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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 incubation chamber system measures net changes as a result of processes in the surface water, reef structure, and shallow sediments. Our experiments, thus far, have not been designed to discriminate which dissolution processes are occurring (pore water dissolution, endolithic and other bioeroding organisms, etc.). We agree that the dissolution we see is likely taking place in the pore water of shallow surface sediments. We don't know, at this point, what the carbonate speciation is in these pore waters, or how deep within the sediments this interaction occurs, but, our current experiments are designed to try to tease this out. We do know that dissolution in shallow pore waters is responding to changes in surface water chemistry to some unknown depth depending on porosity, permeability, and advection/diffusion. We know this primarily from experiments on the Molokai reef flat (unpublished data) whereby we injected CO2

into the system during daylight hours, and observed a dissolution response similar to that which we observed at night during the experiments presented in our manuscript. We observed the same trends and dissolution response during similar CO2 injection experiments performed on reef sediments in South Florida (Halley et al. 2004). The threshold values we report for the Molokai reef flat are the surface water pCO2 and CO32- concentrations that are forcing the system (surface and shallow pore water combined) towards dissolution. We don't believe you can treat the surface water mass and pore water mass separately in our system because they affect and are affected by each other. We do agree that much work remains to be done to begin to quantify individual processes and their contribution to the community system.

Specific comments: Thank you for pointing out the additional references to add to our introduction, the Langdon et al. 2000 discussion, and the technical corrections. We will include these in our revised manuscript.

References: Halley, R.B., Yates, K.K. and Brock, J.C.: South Florida coral-reef sediment dissolution in response to elevated CO2.

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