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# Dual temperature effects on oxygen isotopic ratio of shallow-water coral skeleton: Consequences on seasonal and interannual records

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Oxygen isotopic ratio from coral skeleton is regarded for a long time as promising climate archives at seasonal scale. Although in isotopic disequilibrium relative to seawater, it is supposed to obey to the isotope thermometer. Indeed, coral oxygen isotopic records are strongly temperature dependent, but d18O-temperature calibrations derived from different corals are highly variable. The isotope thermometer assumption does not take into account vital effects due to biogenic origin of the mineral.
Corals are animals living in symbiosis with algae (zooxanthellae). Interactions between symbiont photosynthesis and coral skeleton carbonation have been abundantly observed but they remain poorly understood and the effects of photosynthesis on coral growth and skeleton oxygen ratio are ignored. Coral cultured under two light conditions enabled to relate metabolic parameters and oxygen isotopic variability with photosynthetic activity. By examining responses provided by each colony they revealed that photosynthesis significantly affected d18O, by an opposite sense compared with the sole temperature influence. Since temperature and light changes are associated during seasonal variations, this complicates the interpretation of seasonal record. Additionally, this complexity is amplified because photosynthetic activity is also directly impacted by temperature variability. Thus, the annual isotopic amplitude due to the "physical" temperature influence is partly compensated through photosynthesis. Similar opposite effect is also shown by extension rate of the cultured colonies.
First, we will examine and quantify consequences of photosynthesis on growth rate and oxygen isotopic signature, from cultured corals. Second, we will consider the consequences of this vital effect on data series, at seasonal and interannual time scales.