

3.1 Ocean-Ice-Atmosphere Coupling and Climate Variability

Summary

Project Leader(s)

Barber, David G.

Project 3.1 focuses on the connection between freshwater quality and quantity on marine processes within Hudson Bay. Observational data include a complete suite of oceanographic, hydrographic, snow/sea ice geophysical, and surface energy balance variables collected at a range of spatial and temporal scales. Project 3.1 will concentrate the sampling around two "supersites" in the Churchill and Nelson River estuaries. We also participate in the development of the Community Based Monitoring (CBM) program where communities are involved in the science by collecting samples and maintaining/operating meteorological towers. Freshwater fluxes, both magnitude and timing, will be provided through project 3.2. The impacts of variable freshwater fluxes and the consequences of the timing of these fluxes on marine ecosystem function (project 3.3) will be evaluated for a variety of climate and anthropogenic change scenarios. These observational data will be examined within a framework of model prediction fields and remote sensing information of climate state variables throughout the annual cycle as a means of defining a baseline for freshwater-marine coupling and as a means of separating climate change from variability induced from anthropogenic sources (e.g., hydroelectric development, shipping, etc). This project integrates two primary industry partners within ArcticNet, namely Omnitrax (owner-operator of the Port of Churchill) and Manitoba Hydro.

People

Network Investigators

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Collaborators & Research Associates

Carsey, Frank (NASA - National Aeronautics and Space Administration)

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Massot, Pascal (Université Laval)
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Petrusevich, Vlad (University of Manitoba)
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Partners

IPY Federal Program Office
Indian and Northern Affairs Canada - Northern Scientific Training Program
NASA - National Aeronautics and Space Administration
Manitoba Hydro
Churchill Northern Studies Centre
Fisheries and Oceans Canada - Bedford Institute of Oceanography
OmniTRAX

Publications

Articles Published in Refereed Publications

Baggaley, D.G. and Hanesiak, J.M., 2005, An empirical blowing snow forecast technique for the Canadian Arctic and Prairie Provinces, *Weather & Forecasting*, In Press, Accepted

Howell, S.E.L., Yackel, J.J., De Abreu, R.A., Geldsetzer, T., and Breneman, C., 2005, On the utility of SeaWinds/QuikSCAT for the estimation of the thermodynamic state of first-year sea ice, *IEEE Transactions on Geoscience and Remote Sensing* 43(6), 1338-1350, Published

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Xin J, Hanesiak J.M., Barber D.G., 2005, Time series of daily-averaged cloud fractions above CASES winter camp from multiple data sources, *Journal of Geophysical Research*, 1, Submitted

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Langlois, A, Mundy, C.J, and Barber, D.G., 2005, On the winter evolution of snow thermophysical properties over landfast first-year sea ice, *Hydrological Processes*, 1, Accepted

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Xin, J. and Barber, D.G., 2006, An assessment of the sensitivity of cloud radiative forcing on the initiation and rate of melt over snow covered landfast first year sea ice with Terra/MODIS data, *Hydrological Processes*, Submitted, Submitted

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Arnold, G., 2006, Churchill youth, scientists, hunters and elders discuss climate change., *Climate Change: Linking Traditional and Scientific Knowledge*, 59-73, Accepted

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Dunlap, E. and Tang, C.C.L., 2006, Modeling the mean circulation of Baffin Bay., *Atmosphere-Ocean*, 44, 99-110, Published

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- Gilligan, J. and Clifford-Pena, J. , 2006, Traditional knowledge, local knowledge and scientific knowledge: The value of knowledge integration, *Climate Change: Linking Traditional and Scientific Knowledge*, 3-16, Accepted
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- Belt, S.T., Massé, G., Rowland, S.J., Poulin, M., Michel, C. and Leblanc, B., 2007, A novel chemical fossil of palaeo sea ice: IP25, *Organic Geochemistry*, 38, 16-27, Accepted
- Granskog, M.A., Macdonald, R.W., Mundy, C.J. and Barber, D.G., 2007, Distribution, characteristics and potential impacts of chromophoric dissolved organic matter (CDOM) in Hudson Strait and Hudson Bay, Canada, *Continental Shelf Research*, 1, Accepted
- Straneo F. and Saucier, F.J. , 2007, The Arctic-Sub Arctic Exchange through Hudson Strait, *Deep Sea Research*, 1, Submitted
- Hochheim, K.P., Lukovich, J. and Barber, D.G, 2007, The role of climate forcing on sea ice dynamics of Hudson Bay, *J. Geophys. Res.*, 1, Submitted

