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Degradation of organic matter in nearshore waters of the Canadian Arctic coast

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Rapid increases in air temperature and sea ice loss in the Arctic are causing greater storminess and coastal erosion, enhancing the delivery of terrestrial, permafrost-derived organic matter into shallow coastal waters[1]. Additional terrestrial organic matter may settle on the seabed or degrade in the water column, releasing greenhouse gas emissions and acting as a positive feedback on climate warming[1].

Coastal erosion rates and controlling factors (e.g. cliff height, soil matrix) differ across the Canadian Arctic coast along with freshwater inputs[2]. This variability links to the characteristics of released organic matter (e.g. composition, carbon-mineral associations) affecting its susceptibility to microbial degradation in nearshore areas[3]. Here, we sampled waters along the varied Canadian Arctic coastline in August 2023 and executed short-term incubations (20–68 h, in the dark, ~5 ℃) on filtered and non-filtered waters. We measured dissolved O_2, a proxy for microbial degradation, at ~10 min intervals and analysed water chemistry parameters and nutrients before and after incubations. Further, to connect degradation patterns to environmental conditions, we measured *in-situ* water chemistry, water isotopes ($\delta^{18}O$), total suspended solids, particulate organic carbon (POC), $\delta^{13}C$-POC, total particulate nitrogen and dissolved organic carbon at each location.

Our preliminary results show a wide range in water isotope signal (from -19.95 to -4.04 ‰) and total suspended solids (from 15 to 754 mg L^{-1}) in nearshore waters, suggesting large variability between water sources and terrestrial inputs along the coast. Contrasting O_2 loss rates during incubations suggest variation in the processing of organic matter between sampling locations. Improved understanding of water column degradation rates will help us to improve estimates of organic matter processing and greenhouse gas emissions along the coast.

References:

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