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Carbon and Carbon Isotope Cycling in the Western Canadian Arctic

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Increasing carbon dioxide levels in the atmosphere are having drastic effects on the global oceans. The Arctic Ocean is particularly susceptible to change as warming, sea-ice loss and a weak buffering capacity all influence this complicated semi-enclosed sea. In order to investigate the inorganic carbon system in the Canadian Arctic, water samples were collected in the Beaufort Sea, on the Alaskan shelf, at the Mackenzie river delta, and in Amundsen Gulf during the summer of 2014 and were analyzed for dissolved inorganic carbon (DIC), total alkalinity (TA), DI13C and 18O isotopes. Carbon isotopes are used to investigate the role of biological production on the uptake and transfer of inorganic carbon to depth. A preferential uptake of the lighter 12C relative to the heavier 13C isotope during biological production leads to a fractionation of the 13C/12C isotopes in both the organic matter and the water column. This results in an enrichment of DI13C in the high productivity surface waters and a depletion of DI13C at depth. Physical processes including freshwater input, brine rejection, and water mass mixing are investigated through the measurement of oxygen isotopes. Differences in the carbon system across the study area due to both biological and physical processes are assessed using depth profiles of DI13C and related carbon system parameters.