

Interactive comment on “Impact of seawater $p\text{CO}_2$ changes on calcification and on mG/cA and sR/cA in benthic foraminifera calcite (*Ammonia tepida*): results from culturing experiments” by D. Dissard et al.

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We appreciate the effort the reviewers put into our manuscript, which greatly benefitted from their comments. Each of their comments were addressed separately.

Answer to anonymous referee 1

Comment: While this paper is probably worthy of publication, I would have liked to see some time course experiments and the experiments done at more than two $p\text{CO}_2$ concentrations. It would have also been informative to determine nutrient concentrations,

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particularly during a time course experiment. Answer: We agree with the reviewer that a time course experiment and measurement of nutrients would have been of interest but this fell beyond the scope of this paper. Manipulation during a time course experiment would disturb the results. For instance, multiple exposure of the specimens to UV light and/or to ambient atmospheric $p\text{CO}_2$ conditions would impact the results. We also agree with the reviewer that it would have been optimal to run additional experiments at more $p\text{CO}_2$ conditions. Unfortunately, practical constraints only allowed experiments at high and low $p\text{CO}_2$. However, we have added an additional data-set for ambient $p\text{CO}_2$ (see reply to reviewer 3).

Comment: Although I understand why the authors felt they need “to alter physico-chemical conditions beyond the range typically observed in nature”, this also presents a dilemma in that the ΔG of reaction will also be very far from the equilibrium state. This is why experimenters dealing with solid-aqueous solution reactions try to design experiments close to the ΔG of reaction = 0 and maintain that during the time course of the experiment. Answer: Because natural system responses are variable, one needs to take the specimens to more extreme conditions to observe trends. At a later stage experiments within the natural range of variations can be carried out. As stated above, we have added a data-set under ambient $p\text{CO}_2$ conditions.

Comment: The paper also begs some questions: Why did the specimens of *Ammonia tepida* calcify at undersaturated conditions and not dissolve? Answer: The answer to this question is simply that we are not dealing with inorganic precipitates but products of biological calcification. It is interesting to note that *Hoeglundina elegans*, a deep sea benthic foraminifer, precipitates aragonitic tests in undersaturated conditions. This demonstrates the strong biological control over calcification (in contrast to inorganic precipitation).

Comment: Why are not some of the original papers, like Smith et al. (1979) and Speer (1983), addressing Sr partitioning not mentioned in this paper? Answer: The Speer (1983) paper deals with inorganic systems, and Smith et al. (1979) is describing an

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aragonitic corals. Hence, none of these papers allows a straightforward comparison with the calcitic test of *Ammonia tepida*.

Comment: Why the differences between the effects of CO₃²⁻ and DIC concentrations on the Mg and Sr partition coefficients for *Ammonia tepida* calcite? Answer: Answer: In a recent study, Raitzsch et al. (2008) report a significant control of bottom water $\Delta[\text{CO}_3^{2-}]$ on $\Delta\text{Mg}/\text{Ca}$ of *C. mundulus* calcite, and a DIC control on $\Delta\text{Mg}/\text{Ca}$ of *P. wuellerstorfi* calcite (two deep benthic species). Therefore we discussed the impact of DIC as well. It turned out that the effects of $[\text{CO}_3^{2-}]$ and DIC on the Mg and Sr partition coefficients are indistinguishable for *Ammonia tepida* calcite.

Comment: Finally, there are quite a few typographical errors (even in the title) in the paper that need to be attended to before publication. Answer: Typographical errors were corrected.

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