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Interactive comment on "CO_3^{2-} concentration and pCO_2 thresholds for calcification and dissolution on the Molokai reef flat, Hawaii" *by* K. K. Yates and R. B. Halley

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Our calcification rates are, in fact, 4-hour rates. We normalize our calcification rates to the volume and surface area of the incubation chamber to calculate rates for benthic surface area. We reported the dimensions of the incubation chamber for our 1.2 m tall chamber. However, due to the shallow nature of the reef flat, we used our 0.6 m tall incubation chamber and, inadvertently, forgot to change this in our methods section. We suspect that you used the volume/surface area ratio in your calculations assuming 1.2 m. Also, this value varies for each experiment due to the flexible nature of the tent covering the chamber and change in volume of coral inside of the chamber. We measure the volume during each deployment by injecting a known quantity of dye and measuring the concentration inside of the chamber. We will correct the manuscript with the appropriate dimensions.

We are not exactly sure how you re-calculated the calcification rates and pCO2 values in your table. It appears that you have calculated average numbers for hourly calcification rates and average pCO2 for day and night. If you plot the average hourly calcification rate for day or night vs. average pCO2 for day or night for each substrate type on the same set of axes, we would not expect to see a correlation either. As we point out in the paper and in "Response to Anonymous Referee #2", different substrate types (and similar substrate types measured during different time periods) respond differently to pCO2. Therefore, we have examined each substrate individually. As a result of this variability, you cannot create a composite data set (as you have tried to do with this example) and expect to see a significant correlation.

If you plot 4-hour calcification rates over 24-hour time periods, pCO2, and CO32- vs. time for each substrate type, it is very evident that clear correlations exist among these parameters, and the trends (increases during the day and decreases during the night) are generally the same for all locations. The slopes of the regression curves are different for each location reflecting the variability in response from each substrate type. As discussed by another reviewer (J.P. Gattuso), it is difficult to tease out whether or not the day/night trend in calcification and dissolution is due only to pCO2, or to a combination of irradiance and pCO2 effects. There is also a question as to how much of a calcification/dissolution signal we are seeing from pore water in the underlying sediments. However, the results of our unpublished CO2 injection studies on the Molokai reef flat (discussed in "Response to C. Langdon Comment of 8 February 2006) confirm that pCO2 and saturation state are exerting a moderate level of control on dissolution and calcification at this study site.

We don't believe that pCO2 is the only factor exerting control on calcification and dissolution, but we do believe that it is exerting a moderate level of control and have speculated on the implications of this data set with respect to future pCO2 levels. Note that we have cautioned the readers on the limitations of this data set. This is the first attempt that we know of to determine pCO2 and CO32- threshold values in a natural

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reef community, and feel that it is important to discuss the implications as a first approximation that will undoubtedly be modified as additional data sets are published and variability in these threshold values are understood.

Interactive comment on Biogeosciences Discussions, 3, 123, 2006.