

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

Anonymous Referee #1

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While this is an interesting paper, and will likely be a useful contribution to the literature in the future; however, as it stands, there are a number of significant matters which need to be addressed if it is to be accepted for publication.

Perhaps most easily remedied, the paper does not refer to or take into account the results of a number of recent and high-profile publications which directly deal with the interpretation of environmental influences on modern coral skeletal records. These are:

De'ath, Lough and Fabricius (2009) *Science* 323(5910): 116-119 De'ath, Fabricius and Lough (2013) *Marine Geology* 346: 400-402 Cantin et al. (2010) *Science* 329(5989): 322-325

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These publications demonstrate relationships between SST and coral calcification rates in banded massive corals, but importantly, show that other, but as yet unidentified decadal-scale factors can potentially have significant effects on calcification rates. The De'ath et al papers were based on work in the Great Barrier Reef (GBR) where there is no evidence for upwelling processes influencing the rates.

My other problem with the paper lies with the use of 'upwelling'. There are many types of upwelling processes in the oceans, with different spatial domains and temporal scales. It is not entirely clear what type of 'upwelling' the authors have in mind. The reader may have an entirely different interpretation of this scheme. The primary type of upwelling observed today in Florida is associated with shoaling of the thermocline in the Loop Current and Gulf Stream along the shelfbreak allowing upper thermocline waters to intrude laterally onto the outer shelf. Is there evidence that these processes were operating in a similar way in the past? Modern intrusive upwelling processes in this region are both episodic and intermittent, especially in very shallow waters. The dynamic nature of modern intrusive upwelling processes seem to be at odds with the multi-year to multi-decadal time scales of variation observed in the relatively coarse temporal sampling of the coral skeletons. This needs to be better explained and resolved.

The authors need to consider other potential sources of near-surface temperature variation operating at decadal time frames. These might include: large-scale fluctuations in the surface temperature of source water entering the pre- Caribbean and Gulf of Mexico during this period, factors which might be causing changes in the thickness of the surface mixed layer in the pre-Gulf of Mexico region, potential atmospheric cooling of surface waters due to regional-scale climate fluctuations, as well as decadal-scale variations in the strength of the Loop Current/Gulf Stream that would affect thermocline depths along the western Florida shelfbreak.