

We thank the reviewer for further comments.

We agree that SEM images would be beneficial for this study, but we regretfully do no longer have the option of performing these analyses, as the samples were dissolved in their entirety in order to perform the Ca isotope analyses. However, the experimental setup was essentially a replicate of the experiments detailed in Stanley, Ries, and Hardie (2010), which do include SEM images, and we assume that the features of our samples are similar. If we had been able to access samples from the earlier study, we would have, but unfortunately no sample remained. The replicate experiment was performed with the exclusive purpose of obtaining Ca isotope data to compare the calcite to aragonite fractions. We direct the reader's attention to the original, complementary 2010 paper more clearly throughout the manuscript, in particular in the subsection on the experimental setup, as well as in the introduction.

As suggested, we have incorporated content at the beginning of the discussion with further details on the calcification of *Halimeda*, incorporating information from the Larkum et al, 2011 paper that was brought to our attention.

We have now mentioned in the methods section that the calibration curve for % aragonite vs. calcite was a curve fit to the data, rather than a linear fit.

We have added a simple calculation of a Rayleigh distillation model for our interpretation of the vital effect. The enrichment of 0.25 permil in the integrated precipitate corresponds to 25% Ca removal from the reservoir, as is now explained in the discussion.

In response to concerns about calcification rate, we would like to point out that precisely because *Halimeda* do not control the calcification process, but merely induce it, the rate of calcification (which is distinct from the rate of growth) should be largely controlled by inorganic reaction kinetics. It is using this model, which was the reason for choosing *Halimeda* as the test organism for this study, that allows us to make inferences about the mineralogical control, the expected fractionation, and the magnitude of the Rayleigh effect. Studies on foraminiferal calcification (e.g. Kısakürek et al, 2011) are demonstrably more complicated and we have intentionally used *Halimeda* to be able to isolate particular effects. Data on *Halimeda* Mg/Ca, which look very much like Mg/Ca in inorganic phases, support this interpretation and we cite this result in the text (first and second paragraphs of discussion).

In response to questions about the calcite XRD profile: we agree that calcite is very easy to detect with XRD. However, the total amount of carbonate was so small with sample #6 that there was not sufficient powder to cover the X-ray spot, and we did not want to risk transferring the sample and potentially losing more material and failing to acquire a Ca-isotope ratio. Thus, the detection of a poor signal is not likely to be amorphous material, as imaging of *Halimeda* skeletons has always shown clear mineral forms (Stanley et al., 2010; Borowitzka and Larkum, 1987). We have included a new figure showing the XRD profiles to support the absence of aragonite and the presence of calcite. Again, we regret that we are not able to perform SEM analyses on the experimental samples, although we anticipate that the images in Stanley et al, 2010, reflect the state of our experimental samples very closely.

The main contention of the reviewer is that the results based on a single calcitic sample are not convincing. All the authors believe that this sample and the interpretation it points to, even if only suggestively, is an important part of the study. To reconcile these opinions, we take the advice and try to treat the interpretation more cautiously. Perhaps our initial attempt to be conservative and cautious was instead viewed as a 'vague interpretation' – we have tried to improve this throughout the results and discussion sections. Specifically, we hope that rewriting lines 233-236 and 253-268 has clarified the interpretation.

We hope that our work to improve the manuscript will support its eventual publication in Biogeosciences.