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Interactive Comment

Interactive comment on "Impact of seawater  $pCO_2$ 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.

## D. Dissard et al.

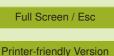
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We appreciate the effort the reviewers put into our manuscript, which greatly benefitted from their comments. Each of their comments were addressed separately.

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 pCO2 concentrations. It would have also been informative to determine nutrient concentrations,



Interactive Discussion

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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 pCO2 conditions would impact the results. We also agree with the reviewer that it would have been optimal to run additional experiments at more pCO2 conditions. Unfortunately, practical constrains only allowed experiments at high and low pCO2. However, we have added an additional data-set for ambient pCO2 (see reply to reviewer 3).

Comment: Although I understand why the authors felt they need "to alter physicochemical conditions beyond the range typically observed in nature", this also presents a dilemma in that the  $\Delta G$  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  $\Delta G$  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 pCO2 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  $\Delta$ [CO32-] on  $\Delta$ Mg/Ca of C. mundulus calcite, and a DIC control on  $\Delta$ Mg/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 [CO32-] 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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Interactive comment on Biogeosciences Discuss., 6, 3771, 2009.