3.4 Carbon & Contaminant Cycling in the Coastal Environment

Summary

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Hudson Bay is a shelf sea with a coastal freshwater corridor supported by strong inputs of fresh water from land runoff. This freshwater corridor is the most important location for primary production and subsequent energy transfer to higher trophic levels (seals, bears, belugas) in the Bay. Recent studies suggest that Hudson Bay and its drainage basin are the recipients of enhanced loadings of contaminants such as organohalogens and Hg — a circumstance that has probably existed for decades. Given that Hudson Bay is in the vanguard of change both in its sea ice cycle and in the basin’s permafrost, it seems certain that Hg will become the most important contaminant in the system through release of Hg historically archived in frozen basin soils and through changes in wetland distribution and/or hydro reservoir flooding both of which are known sites of enhanced microbial methylation of inorganic Hg (II) to methyl Hg (MeHg is a toxic form of Hg that accumulates through food webs). The projected climate changes and their consequences to the organic carbon cycle seem likely not only to release Hg but they probably also enhance the efficiency of the production of methyl Hg (MeHg) within the basin and within Bay sediments. In addition, preliminary studies suggest that Hg depletion events (MDEs; the oxidation of tropospheric Hg (0) to Hg (II)), a phenomenon commonly observed in the high Arctic, may also be occurring over Hudson Bay in the spring, making Hg an ideal “tracer” for climate variation. The overarching objective of this project is to examine how the physical processes and climate associated variability being investigated in projects 3.1 and 3.2, and the biogeochemical response to this primary forcing (project 3.3), will affect organohalogen and trace metal contaminant cycling in the Hudson Bay ecosystem and ultimately, their levels in fish, marine mammals and the people who consume these tissues as part of their traditional diets (projects 3.5 and 3.6). In addition, links between sea-ice dynamics and extent of coverage (project 3.1), mercury depletion events (oxidation of Hg (0) to Hg (II)), feeding patterns, movements and dive behavior of beluga, narwhal and ringed seal (project 3.3) and contaminant up-take will be quantified.

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Publications

Articles Published in Refereed Publications
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