

# ***Interactive comment on “Reconsidering the role of carbonate ion concentration in calcification by marine organisms” by L. T. Bach***

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I would like to thank Reviewer #1 for the positive feedback and pointing out that carbonate chemistry is not the sole parameter controlling calcification in the oceans. I fully agree with this statement and emphasized this in the revised version of the manuscript. I updated and restructured section 3.5 (global implications) and pointed out at the very beginning of this section:

“The following paragraphs will address to what extent our view on carbonate chemistry control of calcification in the oceans could be modified when we consider  $[\text{HCO}_3^-]/[\text{H}^+]$  rather than  $[\text{CO}_3^{2-}]$  or  $\Omega\text{CaCO}_3$  as the most influential parameter. Before starting the discussion I would like to emphasize, however, that carbonate chemistry patterns discussed here are just one among other abiotic (e.g. temperature or light) or biotic (e.g.

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food availability or competition) factors which must also be taken into consideration when trying to understand the patterns of calcification in the oceans.”

Reply to minor comments:

1) REVIEWER #1: Pg 6690, Ln 12-13: As well as temperature, salinity and pressure needing to be constant, biological factors will need to be constant in order for unity in the correlation between calcification and  $[\text{HCO}_3^-]/[\text{H}^+]$  as with  $[\text{CO}_3^{2-}]$  or  $\text{CaCO}_3$  saturation state. REPLY: I am not sure if I understood Reviewer #1 correctly but according to equations 9 and 12, salinity, temperature, and pressure are the only factors that need to be constant among treatments in order to establish the proportionality between  $[\text{HCO}_3^-]/[\text{H}^+]$ ,  $[\text{CO}_3^{2-}]$ , and  $\Omega_{\text{CaCO}_3}$ . Variation of other factors will have no influence on the proportionality.

2) REVIEWER #1: Pg 6691, Ln 18: Remove extra comma after both [Molluscs can have both(,) calcite ...] REPLY: I removed the extra comma.

3) REVIEWER #1: Pg 6692, Ln 23: From which reservoir of  $\text{CO}_2$  or  $\text{HCO}_3^-$ ? Cellular or external (boundary layer)? REPLY: From the external reservoir. I added this information to the revised version of the manuscript.

4) REVIEWER #1: Pg 6692, Ln 27: Consider the use of ‘success’ – in an ecological or physiological sense? Possibly replace with fitness or growth. REPLY: I replaced ‘success’ with ‘fitness’ as suggested by Reviewer #1

5) REVIEWER #1: Pg 6693, Ln 21: Replace ‘or’ with ‘and’ so that evidence in bivalves and corals support the point. REPLY: I changed ‘or’ to ‘and’.

6) REVIEWER #1: Pg 6698, Ln 21: How variable is the cytosol pH? REPLY: According to the reference cited here (Madshus 1988) it is strongly regulated and is typically in the range of 7.0 – 7.4. I added the given range to the revised version of the manuscript.

7) REVIEWER #1: Pg 6698, Ln 23: Add “be” to the line “. . . in the cytosol and <be> transported as  $\text{HCO}_3^-$ . . .”. REPLY: I thank Reviewer #1 for spotting this mistake and

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changed accordingly.

8) REVIEWER #1: Pg 6702, Ln 7: Extra comma(s)? “. . . start in the pCO<sub>2</sub>(,) range below 250-500  $\mu$ atm, where . . .” REPLY: I removed the extra comma.

9) REVIEWER #1: Pg 6704, Ln 25: Maybe a good place to state other factors which influence marine calcification that show strong latitudinal patterns (e.g., availability of nutrients, food, light, etc.) REPLY: I addressed this concern at the beginning of section 3.5 (see major comment).

19) REVIEWER #1: Pg 6707, Ln 16: Extra semi-colon “. . .Allemand et al., 2004(;)). . .” REPLY: I removed the extra semi-colon.

REFERENCE: Madshus, I. H. 1988. Regulation of intracellular pH in eukaryotic cells. Biochem. J. 250: 1–8.

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Interactive comment on Biogeosciences Discuss., 12, 6689, 2015.

**BGD**

12, C3901–C3903, 2015

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