Summary

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Climate models predict warming in the Hudson Bay watershed that may alter the amount and timing of runoff and hence, of the load of suspended solids, dissolved organic matter and other major nutrients, and heat delivered to the Bay. In the Churchill and Nelson estuaries, such changes will be superimposed on earlier changes in the hydrological regime; diversion of Churchill River flows into the Nelson River and a shift of a third of total discharge from summer to winter. Our study of transfer pathways through river estuaries into Hudson Bay will improve our understanding of the effects of these changes. The overarching objective of this project is to describe the impact of freshwater quality and quantity on marine processes within Hudson Bay. In particular we are interested in understanding the principal processes which couple the freshwater and marine systems in Hudson Bay and to examine the cumulative impacts of climate change and hydroelectric development on Hudson Bay. Our key industry partner (Manitoba Hydro) will use this information to examine aspects of environmental impacts due to development of dams along the Nelson River, including the planned development of Conawapa Generating Station. More specifically our team will determine the fluxes, pathways and fate of suspended solids and dissolved organic matter transferred through the Churchill and Nelson estuaries during the open water season when mixing in the estuary is determined by wind-driven waves, tides and fluvial and marine currents, and under ice, when mixing is determined by tides and fluvial and marine currents alone. We will also investigate the relative significance of fluvial loading and littoral resuspension to concentrations of suspended solids in the estuaries and Hudson Bay and to study the effect of suspended solids and dissolved organic matter on radiative transfer in the estuary and nearby Hudson Bay. This team will also investigate historical effects of climate on Hudson Bay by interpretation of data stored in bottom sediments within our three supersites - the estuaries of the Nelson and Churchill Rivers, and of the Grande Rivière de la Baleine - and also in sediments deposited at the Bay-wide scale.

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**Partners**

Canadian Coast Guard  
Canadian Space Agency  
Churchill Gateway Development Corporation  
Environment Canada  
European Space Agency  
Fisheries and Oceans Canada - Bedford Institute of Oceanography  
Manitoba Hydro  
Manitoba Innovation Fund  
Memorial University of Newfoundland  
Natural Resources Canada - Environmental Studies Research Fund (ESRF)  
OmniTRAX  
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Polar Continental Shelf Program  
Province of Manitoba  
Transport Canada  
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World Wildlife Fund Canada

**Publications**

**Articles Published in Refereed Publications**

Braune, Birgit M., Anthony J. Gaston, Kyle H. Elliott, Jennifer F. Provencher, Kerry J. Woo, Magaly Chambellant, Steven H. Ferguson, and Robert J. Letcher, 2013, Organohalogen Contaminants and Total Mercury in Forage Fish Preyed upon by Thick-Billed Murres in Northern Hudson Bay, Marine Pollution Bulletin, na, Published  


Dupont, F., M. Vancoppenolle, L. B. Tremblay, 2015, Comparison of different numerical approaches to the 1D sea-ice thermodynamic problem, Ocean Modelling, 20-29, Submitted


Gervais, M., J.R. Gyakum, E. Atallah, L.B. Tremblay, 2014, How Well are the distribution and extreme values of daily precipitation over North America represented in a Global Climate Model? An intercomparison between the CCSM, reanalysis, satellite and gridded station data, Journal of Climate, 5219-5239, Published


Granskog, M. A., 2012, Changes in spectral slopes of colored dissolved organic matter absorption with mixing and removal in a terrestrially dominated marine system (Hudson Bay, Canada), Marine Chemistry, 10-17, Published


Gunn G., Barber, D.G., and McCullough, G., 2015, A large polynya in northwestern Hudson Bay, Arctic, , Submitted


Hata, Y., L.B. Tremblay, 2015, Anisotropic Internal Thermal Stress in Landfast Sea Ice from the Canadian Arctic Archipelago, Journal of Geophysical Research, , Submitted

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Hochheim, K., and Barber D., 2014, An Update on the Ice Climatology of the Hudson Bay System, Arctic, Antarctic, and Alpine Research, na, Accepted

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Komarov, A.S., V. Zabelle, and D.G. Barber., 2013, Ocean Surface Wind Speed Retrieval From C-Band SAR Images Without Wind Direction Input, IEEE Transactions on Geoscience and Remote Sensing, na, Accepted

Kuzyk, Z.Z. A., Gobeil C., and Macdonald R.W., 2013, 210 Pb and 137 Cs in Margin Sediments of the Arctic Ocean: Controls on Boundary Scavenging, Biogeochemical Cycles, na, Published

Lapoussière, A., Michel, C., Gosselin, M., Poulin, M., Martin, J., & Tremblay, J.-É., 2012, Primary production and sinking export during fall in the Hudson Bay system, Canada., Continental Shelf Research, v.52, 62–72, Published


Pogson, L., Tremblay, L.B., Lavoie, D., Michel, C. and Vancoppenolle, M., 2011, Development and validation of a one-dimensional snow-ice-algae model against observations in Resolute Passage, Canadian Archipelago, Journal of Geophysical Research, 1, Accepted


Wang, R., McCullough, G.K., Gunn, G., Hochheim, K.P., Dorostkar, A., Sydor, K., Barber, D.G., 2012, An observational study of ice effects on Nelson River estuarine variability, Hudson Bay, Canada, Coastal Shelf Re., , Submitted


Other Refereed Contributions


Non-Refereed Contributions


**Specialized Publications**

Carrigan, K., 2011, Seafloor records of sediment dispersal patterns in the Nelson River Estuary, Hudson Bay, BSc. Honours Thesis, Memorial University, 69 p., Published

Carrigan, Kendra, 2011, Sediment Dispersal and Accumulation Patterns in the Nelson River Estuary, Honours Thesis, 1, Published


Gunn, G., 2015, Polynya formation in Hudson Bay during the winter period., University of Manitoba, MSpace Thesis, 1-101, Published