

Interactive comment on “Impact of trace metal concentrations on coccolithophore growth and morphology: laboratory simulations of Cretaceous stress” by Giulia Faucher et al.

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We greatly appreciate the valuable comments and critical reading of the manuscript made by L.J. de Nooijer and a second anonymous reviewer which were useful to improve the scientific quality of the manuscript. Please find below our answers to the Reviewers comments.

General comments: In this paper, Faucher et al. investigate the effect of various trace metal concentrations on the growth and morphology of four different coccolithophore species. Using laboratory experiments, the authors simulate the environmental stress identified in Mesozoic geological records and use four coccolithophore species phylo-

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genetically related to Mesozoic species, for comparison with the fossil record. Based on the results obtained, the authors emphasize that each coccolithophore species responds differently to metal availability and that such species-specific response should be taken in to account when coccolithophore morphological characteristics are used to reconstruct seawater chemistry in the geological past. I read the review posted by Dr. L. J. de Nooijer and I agree with his assessment. The manuscript is well written and the results presented can be of interest to a broad audience. However, there are some changes that I recommend the authors to consider in order to improve their manuscript. Overall, I recommend this article for publication in “Biogeosciences” after a minor to moderate revision.

Specific comments:

I agree with the comments already provided by Dr. L. J. de Nooijer. Below are few additional suggestions.

Abstract.

Reviewers’ comment: Page 1, line 20. The authors do not really discuss the changes in coccolithophore algae production as consequence of elevated trace metal concentrations in their experiments. Please, delete.

Authors reply: We made this change

Introduction.

Reviewers’ comment: Page 2, line 19. “During the latest Cenomanian OAE 2 (. . .), increased by about 8-20 times the background level”. Is this “seawater background level”? Please, specify.

Authors reply: Yes, the text was modified accordingly.

Reviewers’ comment: Page 2, line 24. Which coccolithophore species?

Authors reply: We added the nannofossil species. Although, size changes during Cre-

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taceous OAEs are further examined in the discussion.

Reviewers' comment: Page 2, lines 26-28. It is likely that this paper will be read by scientists, who might not be familiar with morphological phylogeny. I recommend adding few sentences to explain what morphological phylogeny is, its implications, and its relevance in this study.

Authors reply: We have improved/modified the text following the suggestions of the Reviewer.

Reviewers' comment: Page 3, line 4. It might be worth to explain why *E. huxleyi* is so widely studied compared to other coccolithophore species.

Authors reply: We have improved the text following the suggestions of the Reviewer.

Reviewers' comment: Page 3, line 9. The trace metals tested – which ones?

Authors reply: The four trace metals tested (Ni, Zn, V and Pb) are listed in the material and method paragraph.

Material and Methods.

Reviewers' comment Page 4, line 8. Please, provide the range of duration of each experimental treatment.

Authors reply: Text modified accordingly.

Reviewers' comment Page 4, line 10. What is meant by “main experiment”?

Authors reply: We delated “main” in the text.

Reviewers' comment: Page 5, section 2.4.2. Please, specify why these analyses were done only on *E. huxleyi*.

Authors reply: We added a comment in the text.

Results.

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Reviewers' comment: Page 6, lines 7-8. “On the other hand, *E. huxleyi*, *G. oceanica*, *C. pelagicus* and *P. carterae* survived in L, M and H”. I suggest adding the word “treatments” (or equivalent) at the end of the sentence.

Authors reply: Text modified accordingly.

Reviewers' comment: Page 6, lines 28-29. “The coccosphere volume was significantly reduced under increased trace metal concentrations compared to control conditions (Fig 6b) with similar coccosphere volumes recorded in both L, M and H”. Can the coccosphere volume be really defined “similar” in L, M, and H?

Authors reply: We checked the results and we modified the text accordingly.

Discussion.

Reviewers' comment: As a general comment, there is no discussion of *E. huxleyi* coccolith malformations (Figure 3).

Authors reply: The Reviewer is correct. We improved the text following the suggestions of the Reviewer (page 7).

Reviewers' comment: Figure 1. The meaning of the grey line is a little bit foggy – what does it represent? Does it represent the coccosphere volume? Please, specify.

Authors reply: The grey line represents coccolith-free cell volume of *C. pelagicus* after acidification with HCl. The caption was modified.

Reviewers' comment: Figure 2. I would recommend moving the column “Control” prior the columns “Low”, “Medium”, and “High”, for consistency with Tables 1-4 and the other Figures.

Authors reply: The figure was modified accordingly.

Reviewers' comment: Table 2. Growth rate, coccosphere diameter, cell diameter, and coccosphere volume are reported either as (almost) fully spelled name or as symbol.

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Please, be consistent and revise the table caption accordingly

Authors reply: Table and caption modified.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2017-138/bg-2017-138-AC2-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-138>, 2017.