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Tracking Holocene paleoenvironmental conditions in the Beaufort Sea and their relation to sea ice variability

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Historical measurements of Arctic sea ice show its accelerated decline in recent decades due primarily to warming caused by anthropogenic greenhouse gas emissions. The anthropogenic effect on sea ice, however, does not fully explain the variability of sea ice on longer time scales, which several authors have attributed to different mechanisms, such as 1) insolation, 2) atmospheric temperature fluctuations, 3) Atlantic and Pacific inflows into the Arctic, and 4) moisture transport over the Arctic. This study uses two long sediment cores (4.2m and 2.2m in length) spanning the last 10 ka from the outer shelf of the Beaufort Sea to reconstruct sea ice variations in the western Canadian Arctic throughout the Holocene. Age-depth models of the shelf break region show decreased sedimentation rates (~12 cm/ka) during the last 8 ka compared to around 100 cm/ka from 10 to 8 ka. Variations in the concentration of the sea ice diatom proxy IP_{25} and abundance of the planktonic foraminifera *Neogloboquadrina pachyderma sinistra* are the primary proxies used to interpret changes in seasonal sea ice cover over the Holocene epoch which show a marked increase towards the late Holocene. Molecular biomarkers are used to interpret primary productivity (i.e., dinosterol, brassicasterol, highly branched isoprenoids), sea surface temperature (i.e., hydroxylated glycerol dialkyl glycerol tetraethers (OH-GDGTs)) and terrestrial input (i.e., branched glycerol dialkyl glycerol tetraethers (br-GDGTs), long chain diols, and b-sitosterol). Organic geochemical analyses (e.g. gas chromatography-mass spectrometry, high-performance liquid chromatography) are conducted on the sediment cores to separate and quantify the biomarkers to track sea ice variability along with changes in surface water parameters. This multi-proxy approach to reconstruct the Holocene sea ice history and paleoenvironmental conditions in the Beaufort Sea will contribute to a deeper understanding of the factors involved in sea ice dynamics relevant in assessing future sea ice variability.