

Interactive comment on “The metabolic response of pteropods to ocean acidification reflects natural CO₂-exposure in oxygen minimum zones” by A. E. Maas et al.

Anonymous Referee #1

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General comments

This is an interesting and well-structured paper that links the metabolic response of pteropods that are naturally exposed to high CO₂ levels in oxygen minimum zones to the ocean acidification (OA) problem. Research on the effects of OA on pteropods is still emerging and this study is the first to add some knowledge about five tropical thecosome pteropod species and at the same time relates findings to the conditions in their natural habitat. The results show that species that naturally migrate in oxygen minimum zones do not respond to elevated CO₂ levels but the one species that does not migrate does respond with reduced oxygen consumption and ammonia excretion.

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Hence, seemingly there is some natural adaptation to the chemical environment of the pteropods and the ultimate conclusion is that some pteropod species will be able to function under increasingly hypercapnic conditions. I definitely will like to see this ms published in Biogeoscience but I have some questions and suggestions to be considered before.

Specific comments

Material and Methods

L99–100: pH profiles were only calculated for 2008. Is there a great inter-annual variation in pH or is it rather constant between the different years? Typically, the whole carbonate system parameters are given in papers dealing with OA. Can the authors add these data in order to provide readers with more elaborate information on the prevailing abiotic conditions that the pteropods live in, i.e. aragonite saturation state?

L 104–114: The same question as above applies to the respiration experiments. If 10–50 ml chambers were used, it should have been possible, although maybe not for all replicates, to take water samples in order to be able to determine the carbonate chemistry more detailed? And how much replicates were set up for each pH level?

Discussion:

L173: “aragonite is thought to be undersaturated in this region” needs a reference or proof through own data

L184: The authors state these pteropods may be able to endure periods of acidosis either through buffering their cellular pH or the dissolution of their aragonitic shell. While the first possibility seems adequate to me, the second does not seem to be a good alternative since the shell of the pteropods is so markedly thin. Do the authors think, pteropods could withstand this and survive without their shell? I'd like the authors to accomplish on this point a bit more as this may constrict their chance to cope with increasingly hypercapnic conditions in the shallower, warmer, oxygenated end of their

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distribution.

Technical/typing corrections

L184: thRough

Table 4 and Fig. 2+3, 5: The units should be consistently: $\mu\text{mol O}_2 \text{ g}^{-1} \text{ h}^{-1}$ and respectively $\mu\text{moles O}_2 \text{ g}^{-1} \text{ hr}^{-1}$ and $\mu\text{mole O}_2 \text{ g}^{-1} \text{ hr}^{-1}$

Fig 5: In CRD 2007 the grey bar at 150 μmol and 300 m depth, to which species does it belong? Usually the grey bars stand left and the right bars right, so I think this bar rather belongs to *C. pyramidata*?

Figure legend of Fig. 5: (solid dark grey line? Should be black line, right?), the same for (dashed dark grey line).

References

There are two references (Maas et al. in prep. for *J. Plankt Res*, and Seibel et al. *PLoS One* subm.) that are not yet accepted and therefore shouldn't be cited except as unpublished work. If these manuscripts are still not accepted in the final stage of the present ms, the authors should omit these from the reference list.

Interactive comment on *Biogeosciences Discuss.*, 8, 10295, 2011.