

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

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Dear Editor,

I enjoyed reading Bach’s contribution to the discussion regarding the relation between calcification and marine inorganic carbon parameters. While going through it, I noticed a few things that may be added to the manuscript’s current version. Since I am not an invited reviewer for this manuscript, I have not made a thorough evaluation of the complete content.

Section 3.1. The argument for the fact that many marine calcifying organisms (ultimately) rely on bicarbonate rather than carbonate ions is convincing, although calcifiers may additionally make use of (locally abundant) CO₂. For example respiratory

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carbon dioxide (as stated in section 3.6.4) or by calcification-induced lowered micro-environmental pH (Glas et al., 2012, J Exp Mar Biol Ecol 424-425: 53-58). In relation to an elevated at the site of calcification (e.g. in foraminifera) this has led to the idea of a 'CO₂-trap' to concentrate DIC at the site of calcification (Erez, 2003; Bentov et al., 2009). The involvement of CO₂ as a source for DIC (in addition to bicarbonate) may be added to this section.

Section 3.6.3. It has indeed been argued that foraminifera rely on the transport of seawater to the site of calcification and likely, modification of that seawater as it is being transported. However, active, transmembrane transport of CO₂ (see also above) and (bi)carbonate ions have been hypothesized/ shown too. See De Nooijer et al. (2014, Earth-Sci Rev 135: 48-58) for an overview, particularly section 3.1 and table 1. In relation to my first comment, conversion between carbon dioxide and (bi)carbonate may be speeded up tremendously by specialized enzymes (i.e. carbonic anhydrase), which generally make marine calcifiers less dependent on any of the DIC-species available. Involvement of CA in calcification has been shown to be involved in corals (e.g. Moya et al., 2008, J Biol Chem 283: 25475-25484), coccolithophores (Rickaby et al., 2010) and bivalves (Marie et al., 2010, ChemBioChem 11: 2138-2147). This may also be added to either section 3.6 or 3.1.

Regards,

Lennart de Nooijer

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