Biogeosciences Discussions

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Comment on bg-2022-200

Anonymous Referee #2

Referee comment on "Reviews and Syntheses: Carbon biogeochemistry of Indian estuaries" by Manab Kumar Dutta et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-200-RC2, 2022

This study compiled the data of carbon dynamics in the estuaries of India and overviewed the regulating factors of carbon dynamics and the contribution of Indian estuaries on global carbon budgets. This approach is helpful to understand the role of continental estuaries on global carbon cycling. However, this version of manuscript contains major concerns which the authors have to improve before publication. In particular, I think the analytical approach and the interpretation of data should be revised substantially.

First, the authors discussed the mechanism of regulating factors of carbon dynamics mainly based on correlation between carbon and other physicochemical parameters but the results of these analysis were not shown in main Figures. If these analyses are substantially used in discussion section, the main text figures and tables should be restructured according to the main agenda. In addition, the statistical analysis must pay attention to the multicollinearity of multivariate variables. For example, there is a correlation between river flow and population density, which may have a combined effect on carbon concentrations. I think the author should try some analytical methods such as principal component analysis.

Although they mentions various regulating factors, it is very difficult to understand from the manuscript what is the key controlling factor. I suggest that important factors should be extracted and discussed based on the statistical results of the above multivariate analyses.

The analysis with outliers removed is also very arbitrary. I think the variability of freshwater endmember would cause such outliers. My recommendation is to analyze the effects of mixing and biogeochemical processes in estuaries separately from the determinants of the river endmember values.

Line comment

203) I think the compiled dataset is very useful for further studies. Don't you open this via any repository?

208) What kind of statistical analyses did you use? You have to explain the approach.

224) You often indicate in this manuscript how large or small by %, is this comparison only rivers for which you have data for both wet and dry seasons? If you are compiling all data, you will have a bias due to the different rivers you are averaging.

Fig. 2-6) This value is average in each estuary? At least, you should show error bars. Is possible, you should show whisker plots.

In result section) You used "higher" or "lower" terms. These are based on statistical analysis? All comparisons should be based on statistical analyses.

245) Basically, outliers should not be arbitrarily removed. It would be interesting to discuss the factors that cause freshwater endmembers to vary.

253, 266) Is the average also higher than in estuaries around the world?

256) Here, "peak" may not be suitable. Higher-lower or heavier-lighter are often used.

265) for dry season?

290) unit

327) Rainfall dilute riverine DIC?

331) These values are averages with the broad salinity range? It is difficult to differentiate the mixing effect from the freshwater endmember variability.

332) BB and AS use different fitting curves, but aren't they just different ranges of precipitation? I think it would be more general if the same relationship equation could be used to explain the difference.

392) Also degassing of CO_2?

402) Rivers with large population densities may have large dilution of river flow. Multivariate analysis may be effective.

420) The relationship between precipitation and DIC should also be discussed comprehensively. DIC supply due to carbonate weathering may dominate in rivers with low precipitation.

468) This paragraph is redundant because it is a general statement.

492) Fig. 12?

496) $p=0.06$ is not significant

521) There may be a combined effect of river discharge and population density.

536) This may also be an effect of multicollinearity.

578) Splitting a fitting line is arbitrary if there is no meaning in 6800 μatm. The influence of other variables should be considered.

595) Without an OM source mixing model (using more than 2 variables), it is difficult to discuss the contribution of each carbon source. For example, d13C value of -24~-19‰ can be explained by the mixing between C3 and C4 without marine origin.

630) I think the quantity and quality of POC cause the decomposition and O2 consumption rather than isotopic fractionation. Isotope fractionation doesn't happen that often with degradation (if it did, POC would be noticeably reduced).

653) Why? It is interesting.