Biogeosciences Discuss., 9, C870–C872, 2012
www.biogeosciences-discuss.net/9/C870/2012/

Biogeosciences
Discussions

Interactive comment on "Effects of seawater pCO₂ changes on the calcifying fluid of scleractinian corals" *by* S. Hohn and A. Merico

Anonymous Referee #2

Received and published: 29 April 2012

This paper, 'Effects of seawater pCO2 changes on the calcifying fluid of scleractinian corals' by Hohn and Merico presents one of the first attempts at producing a kinetic model for the coral calcification process. Although such a model is much needed for improving our understanding of the calcification process, the model presented seems unrealistic and has failed to take into account much of the literature.

The model produces a continuous increase in tissue alkalinity and calcium – both of which should be tightly regulated. Cycling of these values in the tissue layer could be expected, but a continuous increase seems highly unlikely. Although the data may not come from the same experiment which Hohn and Merico seem to focus exclusively

upon, there are a number of useful measurements which should be considered in constructing the model. I suggest looking at Marshall et al 2007 (and references there in) and Tambutte et al 1996. Further the tissue pH values used are unrealistic, please see Venn et al 2009 and 2011.

other comments: Methods are nowhere detailed enough – not even the software package for the simulations is given, some parameters are missing while others lack details as to how the values were assigned and whether or not they are close to any estimates based on the literature. Throughout the paper please use terminology consistent with the literature eg sub-calicoblastic = beneath the calicoblastic cell layer, calcification occurs in the sub-calicoblastic environment, not in the calicoblastic layer see Tambutte et al., 2011

intro line ∼15 there is considerable variation between studies and between conditions in a given study in the response to CO2 – eg Reynaud et al 2003, Holcomb et al 2011

intro line 20 or at least spontaneous precipitation is not a rapid process see Morse et al., 2003

concentrations of phosphate are not generally very high - see Burton and Walter 1987, 1990 for the effects of Mg and PO4 on the precipitation of different species

clarify what is meant by growth medium when first used

Why has seawater entry to the subcalicoblastic medium been ignored?

references: Burton, E.A., Walter, L.M., 1987. Relative precipitation rates of aragonite and Mg calcite from seawater: Temperature or carbonate ion control? Geology. 15, 111-114.

Burton, E.A., Walter, L.M., 1990. The role of pH in phosphate inhibition of calcite and aragonite precipitation rates in seawater. Geochim Cosmochim Acta. 54, 797-808.

Holcomb, M., McCorkle, D.C., Cohen, A.L., 2010. Long-term effects of nutrient and

CO2 enrichment on the temperate coral Astrangia poculata (Ellis and Solander, 1786). J. Exp. Mar. Biol. Ecol. 386, 27-33.

Marshall, A.T., Clode, P.L., Russell, R., Prince, K., Stern, R., 2007. Electron and ion microprobe analysis of calcium distribution and transport in coral tissues. J Exp Biol. 210, 2453-2463.

Morse, J.W., Gledhill, D.K., Millero, F.J., 2003. CaCO3 precipitation kinetics in waters from the Great Bahama Bank: implications for the relationship between Bank hydrochemistry and whitings. Geochim Cosmochim Acta. 67, 2819-2826.

Reynaud, S., Leclerq, N., Romaine-Lioud, S., Ferrier-Pages, C., Jaubert, J., Gattuso, J.-P., 2003. Interacting effects of CO2 partial pressure and temperature on photosynthesis and calcification in a scleractinian coral. Global Change Biol. 9, 1660-1668.

Tambutte, E., Allemand, D., Mueller, E., Jaubert, J., 1996. A compartmental approach to the mechanism of calcification in hermatypic corals. J. Exp. Biol. 199, 1029-1041.

Tambutte, S., Holcomb, M., Ferrier-Pages, C., Reynaud, S., Tambutte, E., Zoccola, D., Allemand, D. 2011. Coral biomineralization: from the gene to the environment. Journal of Experimental Marine Biology and Ecology 408: 58-78.

Venn, A.A., Tambutte, E., Lotto, S., Zoccola, D., Allemand, D., Tambutte, S., 2009. Imaging intracellular pH in a reef coral and symbiotic anemone. PNAS.

Venn, A., Tambutte, E., Holcomb, M., Allemand, D., Tambutte, S., 2011. Live tissue imaging shows reef corals elevate pH under their calcifying tissue relative to seawater. PloS one. 6, e20013.

Interactive comment on Biogeosciences Discuss., 9, 2655, 2012.