Lukovich, J.V., and Barber, D.G., 2007, Atmospheric controls on sea ice motion in the southern Beaufort Sea, *J. Geophys. Res.*, 111-D:18103, 18103, Published

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Jin, X., Hanesiak, J. and Barber, D., 2007, Time series of daily-averaged cloud fractions over landfast first year sea ice from multiple data sources, *Journal of Applied Meteorology and Climatology*, V46, DOI: 10.1175/2007JAMC1472.1. , 1818 - 1827, Published

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Hwang, B. J., and Barber, D.G., 2008, On the impact of ice emissivity on ice temperature retrieval using passive microwave radiance data, *Geoscience and Remote Sensing Letters*, 1, Accepted

Non-Refereed Contributions

Barber, D.G., 2006, Theme 3 – Managing the largest Canadian watershed in a new climate: Land-ocean interactions in subarctic Hudson Bay, Poster presented at the ArcticNet Annual Scientific Meeting Quebec City. December 5-8, 2004, 1, Published

Mundy, C.J., Ehn, J.K., Barber, D.G. and Michel, C., 2006, Spectral Indices for in-situ Estimation of Microalgal Biomass in Landfast First-Year Sea Ice, Poster presented at the ArcticNet Annual Scientific Meeting, Quebec City. December 5-8, 2004, 1, Published

Mundy, C.J., Ehn, J., Barber, D.G. and Michel, C., 2006, Transmitted spectral irradiance ratios for non-invasive estimates of microalgal biomass in landfast first-year sea ice , *Climate variability and sub-arctic marine ecosystems*, GLOBEC Ecosystem Studies of Subarctic Seas Symposium, Victoria, B.C., 16-20 May 2005, 1, Published

Mundy, C.J., Barber, D.G., Papakyriakou, T., Gosselin, M., Stern, G., Ayotte, P. and Oakes, J., 2006, The Hudson Bay System Study (BaySys): Theme 3 of ArcticNet, Oral presentation at Climate variability and sub-arctic marine ecosystems, GLOBEC Ecosystem Studies of Subarctic Seas Symposium, Victoria, B.C., 16-20 May 2005, 1, Published

Iacozza J. and Barber, D.G. , 2006, Snow catchment influence on biological habitats, CRYSYS 2005. Kananaskis, Alberta, March 5-7, 2005. Oral presentation, 1, Published

Iacozza J. , 2006, Physical factors controlling habitat selection of polar bears in the Canadian Arctic, *Wildlife Management in Manitoba Conference*. Oak Hammock Marsh, Winnipeg, Manitoba, Friday March 26, 2004. Oral Presentation, 1, Published

Ehn, J. K., Hwang, B.J., Galley, R. and Barber, D.G., 2006, Comparison of the physical and electromagnetic state of newly formed sea ice during CASES, CASES 2005-2006 General Meeting, 1, Published

Ehn, J. K., Granskog, M.A., Papakyriakou, T.N., Galley, R. and Barber, D.G., 2006, Surface albedo observations of Hudson Bay landfast sea ice during melt onset, ArcticNet 2005-2006 General Meeting, 1, Published

Hwang, B. J., Ehn, J.K., Barber, D.G., Galley, R. and Grenfell, T.C., 2006, Passive microwave and physical linkages of newly formed sea ice in the Cape Bathurst polynya during CASES, CASES 2005-2006 General Meeting, 1, Published

Hwang, B.J. and Barber, D.G., 2006, A temporal transition of geophysical and microwave emission properties of snow-covered land-fast first-year ice during CASES 2004 spring period, ArcticNet 2005-2006 General Meeting, 1, Published

Galley, R.J. and Barber, D.G., 2006, Aspects of snow and sea ice physics, thermodynamics, dynamics and remote sensing, Oral Presentation ArcticNet ASM 2005, 1, Published

