Biogeosciences Discuss., 10, C7637–C7639, 2013
www.biogeosciences-discuss.net/10/C7637/2013/

Biogeosciences
Discussions
Open Access

Interactive comment on "Ocean-atmosphere exchange of organic carbon and CO_2 in the Antarctic Peninsula – physical and biological controls" *by* S. Ruiz-Halpern et al.

Anonymous Referee #3

Received and published: 31 December 2013

The authors present a novel dataset on exchangeable dissolved organic carbon (EDOC) and gaseous organic carbon (GOC) measured in seawater and in the overlying atmosphere during three different cruises in the Southern Ocean, close to the Antarctic Peninsula. From these results, the authors determine the air-sea flux of organic carbon comparing it with measurements on CO2 fluxes. For the region studied and the scarcity of measurements on OC fluxes between the ocean and the atmosphere, the article represents a relevant contribution for the understanding of air-sea carbon fluxes of regional and global relevance.

The topic is approached with valid scientific methods and the results represent an important contribution to scientific progress within the scope of this journal.

In my opinion, the article deserves publication after some aspects have been intensively revised. I hope my comments will help improving the manuscript.

Specifics

In general, I would strongly recommend a language check by a native speaker, as many sentences are extremely long and hard to read. Please try to break down the text in smaller sentences easier to follow.

The abstract needs a style revision.

In the introduction, I would add some references about the ocean as a potential source of CO2 given by positive feedbacks of microbial metabolism (e.g. Del Giorgio and Duarte, 2002). Since the paper is about OC and CO2 fluxes, I would also add some sentences on biological control of air-sea gas fluxes in the present ocean acidification scenario. Moreover, the role of the SML is neglected. Only in the methods and shortly in the discussion the SML is mentioned but it is a burning issue when considering estimates of gas fluxes across the ocean-atmosphere interface. In particular, how was the SML sampled, and which parameters? Consider checking Liss and Duce, 2005 "The Sea-surface and Global Change".

16176 lines 9-13 and 20-23 very long sentence, consider rephrasing

16177 lines 2-4 and 20-25 very long sentence, consider rephrasing 16177 line 26: Polar ecosystems are characterized. . .(I would give a reference there as example).

16180: Did you filter the samples for DOC? Which depths were considered for EDOC and DOC?

16185: line 5, specify that the fugacity of CO2 in surface waters is fCO2-w

16186: lines 5-8: what could be an explanation for this observed trend? and lines 9-12, for figure 4 better give the correlation coefficient and p value anyway. Figure 5: would that make sense to give a median value instead of showing an additional figure?

16187: lines 5-7, what about the role of the SML in air-sea gas exchange during breaking waves events? (e.g. Upstill-Goddard 2003, 2006) 16187: line 14 on, at which depths there was no significant correlation of EDOc with other parameters? Which could be possible explanations for this observation? What about the correlation of GOC and SML-EDOC (figure 7)?

16188: Discussion. Effects of UV on the SML? (e.g., Lechtenfeld et al. 2013)

16189: lines 27-27 please address a possible explanation why you don't see a relationship between krill and Chl a. 16189: line 20 "Therefore, at a small scale"

16190: lines 5-6. Do you think there could be a high heterotrophic metabolism supporting a positive feedback to atmospheric CO2?

Par. 4.3. for OC fluxes, it would be useful to see the different values according to depth. I would also expect some sentences about microbial remineralization of OC.

16191: line 13, figure 7 (not 8).

16192: line 22 "This dual source-sink" and "suggests".

In the last paragraphs of the discussion (4.3 and 4.4), if I understood right, you discuss the downward flux of EDOC by comparing SML-EDOC and 5m-EDOC as if there is a downward diffusion. Did you consider the upward flux of EDOC coming from the water column in areas where high biological activity is supported, reaching the SML and becoming available to be exchanged with the atmosphere?

Conclusions

What can be major implication of your findings for future ocean scenarios?

Interactive comment on Biogeosciences Discuss., 10, 16173, 2013.