

## ***Interactive comment on “Low Florida coral calcification rates in the Plio-Pleistocene” by T. C. Brachert et al.***

### **Anonymous Referee #1**

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Review of BGD-12-20515-2015, Low Florida coral calcification rates in the Plio-Pleistocene This work is a very interesting analysis of calcification parameters from 1-3 myo Scleractinians. The authors used microscopy and xray tools to determine calcification parameters in fossil corals and compare these data to those from the literature. They then use isotopic analyses to determine reasons for lower calcification in FRT fossil corals than in modern western Atlantic and Indo-Pacific. The calcification parameters from *Solenastrea* add to our understanding FRT coral reef dynamics and are therefore important. However, I have several broad reservations with this manuscript and recommend that it be revised and resubmitted. First, the overlap with the group's GPC paper is too strong. Second, the authors should show additional evidence that the fossils are not diagenetically altered. Finally, it is worrisome that the data presented

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suggest environmental conditions for the FRT opposite to that reported by other groups; if the authors cannot resolve this and more clearly link their calcification data to likely environmental conditions, then the manuscript does not fit the Aims and Scope of Biogeosciences. 1. I am not convinced of the 'pristine' nature of the fossil corals. In my experience, fossil corals may exhibit persistence of aragonite, as detected by powder XRD, but elemental analyses reveal a degree of reconstruction. This is particularly in evidence for Fe/Ca, Mn/Ca, and Sr/Ca in aragonite. Do the authors have any elemental data to support their XRD data for minimal recrystallization of the samples? I do not see that the group's 2014 GPC paper fully addressed this issue. Gothmann et al. 2015 GCA (<http://dx.doi.org/10.1016/j.gca.2015.03.018>) and Anagnostou et al. 2011 GCA (75: 2529-2543) suggest several other tests for preservation as well. 2. While it can be useful to make inter-specific comparisons, I find the inclusion of data from *Orbicella* and *Porites* to be unhelpful to this manuscript. Most notably, sample replication for these genera at each age is minimal or non-existent. Additionally, the data presented in figures 4 and 5 indicate that the aragonite formation processes and responses to environmental drivers differ between the genera (already quite well-established). And page 20525, lines 21-22 state 'No consistent relationships... exist... between taxa'. The work would be stronger with a focus on *Solenastrea*. 3. Genera used for the various analyses is unclear. The Methods suggest that *Orbicella*, *Solenastrea*, and *Porites* were used to determine calcification rate/density and for stable isotope analysis (this matches with Table 1). But then the beginning of the Results adds in *Diploria*. Please clarify. 4.  $\delta^{13}\text{C}$  is mentioned in the methods (likely because it was included in a previous paper from which the  $\delta^{18}\text{O}$  data are re-used) but is not addressed later in the manuscript.  $\delta^{13}\text{C}$  references should be removed. 5. With respect to stable isotope analyses, there appears to be significant overlap with this group's 2014 GPC paper. The authors should clarify how this manuscript is related to but independent of their GPC paper. 6. Comparisons are frequently made to modern IP corals. IP environmental conditions are so different from modern WA conditions (which are much more similar to Plio-Pleistocene flow regimes) that the comparisons are unnecessary in my

opinion. 7. The authors state that their data suggest high pCO<sub>2</sub> or upwelling and low temperatures (relative to modern), but that the literature supports the opposite conditions for the geological ages studied. How do the authors rationalize this? 8. The first sentence of the conclusions describes this work as ‘the first record of calcification rates from fossil reef corals’, but on page 20533 the authors compare their calc rate data to that from previous studies. 9. Table 2 should make reference to the data obtained from the literature and clarify the primary data from this study. 10. Table 3. Authors state that bold denotes minimum values, but I do not see ant bold text.

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