Separating the Coccoliths from the Clays and Unlocking New Trace Metal Proxies

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Coccolithophores are considered to be the greatest producers of calcium carbonate on the planet, their external plates constitute the largest single component of pelagic ooze [1], and their effect on and response to, the climate system is one of the biggest questions facing our field today; yet coccolith geochemistry has hardly been explored. Overshadowed by more accessible foraminiferal calcite, and limited by contamination from clay minerals, Sr/Ca remains the only trace metal proxy utilised in coccoliths.

Physical similarities between micron-sized coccoliths and trace-metal rich clay grains rules out purification by settling, and has so far prevented further geochemical analysis [2]. We describe a new approach to separation, exploiting the birefringent and fluorescent properties of coccoliths to descriminate them from clay grains in an automated cell-sorting device. This simple, rapid separation and collection technique, provides high purity coccolith samples ready for geochemical analysis.

Liberated from clay contamination we can further consider trace metal incorporation into coccoliths. Recent work by Rickaby et al. [3] indicates that differing orientations of crystal growth within a coccolith exert differing controls over trace metal content. To explore this we adapted the flow-through method of Klinkhammer et al. [4] to give accurate trace metal analysis from regions with differing solubilities. We will discuss how a mechanistic understanding and physical interpretation of these inhomogeneities presents opportunities for identifying and groundtruthing new and valuable palaeoproxies.

References

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