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Hydrogen and carbon isotopic composition (δ^2H, δ^{13}C) of fatty acids preserved in surface sediments of Baffin Bay and the Labrador Sea

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Fatty acids are composed of a chain of hydrogen and carbon atoms. As the length of their chain can theoretically indicate their sources (long-chain indicating terrestrial plants *vs*. short-chain indicating algae or bacteria), their use as proxies in paleoecology and paleoclimatology is increasing. However, the source of short-chain fatty acids identified in marine sediments is still under debate. We analyzed the abundance, stable hydrogen and carbon isotope composition (δ^2H, δ^{13}C) of fatty acids, the composition of the bulk sediment (%C_{org}%C and %N) , stable carbon isotope composition ($\delta^{13}C_{org}$) of the organic matter, and the dinoflagellate cyst assemblages (produced by single-celled algae) from 40 surface sediment samples from Baffin Bay and Labrador Sea. Our preliminary results revealed high concentrations of palmitic acid (C_{16}), a compound that likely reflects the dominance of autochthonous organic matter production in these coastal waters. Palmitic acid can be produced by phototrophic and heterotrophic algae but also by bacteria and microbes as a by-product of sedimentary organic matter remineralization. As algae use the surrounding water to produce fatty acids, their hydrogen isotope ratios are controlled in part by surface water, which is related to salinity. Previous work suggested that an additional biosynthetic fractionation, related to seawater salinity, enhances the sensitivity of this signature to salinity. However, our results show a negative relationship between the δ^2H of palmitic acid (δ^2H_{C16}) and sea-surface salinity, raising questions about its use as a proxy of salinity. We found a positive correlation between the abundance of phototrophic dinocysts and the concentration of palmitic acid, suggesting that phototrophic dinoflagellates, and possibly other phytoplanktonic organisms, produce palmitic acid. The δ^2H_{C16} values (-175‰ to -220‰) are consistent with values obtained in controlled cultures of phototrophic organisms, implying a dominantly phototrophic source. However, we observe no correlation between $\delta^{13}C_{org}$ and $\delta^{13}C_{C16}$, implying major variance in either the dominant organisms producing sedimentary palmitic acid or in carbon isotope fractionation during lipid biosynthesis. Hence, our dataset suggests that the use of δ^2H_{C16} as a proxy of salinity is equivocal and that the dominant source organisms for palmitic acid in high-latitude marine sediments is complex and highly variable.