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Biogeosciences Discussions

Interactive comment on "Carbon dynamics and CO_2 air-sea exchanges in the eutrophied coastal waters of the southern bight of the North Sea: a modelling study" *by* N. Gypens et al.

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In the context of global carbon cycle, the role of coastal ocean CO2 behavior has currently drawn increasing attention. This modeling paper is timely and extends our view on how coastal ocean C cycling functions at physical, biological and ecosystem levels. Therefore, I support enthusiastically the eventual publication of this paper. However moderate revision is necessary. While an ecosystem model paper that this paper based on is submitted for review (Lancelot et al in review, 2004), without reading that paper, the current reviewer has great difficulty to understand the model results and to judge them independently or in a more concrete way. (This explains my slow submission of my review) For example, while box WCH does not receive direct river input, how are its properties affected by exchanges with BCZ via FCZ? One cannot guess how this and other modeling issues being handled. So, the reviewer suggests that either a section is added on the model background or this paper waits until the model

paper is published. Another suggestion is to make a comparison with the model of Walsh and Dieterle (1994).

Here are a few questions/suggestions that may help in the revision

1) p569, The authors claimed that DIC model is fine while the modeled amplitude is weak in TA as compared to the data. As I see it, the DIC model has the same problem as TA model in Fig. 3a. Data and model curves diverge in wintertime (i.e., it is not a simple shift). The agreement of large DIC drawdown in April may mask the disagreement in winter. But it is there. This is a somewhat typical problem when people only (or focused on) model pCO2 (in several other papers) –less ideal model results of DIC and TA can lead to much better results in modeled pCO2. I am glad to see that the DIC and TA are presented here. However, the authors should take advantage of their modeling tool to explore the reasons. The community will be benefited more.

2) p571, L13-15, It is not just the river inputs of C & N, with equation 3, you basically assigned all non-temperature effect to biology. The most important one, I guess, must be the dilution effect on DIC and TA. As DIC and TA values change slightly, the slope (0.0423) may change significantly. Please evaluate this influence or provide an uncertainty estimates.

3) P566, L25, “a quasi oceanic closed system (no river input).” While the box WCH has no direct river input, it should have exchanges with other boxes. It is not clear from this paper how were these physical constraints/parameters set up.

4) P572, L6/7, what is “the seasonal signal of only temperature” mean exactly? Does it mean a suppression of both biology and river C input (i.e., d=c+b in fig.5)? If that is true, shouldn’t this value be 0.33-0.17? also see 6).

5) P573, L22/574, L15, Early on it was stated “DIC was assumed constant”, and later “lower river DIC input.” Not consistent. Actually river DIC value often inversely correlated to discharge. Therefore, I’d predict a lower DIC in 1999 (higher discharge) rather

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than 1996 as indicated here.

6) P576 (conclusion), Are we supposed to add all numbers together to get -0.17 in Fig 5? (0.87-0.75-0.33=-0.21)

The following are minor points that I noticed when reading through the text though I am clearly not the right person to suggest English improvements.

p.562, L18 “carbon rivers inputs” ??? change to “river inputs of carbon” or “riverine carbon inputs”? (and many other places throughout the entire test)

p.562, L22 “Especially,Ĕ” need improve.

P563, L19, delete “non-estuarine”; depending on who’s definition, a salt marsh with little freshwater input is also called as an “estuarineĔ” in the southeastern US.

P565, L8/9, “...model resultsĔ”need improve. “Ĕmodel is a result of Ĕ?” P566, L13, what is “Baie de Seine”? at least add an English translation in ().

p569, It should also be pointed out here and in figure caption of fig 2 and fig 3 that the model runs were applied to box BCZ.

p569, L13, TA value (not TA concentration); late (or end of) April (not end April)

p569, L27, “This could result fromĔ” ??

p570/571. Do we need both equations 1 and 2? (one may be enough)

P571,L22 &p572, L3, change “carbon river inputs” to “river C input”?

P576,L4, change “drawn-down” to drawdown ?

Interactive comment on Biogeosciences Discussions, 1, 561, 2004.