

## ***Interactive comment on “Evidence of intense climate variation and reduced ENSO activity from $\delta^{18}\text{O}$ of *Tridacna* 3700 years ago” by Yue Hu et al.***

### **Anonymous Referee #2**

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#### General comments:

Hu et al. present a new oxygen stable isotope record of a fossil giant clam from the South China Sea, which reveals new high resolution insights into the ENSO activity dated back 3700 yr BP and fine-tuned using a modern *Tridacna* for comparison. As this study fits well into the journal's scope I rate this manuscript to be of high interest to the audience of *Climate of the Past* and encourage publication after minor revision. As the study was carried out on only one specimen it has a “case study-like” read, however, the authors convince me that their application bears high potential for a potential larger-scale study with more specimens. The manuscript is well structured and outlined. The methodological part appears sound, which is apparent when e.g. sampling resolutions are discussed. I feel the introduction could benefit from discussing

C1

and citing more sclerochronological papers discussing oxygen stable isotope records from bivalves (they don't have to relate to the sampling site) and I would strongly argue that a recent paper demonstrating shell architecture of *Tridacna* ought to be mentioned and cited (Agbaje et al.2017). Further, I have some comments to the title (see below) and there are a few other (mostly language) issues that I feel need fixing before moving forwards and I provide a list of more detailed comments below to address these. I enjoyed reading this study and hope the authors will find my suggestions helpful and encouraging!

#### Specific comments:

L1-2: I believe the use of “ENSO” in the title is not wise. Titles should be fully understandable to a broad audience and community-specific abbreviations should be avoided. I'd urge the authors to type out “ENSO” or phrase this differently. Also it may be good to use “Giant Clam” instead of “*Tridacna*” in the title.

L22: “are the largest marine bivalves” and “carbonaceous shell” and “can be used for high-resolution paleoclimate reconstructions”. L47: delete “of”.

L48: “physicochemical” is weird in this context – do you want to record environmental signatures encoded within the biocarbonate or do you want to look at physiological variations that may or may not be influenced by external factors?

L49: “on past climate dynamics” delete “the”.

L50-51: I recommend also citing the most recent work on the crossed-lamellar shell architecture of *Tridacna* see reference: Agbaje, O. B. A., R. Wirth, L. F. G. Morales, K. Shirai, M. Kosnik, T. Watanabe, and D. E. Jacob. "Architecture of crossed-lamellar bivalve shells: the southern giant clam (*Tridacna derasa*, Röding, 1798)." *Royal Society open science* 4, no. 9 (2017): 170622.

L54: I doubt that *Tridacna* lives up to “few centuries” where is the evidence (reference)? This may have been mixed up with Arctica shells or other long-lived bivalves but these

C2

are very different from *Tridacna*!

L57: “precipitate” is really a wrong term when talking about shells as it is closely associated with classical crystallisation pathways (i.e. “inorganic” systems). However, we know for more than over a decade now that shells form by non-classical crystallisation pathways via precursor phases (amorphous calcium carbonate and/or vaterite). I am not saying you need to venture into the area of shell biomineralization here but I would strongly argue to find a better word for this text passage. Maybe replacing “precipitate their shells” with simply “grow”.

L59-60: What do you mean with “ontogenetic reduction”?

L80: “occurring nowadays”, however, I think you should try and find a more appropriate word than “nowadays” as this sounds perhaps too casual and please replace throughout manuscript.

L83-84: Better: “High-resolution isotopic geochemical data from *Tridacna* may provide detailed insight into climatic variations of this period.”

L117: “give distinct seasonal SST to the *Tridacna* from the coral reefs” reads clumsy, perhaps change to “provide distinct seasonal SST for *Tridacna* populating the coral reefs of the Xisha Islands”.

L123-125: I don’t understand “rehandling” do you mean “re-sampling”? I agree with referee 1 that this sentence needs to be rewritten for more clarity. Please change throughout the manuscript.

L130-131: Perhaps better: “It is excluded that river runoff effects SSS as the Xisha Islands are at a XXX km distance to the continental mainland.” Please quantify roughly to provide evidence.

L138-143: I recommend providing a sentence regarding the crossed-lamellar shell architecture of *Tridacna* see above mentioned reference Agbaje et al. (2017).

### C3

L144: when you mention “<sup>14</sup>C AMS” for the first time I recommend providing the full method name in brackets (replace “<sup>14</sup>C AMS” with “<sup>14</sup>C AMS (Accelerator Mass Spectrometry)”) for readers that lack this methodological background.

L145: I don’t understand the meaning of “conventional” in this sentence – maybe not the right phrase? What is the uncertainty? First or second standard deviation or something else?

L154: “from adult to childhood” is not the right phrase how about “in a transect from adult to ontogenetically younger shell”?

L185: “40 dark/light couples (each representing one year)” please explain how dark-light line couples relate to time/tide schedules/seasonality. How much time/which tide pattern does one ark-light line couple stand for?

L192: Increments are not obvious to me from the image. Especially Fig. 3b is not clear what one should see, perhaps choose a different image with better resolution.

L192-193: “In general, *Tridacna* A5 grew faster in warm seasons and slower in cold seasons (Fig. 3b).” Where is your evidence for this assumption? I feel you need to back this up as this varies between species and you need to demonstrate to the reader that it is the case for *Tridacna*. Also more seasonal information may be needed to achieve this. How long are summers how long are winters? For example: if a reader believes summer and winter are similar in length one could misinterpret short low  $\delta^{18}\text{O}$  periods may have just been formed quicker (and have thus higher not lower growth rates!). This all needs more explanation and demonstration and is important as you build upon this later in the discussion. Perhaps see other papers I suggest any study by Carré et al as they are very educative in this respect.

L196-197: I don’t understand this sentence.

L201: Perhaps not everything about *Tridacna* but  $\delta^{18}\text{O}$ ?

L259: “lived 3700 years ago” delete “in”.

### C4

L286-287: Better: "Due to a higher sampling density in Tridacna...".

L288: "magnified" is the wrong word here.

L292: "switching" wrong word, replace throughout manuscript.

L293-294: This sentence contradicts itself and needs rewording for clarity.

L296-299: reads more like an introduction section and is not relevant here (suggest to delete).

L303: "instrumentation data" is odd.

L326: "calcite-affected" sounds also a bit odd to me maybe you can find a better term. Why is calcite "bad" in this sense? Why is it a limitation?

L326-328: Better perhaps: "Analyses of Tridacna species are performed to overcome this limitation by taking advantage of their denser shells, negligible diagenetic alteration, and oxygen isotopic equilibrium with seawater."

L338: unclear.

Figure 1: It looks like your 5 cm scale bar is too large for the scale in the figure (measuring tape, here 5 cm look smaller). There are some grammar issues in the figure caption.

L633: "amplitude" may not be the right word here.

L635-636: "under the microscope, daily increments grow slower in cold seasons, but faster in warm seasons" – this is not visible from microscope images alone! This needs more explanation! Also, image is not really easy to understand (what should be seen? It's all very blurry).

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-54>, 2019.