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# Stable isotopes in coccolith calcite from sedimentary records

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After decades of research, the interplay between physiological and environmental parameters in governing carbon and oxygen stable isotope fractionation in coccolith calcite in the open ocean remain poorly resolved. Difficulties in characterizing coccolithophore physiology in the open ocean have traditionally hindered the contextualization of culture-based results. Likewise, stable isotope fractionation models derived from laboratory cultures remain too theoretical to be directly extrapolated to natural environments. A newly developed framework for the reconstruction of coccolithophore physiology from sedimentary records facilitates establishing that connection. We measure stable isotopes of oxygen and carbon in size separated fractions correspondent to physiologically differentiated calcifying phytoplankton groups from well-preserved sedimentary records. Our results provide insights of carbon demand to supply dynamics primarily governing the kinetics of carbon and oxygen stable isotope fractionation, imprinted on natural coccolith calcite precipitated across variable environmental gradients. This research provides confirmation of both micropaleontologically derived patterns of physiology with correlated expression in isotopes, consistent with culture-based results [1]. In all, these notions suggest that culture-based evidence for interpretation of coccolith stable isotopes extend to the field results, establishing a new route for the application of sedimentary coccolith calcite stable isotopes records in paleoclimate and paleophysiology research.

References

[1] Chauhan, N. & Rickaby, R. E. (2024). *Geochimica et Cosmochimica Acta*, 373, 35-51.