Coupled organic & inorganic tracers of particle flux processes in the western Arctic Ocean

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A growing body of evidence suggests that particulate matter, including associated biogeochemically-relevant materials supplied to the interior Canada Basin in the western Arctic Ocean is dominated by lateral inputs. The magnitude and origin of lateral inputs has substantial implications for our understanding of biogeochemical cycling in the Arctic Ocean, its impact on ecosystems as well as on records preserved in underlying sediments.

Coupled application of organic and inorganic tracers offers a promising approach to unravel particle sources and cycling in the western Arctic Ocean due to the complementary information they provide and marked natural gradients in source characteristics. We constrain organic carbon sources using bulk compositions (C:N, $\delta^{13}C$, $\Delta^{14}C$) and lipid biomarker signatures (e.g., higher plant waxes, algal sterols, glycerol dialkyl glycerol tetraethers), and combine this with geochemical and mineralogical assessments of detrital sediment provenance based on neodymium and strontium isotope signatures and clay mineral compositions. Potential implications of future changes in the flux and provenance of materials supplied laterally to the central Arctic Ocean in relation to ongoing ocean and climate change are assessed.

The study examines core-top sediments from adjacent marginal seas (Beaufort Sea, Bering Sea, Chukchi Sea) as well as the surface sediments and sediment trap materials from the central Canada Basin.

Nd and Sr isotope ratios reveal a strong influence of the Mackenzie River on sedimentary signatures of the Beaufort Sea extending to the Chukchi Rise. Clockwise circulation of the Beaufort Gyre promotes widespread dispersal of these inputs and supply to the interior Canada Basin.

Biogeochemical and sedimentological implications of our findings will be discussed.