



Peer Community In Paleontology

New results and challenges in Sr/Ca studies on Jurassic coccolithophorids

Antonino Briguglio based on peer reviews by **Kenneth De Baets** and 1 anonymous reviewer

Baptiste Suchéras-Marx, Fabienne Giraud, Alexandre Simionovici, Rémi Tucoulou, Isabelle Daniel (2020) Evidence of high Sr/Ca in a Middle Jurassic murolith coccolith species. Missing preprint_server, ver. 7, peer-reviewed and recommended by Peer Community in Paleontology. [10.31233/osf.io/dcfuq](https://doi.org/10.31233/osf.io/dcfuq)

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This interesting publication by Suchéras-Marx et al. (2020) highlights peculiar aspects of geochemistry in nanofossils, specifically coccolithophorids. One of the main application of geochemistry on fossil shells is to get hints on the physiology of such extinct taxa. Here, the authors try to get information on the calcification mechanism and processes in Jurassic coccoliths. Coccoliths build a test made of calcium carbonate and one of the most common geochemical proxies used for this fossil group is the Sr/Ca ratio. This isotopic ratio has good chances to be successfully used as a robust proxy for paleoenvironmental reconstruction, but, concerning Jurassic coccoliths things seem to be not straightforward. The authors managed to compare the isotopic value of Sr/Ca measured on Jurassic coccoliths from different taxonomic groups: the murolith **Crepidolithus crassus** and the placoliths **Watznaueria contracta** and **Discorhabdus striatus**. The results they got clearly show that the Sr/Ca ratio cannot be used as a universal proxy because these species exhibit very different values despite coming from the same stratigraphic level and having undergone minimal diagenetic modification. Data seem to point to a Sr/Ca ratio up to 10 times higher in the murolith species than in the placolith taxa (Suchéras-Marx et al., 2020). One of the explanation given here takes advantage of modern coccolith data and hints to specific polysaccharides that would control the growth of the long R unit in the murolith species. As always, there is plenty of space for additional research, possibly on modern taxa, to sort out the scientific questions that arise from this work.

References:

Suchéras-Marx, B., Giraud, F., Simionovici, A., Tucoulou, R., & Daniel, I. (2020). Evidence of high Sr/Ca in a Middle Jurassic murolith coccolith species. PaleorXiv, dcfuq, version 7, peer-reviewed by PCI Paleo. doi: [[10.31233/osf.io/dcfuq](https://doi.org/10.31233/osf.io/dcfuq)](<https://dx.doi.org/10.31233/osf.io/dcfuq>)

Reviews

Evaluation round #1

DOI or URL of the preprint: <https://doi.org/10.31233/osf.io/dcfuq>

Authors' reply, 29 September 2020

Dear Recommender,

I have made almost all corrections as asked by reviewers. However, in few cases, I have not completely modified following reviewers' suggestions. And in two cases, I need you to arbitrate because in one case I cannot do what is asked or I would need to re-do the calculations and in the other case the suggestion is too far out of scope from my point of view.

Comment from recommender in section 3.2.: "I think you should just make it all in colours. here is free of charge as no printing costs are associated."

-> I actually prefer to use a grey scale because i) it is colorblindness friendly and ii) color on a scale from min to max may be sometimes less useful than simpler scale. I have practice it already in Suchéras-Marx et al. 2016 and tried a lot of solutions. I keep color only when there is more than one scale.

Comment from reviewer in section 1.: "Because you are discussing Sr/Ca ratios from Middle Jurassic seawater you could add a short paragraph about Sr/Ca ratios: "A downward trend in Sr/Ca ratios is observed throughout the Early and Middle Jurassic. Fossil calcite is a source of Sr/Ca for reconstruction of past seawater, because the variability of Sr/Ca within a single shell is comparatively low, e.g., ~20% in modern oysters (Almeida et al., 1998). The most important factors influencing Sr/Ca ratios in biogenic carbonates is outlined in Ullmann et al. (2013) and are (I) the composition of the liquid from which they are precipitated, (II) the calcium carbonate polymorph, (III) the species specific fractionation of the Sr/Ca ratio, (IV) metabolic controls on this fractionation factor and (V) water temperature.""

-> The study don't talk about Sr/Ca during the Middle Jurassic so I have slightly amended the proposition for (placed at the beginning of the second paragraph): "The most important factors influencing Sr/Ca ratios in biogenic carbonates is outlined in Ullmann et al. (2013) and are i) the composition of the liquid from which they are precipitated (modern oceans ~8 mmol/mol (Lebrato et al., 2020); Middle Jurassic ~5 mmol/mol (Ullmann et al., 2013), ii) the calcium carbonate polymorph, iii) the species specific fractionation of the Sr/Ca ratio, iv) metabolic controls on this fractionation factor and v) water temperature."

