, SST, etc...) collected over more than one year and satellite data (Chla etc...) over 10 years to extrapolate in space and time pCO2

and evalute the interannual variability of the air-sea CO2 fluxes in the Scotian shelf. Such approach is not new, but it is the first time it is applied in this region. This is a nice try to extrapolate annual observations in space (7 boxes) and time (10 years) but authors should justify more clearly both the space and temporal extrapolations. The validation of the "model", expressed by Equation (1), is not really discussed; neither the sensitivity analysis depending on the error in model parameters and/or forcing fields. In this context, I strongly suggest to explore historical datasets that could be used to evaluate the extrapolation back to 1999 in order to better discuss the decadal pCO2 trends. Based on the model results, authors also derive interesting conclusions (link with NAO, pCO2 trends...) but, as also identified by other reviewers, more analysis and discussions are needed on these topics. At that stage, I do not recommend publication of this manuscript.

Specific comments:

C1: Title: Should be changed; the variability of air-sea CO2 fuxes is not revealed by satellite observations but by the method used in the analysis. The same applies for the "Decreasing trend in CO2 fluxes" in the title.

C2: Page 5270, line 24. delete reference Boutin and Merlivat 2009: as opposed to Takahashi et al (e.g. CDIAC) or Watson et al., the data published in Boutin and Merlivat are not available.

C3: Page 5271, line 5: As opposed to all other references, Etcheto et al did not investigate the north atlantic. Suggestion here, add reference to Ullman et al 2009 (see below).

C4: In historical data (e.g. 2003, 2006 2007), several cruises show pCO2 well below 300 μatm in this region whereas the extrapolation presented in this analysis leads to spring values much higher. Would it be possible that the data (Carioca) used to evaluate the model (Eq 1) were conducted during an anomalous year, implying high pCO2 values extrapolated in spring during the decade 1999-2008. This is an important point

that should be discussed regarding all other results, processes analysis, variability of the fluxes (Figure 3c), reconstruction of pCO2 in different locations (figure 4) and pCO2 trends (Figure 10).

C5: As usual, in such a publication that present new observations (depending the status of the paper in revision to Mar Chem), it is recommended to specify where the data are available (CDIAC ?, other Data center ?)

C6: Table 2: specify unit of parameters

C7: Table 3: check spelling, ... containg, moorning, gassing, gird....

C8: Table3: fluxes are presented in molC/m2/yr; is it usefull to specify the area of box 1 and Scotian shelf region ?

C9: Figure 1: adding tracks of the cruises used to validate the extrapolation ?

C10: Figure 6: legend: specify the region investigated in this plot.

C11: Figure 10: legend: specify the region investigated in this plot

C12: Figure 10: legend: specify the year used as a reference to evaluate anomalies.

References in this review. Ullman, D., G.A. McKinley, V. Bennington and S. Dutkiewicz, 2009. Trends in the North Atlantic carbon sink: 1992-2006. Global Biogeochem. Cycles, 23, GB4011, doi:10.1029/2008GB003383

Interactive comment on Biogeosciences Discuss., 7, 5269, 2010.