Freshwater-Marine Coupling in the Hudson Bay IRIS

Summary

Project Leader(s)

Barber, David G.
Sydor, Kevin

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 in 2010. 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.

People

Network Investigators

Barber, David G. - University of Manitoba
Bentley, Sam - Memorial University of Newfoundland
Prinsenberg, Simon - University of Manitoba
Tremblay, Bruno - McGill University

Collaborators & Research Associates

Ferguson, Steven - University of Manitoba
Fortier, Louis - Université Laval
Gosselin, Michel - Université du Québec à Rimouski
Gratton, Yves - Institut national de la recherche scientifique - Eau, Terre et Environnement
Hoelemann, Jens - University of Kiel
Johannessen, Sophie - Fisheries and Oceans Canada - Institute of Ocean Sciences
Macdonald, Robie W. - Fisheries and Oceans Canada - Institute of Ocean Sciences
Miller, Lisa - Fisheries and Oceans Canada - Institute of Ocean Sciences
Oakes, Jill - University of Manitoba
Papakyriakou, Tim N. - University of Manitoba
Stern, Gary A. - University of Manitoba
Straneo, Fiamma - Woods Hole Oceanographic Institute (WHOI)
Sydor, Kevin - Manitoba Hydro
Tenuta, Mario - University of Manitoba

Thomas, Helmuth - Dalhousie University
Tremblay, Jean-Eric - Université Laval

Post-Doctoral Fellows

Granskog, Mats - University of Manitoba
Jahn, Alexandra - McGill University
McCullough, Greg - University of Manitoba
Wang, Ruixue - University of Manitoba

PhD Students

Aylward, Wanda - Memorial University of Newfoundland
Galley, Ryan - University of Manitoba
Hülse, Peter - Memorial University of Newfoundland
Iacozza, John - University of Manitoba
St-Laurent, Pierre - Institut des sciences de la mer de Rimouski

Masters Students

Denommee, Kathryn - Memorial University of Newfoundland
Gunn, Geoff - University of Manitoba
Stainton, Emmelia - University of Manitoba

Honours Undergraduate Students

Carrigan, Kendra - Memorial University of Newfoundland
Power, Jasmine - Memorial University of Newfoundland

Technical Staff

Johnson, Bruce - University of Manitoba
Mouland, Darrell - Memorial University of Newfoundland

Project Staff

Fisico, Teresa - University of Manitoba
Hochheim, Klaus - University of Manitoba
Leitch, Daniel - University of Manitoba
Senneville, Simon - Université du Québec à Rimouski
Stainton, Emmelia - University of Manitoba

Partners

Manitoba Hydro
Memorial University of Newfoundland
OmniTRAX
Polar Continental Shelf Program

Publications

Articles Published in Refereed Publications

Dmitrenko, I.A., Kirillov, S.A., Tremblay, L.B., Bauch, D., Hölemann, J.A., Krumpen, T., Kassens, H., Wegner, C., Heinemann, G. and Schröder, D., 2010, `Impact of the Arctic Ocean Atlantic water layer on Siberian shelf hydrography, Journal of Geophysical Research, VOL. 115, C08010, 17 PP., doi:10.1029/2009JC006020, 1, Published

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Hochheim, K. and Barber, D.G., 2010, Atmospheric Forcing of Sea Ice in Hudson Bay during the Fall Period, 1980-2005,, Journal of Geophysical Research, v.115, no. C05009 (doi:10.1029/2009JC005334), 20 pp., Published

Hochheim, K.P., Lukovich, J.V. and Barber, D.G., 2011, Atmospheric Forcing of Sea Ice in Hudson Bay during the Spring Period, 1980-2005, J. Mar. Syst., 1, Submitted

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St-Laurent, P., F. Straneo, J.-F. Dumais, and D.G. Barber, 2010, What is the fate of the river waters of Hudson Bay?, Journal of Marine Systems, 1, Submitted

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Sutherland, D., Straneo, F., Lentz, S., and St. Laurent, P., 2010, Observations of fresh, anticyclonic eddies in the Hudson Strait outflow, Journal of Marine Systems, doi:10.1016/j.jmarsys.2010.12.004, Published

Other Refereed Contributions

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Non-Refereed Contributions

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Guéguen, C., Perroud, A., McCullough, G. and Barber, D.G., 2010, Fluorescence and absorption properties of colored dissolved organic matter in the Nelson River Estuary, ArcticNet Annual Science Meeting (poster), 1, Published

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St-Laurent, P., F. Straneo, J.-F. Dumais, and D.G. Barber, 2010, Storage and release of freshwater in a subarctic basin: The case of Hudson Bay, 2010 Ocean Sciences Meeting, Portland, Oregon, 1, Published

St-Laurent, P., F. Straneo, J.-F., Dumais, and D. Barber, 2009, What is the Fate of the Riverine Freshwaters of Hudson Bay?, 2009 ArcticNet Annual Conference, 1, Published

Stainton, E., R. Hesslein, T. Papakyriakou, and D.G. Barber, 2008, The Churchill River: Observations of Summer Air-Water CO2 Exchange and Water Chemistry as it Enters the Hudson Bay, Proceedings, Arctic Change (Poster), 1, Published

Specialized Publications

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

St-Laurent, P., 2010, Seasonal and Interannual Variability of the Fresh Waters in Arctic Seas: The Case of Hudson Bay, Universite du Quebec a Rimouski, PhD thesis, 1, Published