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Biogeosciences Discussions

Interactive comment on "The carbon budget of the Baltic Sea" *by* K. Kuliński and J. Pempkowiak

Anonymous Referee #2

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The paper reports an improved and refined carbon budget for the Baltic Sea, a semi enclosed sea in NW Europe. Understanding and budgeting carbon fluxes in semi-enclosed system is crucial for our understanding of the overall global carbon budget, because semi-enclosed seas are located at the interface between the different compartments of the global carbon cycle, and thus play a key role in (re-)distributing carbon on Earth. The work by Kulinski and Pempkowiak substantially moves beyond earlier studies, by providing a much more detailed and comprehensive picture. To some degree unfortunately, the wealth of information is hardly shown. Thus, my general statement would be that, this paper is very concise and acceptable after a minor revision. Still, I think that there is much more valuable information to show and discuss (which has been used anyway). From this discussion many interesting aspects will most likely arise, as I have tried to indicate at least some aspects below in my more detailed remarks. For example:

-Please address and show (!) seasonal variability of the fluxes, if known/computed.

-If evident, is the seasonality the same for all rivers or would there be differences (Scandinavian, vs. continental European rivers)?

-Is there any consideration or information about alkalinity? Eventually, a parallel alkalinity budget, or an least some considerations about it could be used to constrain the closing term (CO2 air-sea flux).

-Please add a summary or conclusions.

Some detailed comments:

Page 4843, line 8-15. please rephrase (expand?) this section. For an introduction section, as it is here it is too short, and does assume too many prerequisites on the readers side.

Page 4844, line 8: Wesslander et al. (2010) do not report pCO2 measurements. They report computed values. Please see also below comment for the discussion.

Page 4846, 2.2: please mentioned first a brief overview over the fluxes considered for the budget

page 4846, line 11: please replace worse: finer? More/less coarse?

4847: Did the authors make assumptions about riverine input of particulate matter? Please discus this point here, if ignored or considered.

Page 4850 equation 15: This does not appear to be the standard way to compute error propagation? Usually, it would be the square root of the sum of the squared errors?

Page 4854, line 3 ...inconstancy...: This statement is not clear to me. How can one derive such information from a 1-box carbon budget?

Page 4854, line 13: I suggest to tone down the discussion/comparison with the Wesslander et al. (2010) study. When going back to Wesslander et al. (2010), they report

an uncertainty for alkalinity of 5%, even there optimistic estimate of 2.5 % would yield an error in computed pCO2 on the order of a few hundred ppm, or 0.2 pH units (not considering the associated error in pH). In any case the pCO2 error is far larger than their assumed delta pCO2 signal, which defines the direction of the flux!! I leave it up to the authors to what degree this issue is addressed, but I think it needs to be addressed here.

Page 4855, line 11: It is unlikely...: This sentence is not clear to me. Please clarify.

Page 4855, line 27: . . . by the increased carbon....

Figure 1 also should reveal the magnitude/values of the fluxes

Again, please add figures showing temporal variability of the fluxes.

Interactive comment on Biogeosciences Discuss., 8, 4841, 2011.