

**Carbon isotope fractionation in
phytoplankton as a potential proxy for pH
rather than for [CO₂(aq)]: Observations
from a carbonate lake**

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The method of reconstructing paleoatmospheric CO₂ levels using carbon isotope signatures of organic matter buried in sediments has been questioned due to the dubious foundation that carbon isotope fractionation during phytoplankton photosynthesis (ϵ_P) is controlled primarily by aquatic CO₂ concentration ([CO₂(aq)]). Consequently, what carbon isotope data from bulk sedimentary organic matter reflects is a puzzle. We determined the carbon isotope compositions of dissolved inorganic carbon (DIC) and particulate organic carbon (POC) in a lake located in a carbonate area [1]. The results of partial correlation analysis show that ϵ_P is more closely, and more steadily related with pH than with [CO₂(aq)], which is in accordance with recent advances in our understanding of the physiology of carbon utilization by phytoplankton for CO₂ and HCO₃⁻. Therefore, we propose that carbon isotope fractionation in phytoplankton is more suitable as a proxy of pH than of [CO₂(aq)]. One advantage of this amendment is that information on HCO₃⁻, the main species of carbon uptake by phytoplankton, is likewise included.

[1] Wang *et al.* (2016) *Limnol. Oceanogr.* 61, 1259–1270.