

Interactive comment on “The role of light as vital effect on coral skeleton oxygen isotopic ratio” by Anne Juillet-Leclerc

Anonymous Referee #1

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The manuscript by Juillet-Leclerc addresses the following question:

How does light intensity affect the relationship between a coral oxygen isotope ratio ($\delta^{18}\text{O}$) and sea surface temperature (SST)?

The author previously reported an increase in coral $\delta^{18}\text{O}$ with increasing light intensity (Reynaud-Vaganay et al., 2001; Juillet-Leclerc and Reynaud, 2010) and now revisits its previously published coral $\delta^{18}\text{O}$ data to explore the potential effect of light on the variability of coral $\delta^{18}\text{O}$ -SST relationships.

The problem addressed in this manuscript is of great relevance to the palaeoceanographic community but the method employed by the author prevents any significant and conclusive result. The main methodological issues are detailed below:

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1. The author neglects the effect of seawater $\delta^{18}\text{O}$ on the individual coral $\delta^{18}\text{O}$ -SST calibrations discussed in the MS and attributes most of the calibration differences to the effect of light. It is well established that temporal variation in SST and seawater $\delta^{18}\text{O}$ are commonly related (e.g. Cobb et al., 2001), which significantly affects a coral $\delta^{18}\text{O}$ -SST relationship. I strongly recommend carrying the data analysis using ‘ $\delta^{18}\text{O}_\text{coral}$ - $\delta^{18}\text{O}_\text{seawater}$ ’ instead of ‘ $\delta^{18}\text{O}_\text{coral}$ ’ alone.
2. Most of the demonstration is focused on finding the cause of variations in the slope (a) and intercept (b) of coral $\delta^{18}\text{O}$ -SST relationships. The author uses the slope (a) as an indicator for isotopic disequilibrium: meaning a slope deviating from “-0.2 per mil/degC” indicates isotopic disequilibrium. Again, the effect of seawater $\delta^{18}\text{O}$ on the coral $\delta^{18}\text{O}$ -SST relationship (including the slope) greatly varies with location and cannot be ignored.
3. ‘Light intensity’ is supposed to be the main parameter tested/discussed in this MS but light intensity data are not shown on any figures or table. The author speculates on a potential link between light and observed coral $\delta^{18}\text{O}$ -SST relationships without any clear evidence of a link between the two parameters.
4. I could not understand why a correlation between the slope and the intercept of the coral $\delta^{18}\text{O}$ -SST relationship had something to do with light intensity and/or coral calcification mechanisms. I do not discard a potential link between these parameters but was simply unable to follow the author reasoning. More generally, I do not think that a link (whether empirical or mechanistic) between light and coral $\delta^{18}\text{O}$ can be assessed with the data presented in this MS.
5. The kinetic isotope effect of McConaughey (1989) and the role of carbonic anhydrase (Devriendt et al., 2017, Chen et al., 2018) on coral $\delta^{18}\text{O}$ are neglected in this MS.

As a general recommendation, the data compiled in the MS is interesting and could serve another purpose than testing the role of light on coral $\delta^{18}\text{O}$. A more general

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paper on coral annual vs seasonal d18O-SST relationship seems more adapted.

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