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Biogeosciences Discussions

Interactive comment on "Air-water CO_2 evasion from U.S. East Coast estuaries" *by* Nicolas Goossens et al.

Anonymous Referee #2

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Overall statements

The manuscript "Air-water CO2 evasion from U.S. East Coast estuaries" by Goossens, N., Gildas, L.G., Arndt, S., Regnier, P. gives valuable estimates on the main biogeochemical fluxes of the estuaries along the US east coast. The authors model 43 tidal estuaries and subdivide the results into 3 different latitudinal zones showing distinct differences which appear reasonable. The problem is that the reader has to accept these "black box results" even though all the details of the different estuaries should be available. I will pinpoint the problems and possible ways to resolve them:

* The data preparation for the 43 estuaries is not transparent and reproducible. Please prepare a table in which all details for each estuary are inserted (like Volta et al., 2016a, Tab. 1). If this table appears too large, put it into the Appendix (supplemental data).

Please use lat/lon positions of the mouth and estuary names if possible.

* The validation chapter only refers to applications elsewhere. Please validate the model for at least one estuary in each latitudinal zone like Volta et al., 2016a did it for some North Sea estuaries.

* You used some arguable boundary conditions and forcing functions: The Alkalinity near the mouth, DIC and Alkalinity from GLORICH positions closest to the river boundary or older discharge estimates. I know that it is difficult to put this all together in a reasonable way. But the reader should get knowledge about the sensitivities of the model in relation to estimates of boundary or forcing data. Please show how the model reacts on changes in these data. In the detailed statements I will show in which context such studies should be done.

As different input parameters are means over several years, the time span of validity of the results should be defined.

The introduction reads rather as an advertising text. Give, for example, details about the structure of the ms. A question, which could be tackled, is whether global models miss estuarine processes (Line 39).

Detailed statements

L14/15 Write 697.000 km2

L19 For which time period?

L19 Only CO2, or also other gases including carbon?

L25 the results

L100 Make a full sentence: For a review see Laruelle et al. (2013)

L107/109/124 unify "Fig. x" -> all over the text

L125 give lat/lon for these stations or enlarge Fig. 1 and indicate individual stations.

L146ff 47 stationed were simulated. This contradicts the number of 43 (abstract). 15+47 is not 64 as I would expect from this sentence.

L151 Do you have a reference for this?

L152 Tab. x not table x (all over the text)

L169 2.9 m (use space)

L207 “These parameters were determined through..”?

L210 are described

L226 Use C only for concentration

L227 You mean eqs (5) and (6)?

L233 You mean eqs (5) and (6)?

L239 Use only English peer reviewed references

L241 Define N by an equation

L260 Omit brackets

L262 2000 m (use space)

L272 273 please give a more detailed description here

L276 For which year? Or are climatological or mean values used?

L289 cloud coverage: Which is the origin of this data?

L293 Are there no recent data available?

L320 You mean 50 g C (g Chla)-1 ?

L332 339 W is not consistently defined. Is it percentage or surface area?

L341 give definition of “a”

L355 358 It seem that you use this argument twice. Here a sensitivity analysis would help.

L364 I doubt that zero concentration for org C is appropriate at open sea boundary. Often org C is transported from the open sea into the estuaries were it is degradated. Please substantiate this assumption.

L374 domain -> boundary

L377 Why longitudinal profiles? You mean at right angles with the river flow?

L383 How large do you estimate the error when neglecting degradation or burial in bottom sediments? A sensitivity test could help.

L408 Fluxes

L430 Boundary conditions and forcings differ from European settings. Show validations for American estuaries.

L443 a regional minimum

L440-456 Give these numbers in a table and discuss the most relevant ones.

L457-462 The percentages should sum up to 100%

L466 What do you mean with “aspect ratio”?

L479ff Why do the small estuaries show higher mean values?

L485 Give more details about the assumptions made to calculate the partitioning for Fig. 8a. Were seasonal partitioning combined to overall partitioning?

L489 Give more details about the different partitioning in the different zones here

L508 Where is Table S1?

L577 budgets

L630 The normalization of NEM by a Q10 value appears reasonable. The normalization of FCO2 by a Q10 value must be justified. I'm not convinced of the latter normalization.

L660 ff Here it becomes obvious that f(t) cannot be applied to FCO2.

L668 whom -> who

L677 In this case the assumption of pCO2 in equilibrium with the atmosphere at the lower boundary contradicts the case "still oversaturated waters .."

L682 No link to Fig. 10d ?

L739 You really mean "prediction"? Not "projection"?

L740 As your model is rather based on empirical relations than on first principles, I expect that changed systems due to climate shifts and consequences can change your basic relationship. Please include this aspect in a more careful outlook.

L1021 7(4), 1271-1295

L1045 give units and if possible your own values.

L1052 definition of winter (DJF)?

L1103 The caption must be understandable alone.

L1105 Separate: "black lines .. using all points" " grey lines are best fit only for .."

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