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Title: Influence of terrestrial inputs on continental shelf carbon dioxide

Author(s): L.-Q. Jiang et al. MS No.: bg-2012-303 MS Type: Research Article

GENERAL COMMENTS

The manuscript "Influence of terrestrial inputs on continental shelf carbon dioxide" by L.-Q. Jiang, W.-J. Cai, Y. Wang, and J. E. Bauer represents a substantial contribution to scientific progress within the scope of Biogeosciences. The manuscript describes a detailed analysis of DIC, DOC, and pCO_2 data from the measurements collected during several cruise transects on the U.S. South Atlantic Bight (SAB) continental shelf. The pCO_2 data from the cruises have been previously reported in a paper by Jiang et al. (2008a), in which air-sea CO_2 fluxes for the SAB were estimated. The present manuscript partitions the observed changes in the surface-water pCO_2 into various components, including biological sources and sinks combined with mixing on the continental shelf and the inputs from the rivers and salt marshes. The manuscript could benefit from a number of corrections that are suggested below. I highly recommend this manuscript for publication after my recommendations are taken into account.

SPECIFIC COMMENTS

The abstract and the introduction should be revised to state unambiguously that the present study is based on the cruise data first reported in Jiang et al. (2008a).

The goal of the study is clearly defined in the last paragraph of the introduction, but the introduction would also benefit from a concise summary of the motivation for the study.

In the introduction, the distinction is made between the proximal and the distal shelf. However, in the results section and in the figures, the area-average is taken for the inner, middle, and outer shelf. Either, the introduction, or the presentation of the results should be revised so that the area-average is consistent throughout the paper.

I suggest that throughout the paper the concentration units be changed to $\mu mol C \ m^{-3}$.

p. 9317

Line 1: atmospheric carbon dioxide (CO2). Need a reference here.

Lines 1-6. This sentence is taken verbatim from Jiang et al. 2008a (p.1), which is unacceptable!

p. 9318

Line 9: The SAB continental shelf is $\sim 10-15$ m deep inshore and 50-75m deep at the shelf break. Need to indicate source of this information.

Lines 21-22: This sentence is taken verbatim from Jiang et al. 2008a (p.3).

Line 23: the CFZ as the proximal SAB (roughly equivalent to the inner shelf, as defined in Jiang et al. 2008a)

p. 9319

Lines 18-23: Did you check if changing the analyzing lab biased the DOC measurements?

p. 9320

Line 1: Section title should be changed to: Calculation of temperature- and gas-exchange-corrected pCO₂

Line 4: air-sea gas exchange, as shown by Jiang et al. (2008a) in shallow coastal waters of SAB.

Line 14: "Normalized" is misleading in this context. I suggest using "referenced" instead of "normalized" throughout.

Line 16: I think that for completeness the differential form of Takahashi et al. 1993 relationship should be shown here and then it should be stated that to obtain (2), the Takahashi relationship was simply integrated, with SST-bar and SST as the integration limits.

Lines 24-25. This sentence seems unnecessary, unless the annual mean temperature used for the calculation is somehow not the annual mean temperature from the observations but something else.

p. 9321

Line 4: (1) Need to include a reference where the formulas for the calculations of the CO2 system in seawater can be found; (2) I do not see how this CA at in situ temperature and salinity is used later in the calculation. Line 8: I suggest using a bar over Δ DIC (air-sea) to indicate that this is an estimate of a 30-day average gas exchange flux.

p. 9324

Line 8: reference is to the wrong figure in Jiang et al. 2008a

p. 9325

Line 1: reference is to the wrong figure in Jiang et al. 2008a

p. 9328

Line 20: This statement needs a reference.

TECHNICAL CORRECTIONS

I suggest that throughout the manuscript, the writing, when describing the work that has been completed, should be changed into the past tense. E.g., on page 9316, the sentence starting on line 6 should read: Contributions from the rivers, marshes, and the continental shelf to the TG-corrected pCO_2 were then calculated.

Everywhere in the paper "the temperature and air-sea gas exchange corrected pCO_2 " should be changed to either "the temperature- and gas-exchange-corrected pCO_2 " or " pCO_2 , corrected for temperature and air-sea gas exchange".

Everywhere in the paper one consistent preposition should be used in the phrase "in/on the South Atlantic Bight".

Below is a detailed list of corrections I believe necessary in order to clarify the meaning of the sentences where they are found. However, I also suggest that the entire manuscript be edited by an English native-speaker, in order to correct multiple grammatical omissions, which do not necessarily obscure the meaning but are, nevertheless, undesirable in a published work. For example, "compared <u>to</u>" should be changed to "compared with" on p. 9316 (line 16), p. 9317 (line 11), p. 9324 (line 16), p. 9325 (line 27), p. 9327 (lines 9 and 22).

p. 9316

Line 1: Air-sea carbon dioxide (CO2) fluxes have recently been reported for the U.S. South

Line 8: Contributions from rivers, salt marshes, and the continental shelf to the

Line 10: rivers [pCO2(river)] are the highest close to the coast and decrease with

p. 9318

Lines 19-21: A Coastal Frontal Zone (CFZ), formed by a pressure gradient induced by freshwater discharge frequently occurs at 10–30 m <u>isobaths</u>, about 10–30 km offshore on the SAB shelf (Blanton, 1981).

Fig. 1

The figure is missing the following:

- labels for the states of NC and SC
- labels indicating depths on the bathymetry contours
- labels for C, D and E transects

Figure caption should be revised:

Study area on the <u>U.S.</u> South Atlantic Bight <u>from</u> Cape Lookout, North Carolina, to Cape Canaveral, Florida. Open circles are the sampling stations, which start from the shoreline and extend to ~ 500-m water depth.

Fig. 2

The figure is too small when printed.

A vertical line, connecting DIC_i to S_i should be added on panel (a).

The last line in the figure caption should be revised to read: Henry's constant

Table 1

Title should be revised to read: Table 1. River, nearshore and open ocean end-members <u>used for the calculation</u> described in Section 2.5

Fig. 3

The figure is too small when printed.

The figure caption should be revised to read: Fig. 3. Dissolved inorganic carbon (DIC) concentrations at depths shallower than 100 m, plotted against salinity and grouped by the sampling month. The dotted lines connect the river and ocean end-members.

Fig. 5

Font is too small when the figure is printed.

Saturation line should be added on the "in situ" panel.

In situ should not be hyphenated on y-axis label.

"Normalized" should be changed to "TG-corrected" on y-axis label.

Fig. 11 and 12

Physical interpretation of "total excess DIC and DOC" (as given at the bottom of p. 9326) should be included in the caption.