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Interactive comment on "Marine and freshwater micropearls: Biomineralization producing strontium-rich amorphous calcium carbonate inclusions is widespread in the genus *Tetraselmis* (Chlorophyta)" *by* Agathe Martignier et al.

A. Immenhauser (Referee)

adrian.immenhauser@rub.de

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Dear Editor, dear Authors,

Thank you for providing me with the opportunity to review this interesting ms on the formation of amorphous calcium carbonate in the cells of micro-algae. Obviously, I am not a lacustrine microbiologist hence my comments are those of a person interested in carbonate biomineralization, metastable carbonate phases, and the role of elemental cycles in aquatic environements. Moreover, I have read the review of E. Couradeau

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and my below remarks do not iterate the – in my view – well justified criticism already brought forward. This allows me to place my comments at a higher conceptual level.

Generally, my impression of this ms is very positive. This is modern, state-of-the-art research dealing with a hitherto less than sufficiently well studied topic. From the perspective of a carbonate sedimentologist and a person interested in the interface between abiogenic and biogenic processes, however, I have a few general comments, some of which are, as indicated above, also editorial in nature and aim for a paper that is accessible to a wider readership.

1) I do not think that the abstract serves well to attract the interest of a wider readership outside of the specialized community performing focussed research in this field. Please consider to start the abstract with a topical statement on element cycles and the role of algae in this "game". The immediate focus on Tetraselmis leaves the reader with the impression of a somewhat narrow approach. I think the paper as such is much broader actually and the abstract undersells the significance of this story.

2) The Introduction, albeit often well written, is in part a bit unstructured or so it seems and I would like to see that the authors provide text regarding the aims of this paper. I guess that would be pretty standard and I know that many readers like to have an idea of the general direction the paper takes.

3) The results chapter is generally well-designed but in places transgresses the boundary between genuine data presentation and interpretation, perhaps the most commonly found criticism in reviews these days. That could be rather easily solved by using a header such as Data "Presentation and Interpretation" and by restructuring the text in a manner that physically separates (paragraphs) more descriptive text from more interpretative text. Again, by this I aim for a better accessibility of the text for the non-specialized reader. Clearly, chapter 3.5 is more of an interpretation than a genuine data reporting. Please consider.

4) Discussion: I was – in places – a bit confused about the manner in which the au-

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thors jump between lacustrine and marine micropearls. Could you do the reader the favour and commence the discussion with a paragraph explaining the reader how you structure the text? After all, the title of this paper refers to lacustrine and marine case examples but I do not see any chapter in the discussion specifically referring to lacustrine micropearls (but there is one dealing with marine examples actually referring to freshwater ones in the first paragraph)? I am aware of the fact that you have published on lacustrine examples before and that you place the lacustrine and marine findings into context but this all seems a bit unbalanced and would clearly benefit from some form of a better structure.

5) Generally, I found the literature cited on ACC somewhat "classical". These are clearly landmark papers worth citing but a series of more recent studies dealing with thermodynamic and kinetic and biomineralization aspects on how and why organisms secrete or induce amorphous phases seems absent or so I think. I am happy to provide references should the authors wish so.

6) The chapter, brief as it might be, that I really miss is one providing the reader with information about the wider significance of the amorphous calcium carbonate with respect to carbonate cycles and elemental cycling in these water bodies. Could you provide back on the envelope estimates about the volumes of material that are cycled here and the temporal constraints (seasonal patterns)?

7) Conclusions: Please don't come up with a paper written in 2010 (Raven and Knoll) and refer to something that was considered non-existent at that time. I agree, eight or so years seem not long ago but in our hyperactive research environment, this is actually a long time and significantly more accurate and recent findings have been published since then.

Summing up: My comments aim to improve an already very nice paper and I clearly encourage the journal Biogeosciences to consider publication of this work. My comments are on a conceptually high level given that a technical review is already available and

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given that I would like to see a wider readership making use of the science documented here.

I hope my comments are of use to the authors.

Sincerely yours, Adrian Immenhauser

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