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Biogeosciences Discussions

Interactive comment on "Seasonal variability of the inorganic carbon system in a large coastal plain estuary" *by* Andrew Joesoef et al.

Anonymous Referee #1

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GENERAL COMMENTS

The authors report a high-quality data-set of total alkalinity (TA) and dissolved inorganic carbon (DIC) in the Delaware estuary. The paper is well written and was prepared with care, although there is nothing radically new, confirming previous findings (long-term trends in river alkalinity, residence time explains differences in carbon cycling from one estuary to another, . . .).

SPECIFIC COMMENTS

I suggest that the authors make their data-set publically available as a supplement of the paper.

Part of the paper is based on the analysis of long-term data-sets from the USGS, going

back to the 1940's. The authors compare their own data with the recent USGS (Figure 7), which validates the quality of the recent USGS data. But this does not necessarily mean that the old data are of the same quality, meaning the derived trends over the decades could be methodological. Please add in the discussion, some elements on the methods of TA analysis, data quality check, and any other element that might be useful to show that over the last 70 years the USGS data-set is of uniform quality and that the observed changes are real rather than methodological.

P2 L 16: to the list of processes that control CO2 in rivers, you could mention inputs from wetlands (Abril et al. 2014).

P3 L 10: I assume that this statement is based on some sort of analysis of numbers, so could you please state the range and central value of the area and the residence time of the estuaries from the cited studies.

P3 L 11: Please define the criteria (threshold value ?) and quantity (surface area ? discharge ? drainage areas ? Length ?) to distinguish "large" and "small" estuaries.

P7 L 12-13: The correlation between TA fluxes and discharge is due to auto-correlation. If you plot AxB versus B, you'll always generate a good correlation (Berges 1997), specially if B changes over several orders of magnitude (unlike A).

P7 L 30: it should be noted that the Amazon river has a very low TA, and extremely organic rich soils. This interpretation might not be applicable to a high TA river, with moderately organic rich soils such as the Delaware. Also, there is a very strong hydrological connectivity between the Amazon and soils through inundation of floodplains that is probably not as extensive in the Delaware.

P 10 L 25: The finding that intertidal marshes have little influence on the CO2 dynamics of the Delaware is quite interesting and would contradict the main conclusion and among the opening statements of the Cai (2011) paper: "It is demonstrated here that CO2 release in estuaries is largely supported by microbial decomposition of highly

productive intertidal marsh biomass".

P 13 L 6: This discussion seems to contradict the Introduction (P3 L10) that previously studied estuaries have a "short residence time"

Figure 1: axis legends have a different font from all of the other figures, it is advisable to have a uniform font in all figures.

Figure 4: Two decimals for R2 are sufficient.

In some figures, numbers in axis legend have thousands separated by comma, but not in others. It is advisable to make this uniform.

In some figures, the axis name is "alkalinity", in others it is "TA". It is advisable to make this uniform

Figures 6 and 7: It is odd that one of the data-sets is named after one of the authors ("Cai"), I suggest that the data set is named "this study", something neutral and a bit more modest.

REFERENCES

Abril, G., Martinez, J.-M., Artigas, L.F., Moreira-Turcq, P., Benedetti, M.F., Vidal, L., Meziane, T., Kim, J.-H., Bernardes, M.C., Savoye, N., Deborde, J., Albéric, P., Souza, M.F.L., Souza, E.L., Roland, F., 2014. Amazon River Carbon Dioxide Outgassing fuelled by Wetlands. Nature 505, 395-398.

Berges J.A., 1997. Ratios, regression statistics, and "spurious" correlations, Limnol. Oceanogr. 42(5), 1006-1007

Cai W.-J., 2011. Estuarine and Coastal Ocean Carbon Paradox: CO2 Sinks or Sites of Terrestrial Carbon Incineration? Annu. Rev. Mar. Sci. 3, 123-45

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