Biogeosciences Discuss., 10, C1889–C1891, 2013
www.biogeosciences-discuss.net/10/C1889/2013/

Biogeosciences Discussions
Open Access

Interactive comment on "Benthic buffers and boosters of ocean acidification on coral reefs" *by* K. R. N. Anthony et al.

K. R. N. Anthony et al.

k.anthony@aims.gov.au

Received and published: 15 May 2013

We thank the two reviewers for their comments and insight. Reviewer 1 refers to the study as being "very well conceived and impressive" and that the data are "incredibly important and should be published". Reviewer 1's comments pertain mainly to the question around the basis for why coral reefs appear to have a universal photosynthesis to respiration ratio of unity. Reviewer 2, on the other hand is undecided and wishes to see more replication. We first respond to Reviewer 2's concern and then address Reviewer 1's question in details.

Reviewer 2 argues that the study suffers from insufficient replication. We would have agreed if we had used smaller reef samples and if our focus had been to test rigorously for differences between treatment (acidification, flow, light) combinations. The main fo-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

cus of this study, however, was to “examine how six benthic groups from a coral reef environment contribute to changes in seawater aragonite saturation state” (abstract). We argue that our experimental analyses achieve that objective. A more correct description of “replicates” in this study would have been “repeated experiments”. Our units of replication were 24-hour long incubations of relatively large benthic communities (>1 square meter) transplanted from the field to a 550 litre laboratory flume. The study thus involved translocating more than 22 square meters (a couple of tonnes) of reef material to the laboratory flume. Given that we used translocated communities or assemblages as opposed to individual specimens, it is safe to assume that our measures of carbon fluxes for each “replicate” is a better representation of benthic carbon fluxes than for smaller community samples typical of laboratory trials, as carbon fluxes over the larger benthic area absorbs the fine scale within-habitat variation. This is supported by the relatively low level of variation (standard error, SE) between repeated experiments. For most treatment combinations, SE was less than 20% of the mean. Also, not all groups had very low replication. We conducted 4 repeated experiments for corals and 3 for crustose coralline algae (CCAs), sand and fleshy macroalgae. Interestingly, for the two groups that we repeated only once (Halimeda and turfs communities), SE was generally as low as for the N=3 and N=4 communities. Again, the objective of the study was to examine contributions from the six groups to changes in seawater of aragonite saturation, and the key results here are shown in the vector plot Fig. 7, demonstrating large differences between groups. We have now clarified these points in the revised manuscript.

Reviewer 2 raises the interesting point that the ratio of photosynthesis to respiration on coral reefs appears to converge universally on unity. While our results do not fully support this (and our focus is more on how net photosynthesis and net calcification drive seawater carbon chemistry), we concede that it is a point worth mentioning in the paper and we now provide a brief mention of this in the Discussion. Importantly, however, our study only included some components of the reef benthos, arguably the most important and dominant components, and does not capture the contribution from

other key groups such as filter feeders and the plankton community. Therefore the photosynthesis to respiration ratio reported in this study does not necessarily reflect the P:R ratio of an intact reef. All technical comments by Reviewer 1 have been taken on board.

Interactive comment on Biogeosciences Discuss., 10, 1831, 2013.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper