Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-433-AC1, 2018

Biogeosciences Discussions
Open Access
EGU

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

Juillet-Leclerc

anne.juillet-leclerc@lsce.ipsl.fr

Received and published: 11 December 2018

a The referee #1 forgets to mention Juillet-Leclerc et al. (2018), where the light role is highlighted at micrometer size. In all the references the light influence on coral skeleton δ18O is proved. The following manuscript is an up-scaling of the conclusions of Juillet-Leclerc et al. (2018).

b The method that I employ in my manuscript is the listing of some details from coral literature where the lack of light effect induced biases. Of course, I cannot show the light record corresponding to the studies that I referred to but knowing light effect on coral skeleton δ18O, I am able to recognize and explain light impact on oxygen isotope.

1 δ18O-SST In the paragraph 2.1.2, I refer the consequences on the correlation coef-

Printer-friendly version

Discussion paper

ficient of the calibration annual δ18O–annual SST after introducing δ18Oseawater. In the paragraph 2.2.1.2, I explain that δ18Oseawater is included in skeleton δ18O but at a lesser degree than SST. Where is light in this comment? In the paragraph 2.2.1.1, I explain that in the term 'temperature', light is hidden as the trigger of photosynthesis increase (decrease) due to temperature increase (decrease) and how δ18O is indirectly affected by light.

2 The slope (a) as an indicator for isotopic disequilibrium Annual Calibrations In the paragraph 2.1.3, I highlight that the constants (a) and (b) from a calibration annual δ18O–annual SST are strongly related. In the paragraph 2.2.2, I consider that a=-0.19 being the theoretical slope of δ18O temperature equation at equilibrium (Kim et al., 2007), the other values of (a) reflect more or less great degree of disequilibrium. The link existing between the constants of annual δ18O–annual SST and those of annual SïĄšïĂŕCïĄą–annual SST allows the link to the relative distribution of microstructures in coral aragonite to be demonstrated. Where is light in this comment? Taking into account Juillet-Leclerc and Reynaud (2010), it is easy to relate fibre existence, one of the aragonite microstructures to light influence on δ18O.

Monthly Calibrations In the paragraph 3.1, I mention all the (a) and (b) relationships deduced from the studies chosen for the demonstration. I consider again, that a=-0.19 being the theoretical slope of δ18O temperature equation at equilibrium (Kim et al., 2007), the other values of (a) reflect more or less great degree of disequilibrium. After explaining the local potential light impact on monthly δ18O in paragraph 3.2.1, the relationship between constant of monthly δ18O-monthly temperature is related to the aragonite microstructures distribution identical to that of annual calibrations, which is recalled on figure captions of Figure 2, Figure 3, Figure 4, Figure 5, Figure 6 and Figure 7. Where is light in this comment? Taking into account Juillet-Leclerc and Reynaud (2010), it is easy to relate fibre existence, one of the aragonite microstructures to light influence on δ18O.

3-4 The factor 'Light intensity' In the introduction of paragraph 2.2, I explain how dif-

Printer-friendly version

Discussion paper

ferent light incidences may affect coral growth condition, considerations well known by biologists. In the paragraph 2.2.1, I explain how temperature is recorded twice in δ18O, which is indirectly affected by light. This part of the manuscript justifies the role of light, which strengthens WW72 conclusions. A part of the response is given in b. Other justifications figure in 2.

5 Kinetic process In Juillet-Leclerc et al. (2018), it is demonstrated that coral skeleton δ18O results of kinetic isotopic fractionation because isotope measures are conducted at micrometer size scale. The conclusion arguments are supported by the biological control of aragonite crystallization. This process is in opposite with Devriendt et al. (2017) and Chen et al. (2018) papers, based on a coral mineralization process purely of physical origin. The kinetic process discussed in Juillet-Leclerc et al. (2018), is not related to calcification rate as is defined by Barnes and Lough (1996) and in McConnaughey (1989) but rather to kinetic fractionations affecting H2O-CO2 system or CaCO3 molecules. The present manuscript does not concern molecular processes and does not involved calcification rates.

Conclusion I admit that when light effect is not identified as soon as the first paragraphs, it is difficult to pay attention before the last paragraphs, comparing annual and seasonal δ18O-SST calibrations.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-433, 2018.

Printer-friendly version

Discussion paper