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Discussions

Interactive comment on "Upwellings mitigated Plio–Pleistocene heat stress for reef corals on the Florida platform (USA)" *by* T. C. Brachert et al.

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Dear editors, we thank J. Cortés for his review. He has been raising three issues: 1. The number of corals investigated in our study is too small for a meaningful result. In particular, more material should be documented from the oldest geological unit. Answer: It should be kept in mind that is the first study to present calcification records from fossil reef corals. The dataset from the oldest unit presented in the paper has been taken from the literature, and we have no materials of our own from that published site. This is the reason why no density data are available for our study. It should also be taken into consideration that a huge effort is necessary to collect material suitable for a study like ours from geological outcrops. In contrast to studies on recent corals, all materials must be carefully selected in the field and screened in the labora-

tory as being suited for proxy analysis and density measurement. Scientist colleagues working with fossil corals will be aware of the problem. In addition, it was a huge effort of taking and analyzing ∼1000 stable isotope samples. For this reason, we must admit to be very happy with what we have finally got. We agree, nonetheless, that more material is desperately needed... 2. Lumping together different taxa may blur calcification systematics. Answer: We agree with Cortés, that a homogeneous sample consisting of one single taxon is the method of choice. In the introduction, we clearly point out the taxonomical issues related to calcification (page 5, lines 1 – 20) and it is true that calcification patterns described for Porites and Orbicella (Montastraea) differ significantly. We suffer, however, for the reasons pointed out above, a significant sample limitation. For this reason, we decided to build our work on data from more than one taxon and follow a "big data" approach assuming no significant taxonomical effects on calcification rate. We used one specimen of Porites and two of Orbicella together with a bulk of specimens of Solenastrea. Interestingly, in cross-plots of extension rate, bulk density and calcification, the data from the fossil Porites and Orbicella do not differ clearly from the main body of fossil data. It is not clear whether this is an effect of statistics, but it should be kept in mind that the differences in calcification patterns described in the literature between recent Porites and Orbicella may to some degree also be an effect of context or oceanography. We discuss this problem extensively in a BG companion publication submitted shortly after this one (Brachert, T.C., Reuter, M., Krüger, S., Klaus, J.S., Helmle, K., Lough, J.M. (2015): Low Florida coral calcification rates in the Plio-Pleistocene.- Biogeosciences Discussions, 12, 20525-20555; doi:105194/bgd-12-20515-2015). For this reason, we recommend it is not necessary to introduce an elaborate discussion on the subject within this paper. 3. Variable phase relationships of the density banding and serial stable isotope data. Cortés suggest the problem to be discussed with colleagues. TB has discussed personally our data with Peter Swart (as suggested by the reviewer) during summer 2015, and TB cannot remember him to have disagreed on the possibility of phase changes between the timing of density band formation and stable isotope chronologies to occur. By the way, there

are only few studies on recent corals describing the phase relationships. In a study on Solenastrea from Florida Bay, phase shifts have been clearly documented (Swart et al., 1996, PPP). As far as we know, there is no paper by Carricart-Ganivet on stable isotope data. Cortés also stresses our tables to be not formatted consistently. We find the listing of samples according to geological age and sample code a good idea. This formatting is consistent with a previous publication (Brachert et al., 2014, GloPaCha) and the companion paper mentioned above. For this reason we consider it more confusing then helpful to make changes to the table format. Comment on Figure 2: Images are not very good. It is not possible to see what is pointed out. Answer: We will add some arrows to make clear what is to be seen.

In case you have any question, please feel free to contact us again.

Sincerely, yours Thomas Brachert and co-authors

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