Comment from reviewer in Figure 2.: Could insert boxes be added to show the "selected zone".

-> I can't show those selected zones, I did not save the image of the zones I used and did it years ago. If this is mandatory, I'll have to choose new zones and recalculate Sr/Ca and Mn/Ca again...which is not that easy because I have to find in a matrix the pixels selected. Could the recommender arbitrate this point?

Comment from reviewer in Table 1: Could Fe data be added to the table.

-> I could but this information is never mentioned in the study so it would be completely useless. I rather not do it then. Moreover, Fe in coccolith is diagenesis and contamination (Suchéras-Marx et al., 2016). The use of Mg/Ca already cover the diagenetic overprint. Could the recommender arbitrate this point?

Comment from reviewer in Section 4.: The Sr/Ca ratios for Middle Jurassic seawater should be mentioned "Calculated Sr/Ca values for the Early to Middle Jurassic seawater ranges from 3.8 to 7.8 mmol/mol (Ullmann et al., 2013)." -> I have slightly amended the proposition for : "Finally, the calculated Sr/Ca for the lower Bajocian seawater ranges between 4 mmol/mol and 6.8 mmol/mol (Ullmann et al., 2013) below most modern oceanic environments (Lebrato et al., 2020) and thus cannot explain the high Sr/Ca in *C. crassus*."

Comment from reviewer in Section 4.: have Sr/Ca ratios been used to determine phylogeny in any previous studies?

-> There is a misunderstanding. Sr/Ca is not used to determine the phylogeny but the opposite, could the

phylogeny explain the Sr/Ca through inherited character. I have slightly changed the beginning of the section to make the purpose of this discussion clearer.

Decision by [Antonino Briguglio](#), posted 01 September 2020

minor revisions required

Dear Authors,

first and foremost, let me send you our deepest apologies for the delay in receiving your revisions. PCI struggled over two months to find a suitable handling editor as none of the listed recommenders felt having enough skills in handling the manuscript. I was asked directly twice and finally I humbly accepted the task. I sent your manuscript to 13 possible reviewers and most of them either refused the task or took immensely long to get me back their comments. Covid crisis took part in this delay as well. I finally got one excellent revision by one reviewer and one more succinct but with nice hints from an early career scientist. Additionally I personally went through the text highlighting some parts that can be modified.

Based on the revisions I have got I am convinced that your paper can be a very interesting contribution in PCI Paleo but some more extended discussion might increase the readership and might get the paper more to the topic. Please, check directly the pdfs I attach to this letter and in those you will find all specific comments and hints.

As usual, a rebuttal letter is expected, shall you decide to submit again the revised version; make sure you indicate your response for each single comment.

Kind regards and, again, our most sincere Apologies,

Antonino Briguglio [Download recommender's annotations](#)

Reviewed by [Kenneth De Baets](#), 20 July 2020

This interesting contribution investigates Sr/Ca ratio in Bajocian coccoliths. It proposes new mechanisms to explain the high Mg/Ca ratio in particular species which are crucial for interpreting these parameters in our field. These hypotheses should now be further investigated using culturing experiments. The data underlying this manuscript is publically available on PANGAEA.

I would recommend this manuscript for publication pending some minor revisions:

Beam line set-up, analysis procedure and calculation fit: you refer to another published paper, but I would be appropriate for the reader to have a quick summary of critical properties here (for details you can still refer to this other paper). I also see no reason (there is not space limit) – not to include it here – for completeness sake.

Some expressions need to be checked: I would suggest to use “culturing experiments” instead of “culture experiments”, it remains poorly understood instead of “it remained partially understood”: “Family ancestor”: this sound really strange. Do you mean the ancestor of this lineage? Why should this be a family? I would advise for a colleague fluent in English to proofread your manuscript (note I am not a native speaker myself).

Suchéras-Marx et al. “submitted”: as the reviewer I cannot verify submitted manuscripts unless they are deposited somewhere as a pre-print. It is a nice to see you made the pre-print available in the reference list, but it would be better to highlight this in the main text - i only realized this when going through the reference list. If I correctly understand the underlying data of this publication is already available, so you could in addition also refer to this data (where relevant) in text.

These and additional comments can be found in the annotated pdf.

Looking forward to seeing these implemented.

Kenneth De Baets

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Reviewed by anonymous reviewer 1, 27 June 2020

This is a very interesting paper with good data and useful applications for coccolith research (both paleobiological, phylogenetic and geochemical). I've made a few suggestions in the PDF.

[Download the review](#)