Geochemistry of the coccoliths: proxy of surface water conditions or of resilience of coccolithophores facing climate change ?

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Coccolithophores, the pelagic calcite ocean producers, experience ocean acidification and warming of Anthropocene. Concomitantly, they can recorde changes in pH and temperature (SST) in surface waters, through the incorporation of elements (B, Sr, Li, Mg) and isotopes ($\delta^{11}B$) in their biominerals (coccoliths) during biocalcification. Yet, geochemistry of coccoliths is still relatively unexplored so far, stressing the need for calibration of such proxies in coccoliths. In this work, we studied the geochemistry of coccoliths deposited on top-core sediments of worlwide ocean. Elemental and isotopic compositions of these archives were then plotted against *in situ* data of surface-pH and SST to investigate potential relationships.

A positive relationship was found between the B/Ca ratio of large sedimentary coccoliths (5-12 µm, mainly *C. leptoporus*) and surface-pH as predicted by thermodynamics, indicating these biominerals could be used as an archive of surface acidification. Conversely, the relation was negative for those of small size (3-5 µm, essentially consisting of *E. huxleyi* and *G. oceanica*), suggesting an increase of pH in the internal vesicle where coccoliths are formed when pH is decreasing in surface waters. Intra-vesicular pH regulation is favourable for the precipitation of calcite. We also showed that Li/Mg in coccoliths-rich sediments could be used to estimate SST. Our work constitutes an important step towards the calibration of proxies in coccoliths either to reconstruct surface water conditions, or to explore biocalcification mechanisms that will help to better anticipate and reconstruct the evolution of the pelagic calcification.