

## **Anonymous Referee # 2**

**Journal:** Biogeosciences

**Title:** CO<sub>2</sub> increases <sup>14</sup>C-primary production in an Arctic plankton community

**Author(s):** A. Engel et al.

**MS No.:** bg-2012-319

**MS Type:** Research Article

**Special Issue:** Arctic ocean acidification: pelagic ecosystem and biogeochemical responses during a mesocosm study

### **Overall quality of the discussion paper**

**General comments:** The experiment conducted by Engel et al. studies the response of an arctic plankton community to CO<sub>2</sub> enrichments using 9 mesocosms located in Kongsfjorden, Svalbard (i.e. an archipelago between Barents Sea and Greenland Sea). Their paper addresses relevant scientific questions about the impacts of ocean acidification on the interactions between biological and chemical processes in arctic seas. These results are important for biogeochemical models and predictions of marine ecosystems response to the climate changes. This study presents interesting data, concepts and ideas which should be published. However, the issues, the hypotheses and the conclusions of the text should be more explicit and clearly defined so the reader could easily refer to it. The important information provided in the text should always converge to one of the conclusions. Thus, I recommend the publication of Engel et al.'s paper after major revisions.

### **Individual scientific questions/issues**

**Specific comments:** First, the introduction may go from large theory to the specificity of your site. It will be easier to introduce the working hypotheses. I suggest also putting together the sections Results and Discussion. It will be easier to link up together a given result and its conclusion according to the working hypotheses. Moreover, it would be very interesting to divide this new section not by parameters (i.e. as in section 3) but by topics (i.e. as in section 4). For example, the first part of the new section 3 could also be divided in two subsections separating the dataset before and after nutrients addition.

The authors must also carefully define all the parameters used, as simple as they seem, and make sure that the discussion about the methods is done in the section Material and methods. This way, the discussion will focus mainly on the results, impacts of the ocean acidification on plankton, not on the chosen methods. Some parameters discussed are not well defined in the text. The data used in the section Results are not always explained in the section Material and methods (i.e. cumulative concentrations, O<sub>2</sub>-NCP, DIC, DI<sup>13</sup>C, GCP, etc.). Some figures and authors are also not cited in an appropriate way (see section Technical corrections).

Finally, add a short conclusion. The abstract provides a concise and complete summary. The text should be structured in the same way. The results are sufficient in this study to support strong interpretations and conclusions.

## Technical corrections

### 1 Introduction:

*Page 10287:*

Line 1: Why the Arctic Ocean is predicted to be among the most affected by the increase of carbon dioxide? Could it be due to the cold water temperatures and rapid sea ice melting?

Line 18: It may be obvious, but should we read: “... the partial pressure of CO<sub>2</sub> in the ocean ( $p\text{CO}_2$ ) ...”

*Page 10288:*

Line 4: Is energy light?

### 2 Material and methods

*Page 10290:*

Line 9: Why day 10?

Line 12: Don't need to cite the Figure 1.

*Page 10291:*

Line 1: This sentence includes results and not methods.

Line 3: Could you be more precise on what information we should find in Schulz et al.?

*Page 10292:*

Line 9: Does d7 mean day 7?

*Page 10293:*

Line 14: The mathematical formula (1) and (2) may be too obvious to be numbered in the text. There are others more important formula in my opinion (i.e. PP and PER (%)) that could be numbered in section 2.7.

### 3 Results

*Page 10294:*

Line 5: Could “No temperature ...the fjord. At the site... deployment.” be in the sections Material and methods? Temperature variations could be indicated for the period before and after the nutrients addition (same thing for PAR data).

Line 15: Sometimes it is written “day” or “d”. It should be more homogenous.

Line 17: Could it be better to use the  $p\text{CO}_2$  level in Table 1? At least, enumerate the mesocosms as the Table 1 would be classified in order of  $p\text{CO}_2$  levels.

*Page 10295:*

Line 4: Insert at the end of the sentence: (data not shown)

Line 20: Could you change the numbers attributed to the mesocosms as we could read: “... high  $p\text{CO}_2$  (M7, M8, M9), by 48% in the medium (M4, M5, M6) and ... (M1, M2, M3).”. If it was well defined in the Materials and methods, you could just say high, medium and low  $p\text{CO}_2$  levels.

Lines 22-24: These sentences should be in the section Material and methods.

*Page 10297:*

Line 12: Replace “We do not known...” by “We did not know...”. It is rare to use the pronoun “we”.

Line 15: This sentence should be in the section Material and methods.

Line 18: This sentence should be in the section Material and methods.

*Page 10298:*

Line 6-11: These sentences should be in the section Material and methods (sections 2.7).

*Page 10299:*

Lines 3-8: These sentences should be in the section Material and methods (sections 2.7).

Lin 12: Did you mean: (Fig. 7b)?

*Page 10300:*

Lines 1-22: These sentences should be in the section Material and methods (sections 2.7).

Lines 23-27: These sentences should be in the section Introduction.

*Page 10301:*

Lines 1-5: These sentences should be in the section Introduction.

Lines 6-14: These sentences should be in the section Material and methods.

Line 16: Repetition: this sentence is also in section Results, page 10297 at line 5.

*Page 10302:*

Lines 1-7: These sentences could be directly associated with the related results of section 3.

Line 13: Why the authors are cited?

Line 17: How did you measure the nutrient concentrations during the experiment? Shouldn't it be in the section Material and methods?

*Page 10303:*

Line 3-7: These sentences could be in the section Introduction. If all the concepts are predetermined, you just refer to it as part of your working hypotheses. I think it is a mistake to always introduce new parameters and concepts throughout your paper.

Line 27: The interrogative form may be not appropriated here.

*Page 10303:*

Line 23: Is it the first time you use the terms DIP and DIN?

*Page 10304:*

Line 3: Is it the first time you use the term PON?

*Page 10305:*

Line 18: This could be the beginning of a conclusion.

*Figure 13:* Does the linear regression is the best fitting you can use?