Organic matter distribution and origin in marine surface sediments on the Canadian Beaufort Sea Shelf

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Abstract

The continental shelves of the Arctic Ocean are undergoing profound changes because of climate warming. Large amounts of previously freeze-locked carbon and nutrients are released towards the shelves due to increasing river discharge, deeper permafrost thaw and accelerated coastal erosion. Still, their interactions and their effects on carbon turnover and greenhouse gas fluxes between sediment, ocean, and atmosphere are poorly understood. This study aims to investigate the origin and depositional patterns of organic matter in the Canadian Beaufort Sea. To address this, long and short sediment cores were taken in fall 2021 from twenty-five positions along five major transects that spanned the Beaufort Sea Shelf. We discuss the concentration and regional distribution of organic carbon, nitrogen, mercury, and grain size in surface sediments (upper 2 cm). In addition, bulk ^{14}C radiocarbon ages and stable isotope ratios ($\delta^{13}C$ and $\delta^{15}N$) are used to help distinguish sources and degradation status of terrigenous organic matter. Preliminary results show that the material is predominantly fine-grained clayey silt, and the bulk surface ages vary between 5500 and 10000 years before present. We found specific spatial distribution patterns of carbon, nitrogen, and mercury, which highlight the influence of bathymetry, currents, and distance to the Mackenzie River delta on transport and degradation mechanisms of organic matter. The Permafrost Carbon in the Beaufort Shelf (PeCaBeau) project took place on the Research Vessel CCGS Amundsen in September and October 2021 on the Canadian Beaufort Sea Shelf. This project was funded by the EU Horizon 2020 Arctic Research Icebreaker Consortium (ARICE, grant no. 730965).