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The dual temperature influence on coral skeleton oxygen isotopic ratio

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The coral skeleton oxygen isotopic ratio is in disequilibrium, always lower than inorganic aragonite formed in similar conditions. In addition, 18O/16O of skeleton deposited simultaneously in a unique site or from one head may vary. It is commonly called “the vital effect”.
It is known that skeletogenesis is strongly linked to photosynthesis activity, but the processes remain obscure. In order to understand the role of the photosynthesis on metabolism and d18O and to compare it to the single temperature effect, we cultured Acropora in constant and controlled cross-conditions of temperature and light. Indeed, on the fields these two parameters are always associated.
Our investigations revealed that photosynthesis acted on d18O, light increase leading to an increase of oxygen ratio. We also observed that higher temperature enhanced more than we expected photosynthetic activity. Thus, we realized that temperature could affect d18O both through a physical process implying a decrease and through photosynthesis producing an increase, physical effect remaining prominent. More, the experiments testing only temperature were biased by light. Growth rates were also differently affected by temperature.
We will examine some consequences of this duality on climatic investigation using 18O time series.