Biogeosciences Discuss.,
doi:10.5194/bg-2016-502-RC1, 2017

Biogeosciences Discussions

Interactive comment on "Technical Note: A minimally-invasive experimental system for pCO_2 manipulation in plankton cultures using passive gas exchange (Atmospheric Carbon Control Simulator)" *by* Brooke A. Love et al.

Anonymous Referee #1

Received and published: 4 January 2017

General Comments

This is a very interesting and well-written manuscript that describes a sophisticated and novel ocean acidification (OA) simulation system. Of particular interest is the use of CO2-enriched headspace to compensate for the CO2 drawdown effects of photosynthetic organisms. In addition, the opportunistic use of fluctuations in carbonate chemistry (caused by water replacement) to mimic diurnal changes in carbonate chemistry in the field is interesting, especially in the context of the ever-increasing demand for more realistic OA simulation systems.

The authors acknowledge that the design of this system is vulnerable to the pseudoreplication outlined in Cornwall and Hurd (2015). However, insufficient detail is given on how this can be compensated for during data analysis, e.g. does a 'nested design' fully counter these problems? Have the authors considered evaluating the variability caused by 'Culture Vessel' as a random effect? This can quantify the independence or non-independence of phytoplankton cultures maintained in the same chamber.

While this manuscript is very well-written, the overview of the system (Section 2) lacks a straightforward and thorough description of the simulation apparatus. I am still unclear on how large the culture vessels are, how they are physically positioned in the simulation chamber, and how the chambers are maintained from day to day. The introductory passage in Section 2 should be expanded to include a detailed description.

Finally, as this manuscript describes a novel OA simulation system, I expected the authors to include all measurements used in the validation process, i.e. Total Carbon and Total Alkalinity data. The supplementary document provides ample detail on how these measurements were taken, but does not include the data needed to gauge the success of the system. In any case, these measurements should be included in the manuscript of any description of a novel OA simulation system.

Specific Comments

Line 24-25: 'Manipulative OA research has increased dramatically. . .' Comment: On what timescale?

Lines 41-42: 'The ACCS is designed to accommodate differing trophic levels and differing levels of desired carbonate control, re-equilibration, or metabolically driven cycling.' Comment: I recommend that the authors briefly expand on these claims in this passage, allowing the reader to place the system in the context of other acidification apparatus.

Line 67: In the unpublished data referred to here, what was the control, i.e. the un-

bubbled culture, that the authors compared with the bubbled culture? Was this part of a validation exercise? If so, please expand on this statement and refer to the validation trial.

Line 176-177: 'This level of variability rivals that of some of the most dynamic marine systems.' Comment: This statement needs an example and citations.

Technical Comments

Line 55: 'e.g.' is in the middle of the in-text citation.

Line 73: 'e.g.' is in the middle of the in-text citation.

Figure 1: Add an explanation of the abbreviation 'sim.ch.'

Table 1: Please specify that pH is reported on the Total Hydrogen Ion Scale.

Figures 3 and 4 are mentioned in the text before Figure 2.

Figure 3: Are the error bars SD or SE?

Figure 4: Are the error bars SD or SE?

Figure 2: Are the error bars SD or SE?

Line 160: Scientific name (Emiliania huxleyi) is not italicised.

Lines 168-169: There is a formatting error in the citation for Hofmann et al. (2011).

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-502, 2016.