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Biogeosciences Discussions

Interactive comment on "Temperature affects the morphology and calcification of *Emiliania huxleyi* strains" *by* Anaid Rosas-Navarro et al.

Anonymous Referee #1

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General comments:

The authors' address the effects of temperature on Emiliania huxleyi's morphology and calcification. Due to increased anthropogenic emissions of greenhouse gases, combined land and sea surface temperature has risen and is expected to continue to increase. Its effects on calcifying phytoplankton are confounded since there isn't enough data to conciliate interpretations and establish the potential of malformations as proxy. The analysis of more strains manipulated similarly is an interesting approach. The observed correlations between coccolith mass and PIC production as well as data on the percentage of incomplete coccoliths in relation to temperature provides information that can potentially be used to understand the past.

The paper would benefit from better structured abstract and additional information in

the discussion, namely the authors might want to briefly discuss coccolith function and explain with more detail their formation process, since malformations might occur at different steps of the latter.

Although the temperature range used is physiologically interesting it is broader than expected for the year 2100. Therefore, this should be clear in the discussion.

Finally, the manuscript seems to follow reliable experimental procedures and design and is overall well written.

Specific comments and technical corrections:

Abstract

The abstract would benefit from a statement with the importance and aim of the study as well as a clear conclusion.

Page 1, line 20 - Replace "E. huxleyi" with " Emiliania huxleyi ".

Page 1, line 28 – Increasing PIC production (Figure 1C) was only positively correlated with the percentage of incomplete coccoliths in one strain? Do the authors mean significantly?

Page 2, line 1-3 – It could be related to time shortage of other steps of the coccolith formation.

Page 2, line 8 – Clarify the final sentence.

Introduction Page 3, line 9-10 – Correct and clarify.

Page 3, line 10-14 – Long sentence. Improve ". . . traditionally in particular. . .".

Page 3, line 14-16 – The sentence should include information concerning stratification, since it is a relevant point in the argument. Moreover, it needs to be clearer.

Page 3, line 17-18 – Improve the sentence.

Page 3, line 19 – Replace “. . .PIC and the POC production. . .” with “. . .PIC and POC production. . .” and improve sentence.

Page 4, line 12-13– Clarify the sentence.

Material and methods

When describing units, like “cells.ml-1”, I would remove the “.”.

Page 5, line 8 – Explain “alternatively”.

Page 5, line 10 – Replace “North Sea seawater” with “North Sea water”.

Page 5, line 11 – Is it relevant to state “filter cartridges”? Perhaps the filter composition could be more interesting.

Page 5, line 11-12 – Replace “nitrates and phosphates” with “nitrate and phosphate”.

Page 6, line 8 and 13– For how long were the samples stored before being measured?

Page 6, line 17– Remove “,” after TA

Page 6, line 22– I would add a “and” before “calcite”.

Page 7, line 2– Storing the samples in a desiccator is important to dry the samples before analysis, correct? How long were they stored in the desiccator?

Page 8, line 18– Start the sentence with text.

Results

Results could be better organized and more fluid. Reference to effects of the carbonate system could be pooled in one / two paragraphs.

Page 10, line 12– For which temperature(s)?

Page 10, line 25– Correct “pgcell-1”, “-1” should be superscript.

Page 11, line 7-9– It is not clear to which carbonate system variable it is being referred

here. It would be useful to have a short explanation on the material and methods section concerning the reasoning for following the carbonate system in the experiment. Is it part of your hypothesis? Moreover, the legend of Table 2 should state whether the values are initial, final or averages of the incubations.

Page 14, line 10-15- The paragraph should be clearer.

Discussion

Page 14, line 19– In spite of being referred in the text, this title does not refer growth rate.

Page 14, line 21– I would replace “versus” with “in relation to”.

Page 14, line 22-23– Specify how many strains and add their isolation sites or areas.

Page 15, line 6- Why do you only show data for 2 strains and 2 temperatures?

Page 15, line 5- Add reference to support the statement.

Page 15, line 6- Percentage of incomplete coccoliths is higher under 20-25°C than 10-15°C in RCC1252. Thus, if one would consider the temperatures used to determine the coccolith production time, both strains would show similar trends, or not? The lack of significance precludes a strong conclusion concerning this parameter.

Page 15, line 10- What about coccolith mass?

Page 16, line 14- The authors refer a previous study (Sett et al., 2014) that showed a different relation between PIC:POC and temperature in the introduction section. This should be referred in the discussion section.

Page 17, line 6- Add references supporting “. . . most strains live at sub-optimal temperatures in the field.”.

Page 17, line 10-13- Clarify what is meant with “short timescales”.

Page 17, line 19-20- Specify which artificial conditions could play a role in producing

malformations of coccoliths.

Page 18, line 13-15- One of the strains tested in this study is considered to belong to the warm-water group while the others not. Why is it referred in the text and how can it affect the observed responses to increasing temperatures?

References

Young and Westbroek, 1991 cited on page 15 line 21 is missing in the references. Several references have typos, namely missing italics, incorrect formatting of the 2 of CO2 (should be subscript) and accents.

Page 30, line 7– Incorrect date, it should be 1993.

Legends

Table 5 and Figure 2, 3, 4- Species should be in italic and presented in a consistent form, either E. huxleyi or Emiliania huxleyi.

Figure 1, page 37, line 4- missing a space between “(E) and”.

Tables

Table 5- The percentage of incomplete coccoliths is considered a strain-specific response, why? The author’s should clarify the choice of responses in the legend of the table. Was it based on significance?

Figures

Figure 1, 5 and 6 are hard to analyze due to size / resolution. Labels (A, B. . .) of the figures and text should follow the same formatting. Figures that do not start with 0, should show an interruption on the axis. Finally, when the unit is in the axis title it is not necessary to have it close to the numbers (see for instance Figure 6).

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