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Biogeosciences
Discussions

# *Interactive comment on* "Weaving of biomineralization framework in rotaliid foraminifera: Implications for paleoenvironmental reconstructions" *by* Y. Nagai et la.

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The study by Nagai and co autors ('Weaving of biomineralization framework in rotaliid foraminifera: Implications for paleoenvironmental reconstructions', bg-2018-295) shows new insights into the pseudopodial structured during foraminiferal chamber formation, leading to better understanding of processes involved in controlling the chemical signature of the precipitated carbonate shell. By timing calcium carbonate precipitation with the structure of organic layers gives crucial information about the closeness/openness of the site of calcification, and therefore the role of passive transport (seawater exchange), which is still heavily debated. In general, the manuscript is well-



structured and well-illustrated and I just have some minor comments.

Minor comments:

- Change numbering of figures: Reference to figure 7 (page 8/ line16) before Figures 5, 6.

- 4.2 It has been suggested pores are used for gas exchange/respiration (e.g. Berthold, 1976; Leutenegger and Hansen, 1979), and their size might change with e.g. seawater oxygen level (Kuhnt et al., 2013). Would this fit with your observations? Or are the pores closed by pore plates and have no possibility to exchange?

- 4.3 Are there observed vesicles associated to seawater vacuoles? Was it possible to perform SEM-EDS on vesicles observed during chamber formation to potentially observe (amorphous phase of) calcium carbonate? Did you observe a difference in the intensity/size of vesicles during different phase of calcification and/or chamber size?

- 4.4 Implications for element distribution: When looking at element distribution across the chamber wall, it has been shown for several elements (e.g. S, Na, Mg) there is a higher concentration band near the POS. The presence of gaps in the organic layers at the initial phase of calcification compared to its absence during llater phases does explain the difference observed in element distribution (i.e. band and no-band). However, when taking Mg as an example, these Mg/Ca bands close to the POS are still much lower than expected from inorganic precipitation experiments. Based on your observations, is this because the system is not fully open, or simply because inorganic partitioning is different from foraminiferal partitioning, due to presence of other ions (inhibitors) or organic layers (adsorption)? Would this suggest that comparing foraminiferal element partitioning to inorganic precipitation experiments is not useful, since the systems are so different (organics, open/closed system etc.)?

Textual suggestions (page number/line number):

2/14 ..from seawater, which implies active ion exchange.

2/24 ..(Haynes, 1981), and each species..

2/25 ..modern days, during which they have..

2/29 Moreover, the tests are..

3/5 Even though the test morphology and chemical composition depend to a certain extent on the environment (), the calcification process..

5/5 For specimens fixed at different time slides during the chamber formation process..

5/15 ..the chamber formation process of A. beccarii with DIC for 59 times in total..

6/19 ..the pseudopodial activity significantly differed. A fan-shaped..

7/13 formed chamber, leaving an empty space in the new chamber..

9/16 ..corresponding to the IOL, the POS, and the OOL respectively from inner to outer side..

10/1 ..has been speculated in previous studies,..

10/6 – in other words the organic layer is part of cytoplasm.

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