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Estimating Holocene Sea Ice Algae Productivity in the Western Arctic using Stable Isotopes.

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The Western Arctic is one of the least understood ocean systems, largely due to the difficulty of obtaining samples. It is also an area experiencing considerable modification, with the effects of global climate change threatening to drastically reduce sea ice cover. The loss of sea ice will likely lead to higher primary productivity in the water column as sea ice considerably attenuates light penetration to the photic zone. However, total productivity may actually diminish given that algae growing on or within the sea ice are a significant component of overall primary productivity in the region, with recent estimates being as high as 4-26% in seasonally ice-covered areas (Gradinger 2009). The reduction of the ice algal component may then diminish total contribution of nutrients to the benthos. Sedimentary analysis of sea ice algae contributions to total primary productivity, and thus their impact on the Arctic carbon cycle overall, give us a perspective of what was occurring in the past at a location. Using mixing models, stable isotopes can be used to estimate relative contributions from multiple sources if the end members are well- constrained. In the case of West Arctic marginal seas, three possible end-members must be accounted for: terrestrial organic matter, marine phytoplankton and sea ice algae. Bulk isotopic data from Shelf Basin Interaction cores, supported by biomarker and compound specific isotope data from these same cores will enable a three membered mixing model to be constructed, allowing for the contributions of water column- and ice- algae to be quantified.