Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18298

Evaluation of the isotopic composition of carbon in the calcite produced by phytoplankton (coccolith $\delta^{13}C$ vital effects) in the modern ocean

ALBA GONZALEZ-LANCHAS[1], KARL HEINZ BAUMANN[2] AND ROSALIND E. M. RICKABY[1]

[1]University of Oxford
[2]Universität Bremen
Presenting Author: alba.gonzalez-lanchas@earth.ox.ac.uk

Coccolithophores, a cosmopolitan group of marine phytoplankton, account for a substantial fraction of global primary production of organic and inorganic carbon through the functions of photosynthesis and calcification, respectively.

The values of $\delta^{13}C$ in the calcite intracellularly produced by this phytoplankton group (calcium carbonated scales called coccoliths), are known to exhibit variable isotopic offsets to the abiogenic reference of equilibrium. The meaning of these values in not unilaterally understood but suggested to be controlled by the physiology of coccolithophores and/or the environmental conditions during calcification. Observations in culture indicate the rate of calcification to organic carbon fixation by cell, or production or inorganic to organic carbon (PIC/POC), to be an important element influencing the coccolith $\delta^{13}C$ vital effects. But other parameters, as the rates of coccolithophore cellular growth, or the availability of CO_2, can also differently affect these isotopic offset values [1]. The confirmation of these influences in the natural environment, its direction and magnitude, remains scarce up to date, but crucially required in order to i) provide a better understanding of the isotopic fractionation of carbon during the function of phytoplankton calcification ii) build new and consistent geochemical proxies for paleoclimatic reconstruction, on a geological perspective.

Here we present values of coccolith $\delta^{13}C$ and $\delta^{13}C$ vital effect measured in coccoliths extracted from sediments precedent from core top records covering a huge range of latitudes and environments across the Atlantic Ocean. The integration of geochemical values with a complete set of independent measurements and/or estimations of PIC/POC and environmental conditions at each studied region provides an excellent opportunity to evaluate the meaning and controls of coccolith $\delta^{13}C$ in the natural environment

References:

[1] McClelland, Bruggeman, Hermoso & Rickaby (2017), *Nature communications*, 8(1), 14511.