

An evaluation of acid decalcification methods to estimate coccolithophore PIC:POC ratios

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Accurate direct measurements of coccolithophore particulate inorganic and organic carbon ratios (PIC:POC) is crucial for understanding the role of these microbes in global ocean carbon flux. Direct measurements of POC are obtained by acid fuming filters to dissolve PIC (CaCO₃) prior to CN Analysis. There is great variation in the literature for this step suggesting a clear need for a standard operating procedure. Importantly, it is not standard practice to verify complete decalcification on acid treated filters, which could result in measurement errors. Our goal was to systematically test the efficacy of acid decalcification for several species of coccolithophores prior to CN analysis. We examined acid fuming wet or dry filters, time spent fuming, and whether there is a significant difference between acid fuming or direct addition of acid. Scanning electron microscopy verified acid fuming completely decalcified the filters and there was no statistically significant difference in PIC:POC ratios determined between 30 min and 24 h. Direct addition of 0.5M HCl to wet filters also yielded complete decalcification across all species and cell densities with less variation in subsequent CN analysis. This study provides crucial recommendations for accurate and precise PIC:POC ratios utilizing either acid fuming or direct addition protocols.

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