A long-term biophysical study of the Nelson and Hayes Rivers and their impact on coastal and marine processes in Hudson Bay

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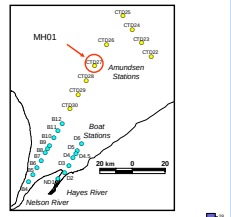
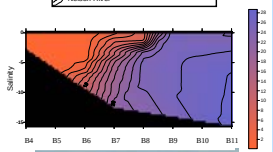
Introduction: Hudson Bay is Canada's largest watershed, draining approximately 30% of its freshwater. The Nelson and Hayes Rivers account for more than 25% of this total freshwater drainage. However, very little is known on the effects of these rivers on coastal and marine processes in Hudson Bay. Therefore, a long-term study focussing on the Nelson and Hayes River plumes, their annual transport of sediments, and the impact of their water on optical and biogeochemical properties and thereby on biological productivity within Hudson Bay was initiated. The study is separated into four projects: (1) long-term monitoring via moorings (seasonal and annual); (2) biophysical sampling transects (year round); (3) sediment flux monitoring; and (4) ice dynamics.

Partnership: This study represents a partnership between Manitoba Hydro and its consultants with Theme 3 of ArcticNet.

2. Transects

The objectives of the biophysical sampling transects are to 1) provide detailed spatial and temporal information of physical-biological processes in the estuary and 2) calibrate mooring sensors. The data collected will contribute to projects 3.1, 3.2, 3.3 and 3.4 of ArcticNet and include: CTD profiles, TSS, Chl *a*, Nutrients, POC, DOC, CDOM, CPOM, $\delta^{18}O$ and environmentally relevant species of Hg. Stations will be re-visited every month throughout the annual cycle via river boat, *CCGS Amundsen* or helicopter.



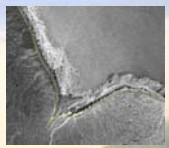


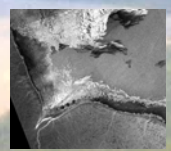
3. Sediment Flux

The objective of this project is to estimate the volume and pathway of sedimentation (organic and inorganic) in the Nelson and Hayes Estuary. In-situ (e.g., ADCP, mooring transmisometers, TSS, etc.) and remotely sensed data (aerial surveys and satellite) will be collected year round in support of this study

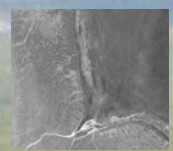
4. Ice Dynamics

Ice modifies both physical (e.g., plume extent) and biological (e.g., primary production) processes operating in the estuary. The objective of this project is to investigate the influence of ice on the estuary and the estuary on the ice cover





Fall Freeze-up

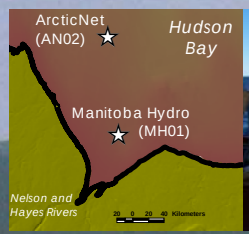


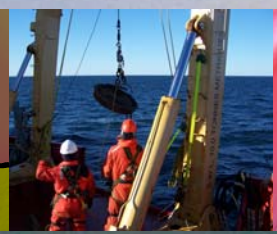
Winter

1. Moorings

Seasonal Moorings: The seasonal mooring program was designed and implemented by the engineering division of Manitoba Hydro with input from ArcticNet investigators. The seasonal mooring will provide spatial and temporal coverage of physical properties supporting both estuary modeling efforts by MH and the biophysical study of ArcticNet.

Annual Mooring: Purchased by Manitoba Hydro, the annual mooring MH01 was deployed during Leg 2 of the ArcticNet 2005 marine science expedition. The mooring will provide critical information on underice currents and plume dynamics of the Nelson estuary, providing a comparison with the ArcticNet AN02 mooring deployed out of the plume influence.





This study will contribute greatly to our knowledge of freshwater-marine coupling in Hudson Bay and provide some of the first baseline information on estuarine processes in the Nelson and Hayes Estuary

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