Galley, R.J., Granskog, M., Ehn, J. and Barber, D.G., 2006, Land fast sea ice in western Hudson Bay – Physical properties, snow cover and superimposed ice formation, Poster Presentation - ArcticNet ASM 2005, 1, Published

Langlois, A., Barber, D.G. and Hwang, B.J., 2006, Development of a Snow Water Equivalent (SWE) Algorithm using In-Situ Passive Microwave Measurements over First-Year Sea Ice, ArcticNet 2005-2006 General Meeting, 1, Published

Langlois, A. and Barber, D.G., 2006, Snow Cover: A big player in climate change, Arctic Climate Change Youth Forum 2006 (ACCYF), 1, Published

Mundy, C.J. and Bukowsky, R., 2006, The Nelson River Study – A focus for the Manitoba Hydro – ArcticNet partnership, 2005 ArcticNet Annual Conference Proceedings, 25, Published

Geldsetzer, T., Fuller, C. and Yackel, J., 2006, Towards the utility of polarimetric C-band microwave backscatter for estimating snow depth on first year sea ice, 2005 ArcticNet Annual Conference Proceedings, 59, Published

Hamilton, A., Lovejoy, C. and Ingram, G., 2006, Vertical segmentation of microbial communities in a cold ocean ecosystem, 2005 ArcticNet Annual Conference Proceedings, 60, Published

Howell, S., Tivy, A., Yackel, J. and Scharien, R., 2006, Assessing melt dynamics in the Canadian Arctic Archipelago from SeaWinds/QuikSCAT, 2005 ArcticNet Annual Conference Proceedings, 63, Published

Mundy, C.J., Granskog, M., Rail, M.-E., Macdonald, R., Gratton, Y. and Barber, D., 2006, Hydrography of the eastern and southern Hudson Bay – preliminary results from the ArcticNet 0502 cruise in Sep/Oct 2005, 2005 ArcticNet Annual Conference Proceedings, 80-81, Published

Mundy, C.J., Granskog, M., Barber, D., Bukowsky, R. and Bernhardt, W., 2006, A long-term biophysical study of the Nelson and Hayes Rivers and their impact on coastal and marine processes in Hudson Bay, 2005 ArcticNet Annual Conference Proceedings, 81, Published

Scharien, R. and Yackel, J., 2006, Comparison of texture from multi-resolution synthetic aperture radar (SAR) and in situ data for surface state estimation of decaying landfast first-year sea ice, 2005 ArcticNet Annual Conference Proceedings, 92-93, Published

Tivy, A., Alt, B., Howell, S., Wilson, K. and Yackel, J., 2006, On the Relationship Between ENSO, the NAO and Anomalous Spring Ice Cover in Hudson Bay, 2005 ArcticNet Annual Conference Proceedings, 99, Published

Yackel, J., Scharien, R., Else, B. and Geldsetzer, T., 2006, Time series SAR investigations of landfast first-year sea ice surrounding the Amundsen Gulf for spring melt timing information, 2005 ArcticNet Annual Conference Proceedings, 103, Published

Wu, W., Barber, D., Iacozza, J. and Moss crop, D., 2006, Trends of Spatial and Temporal Patterns of Sea Ice Concentrations in Hudson Bay Region over the Period 1971 to 2004, 2005 ArcticNet Annual Conference Proceedings, 103, Published

Hare, A. G. Stern, G., Wang, F., Macdonald, R.W., Pazerniuk, M. and Kuzyk, Z., 2006, Mercury Cycling in Hudson Bay and its Response to Changing Terrestrial-Marine Relationships, ArcticNet Newsletter, 1, 9-10, Published

Biasutti, M. and Reimer, K., 2006, Understanding the effects of climate change and modernization on three fiord marine ecosystems in northern Labrador: ArcticNet project 3.7., ArcticNet Annual Scientific Meeting, Victoria, BC, 1, Published

Churchill, J., Tenuta, M., Bello, R. and Papakyriakou, T., 2006, Greenhouse gas emissions related to landscape elements in the subarctic, Manitoba Soil Science Society Annual Meeting, 1, Published

Churchill, J., Tenuta, M., Bello, R. and Papakyriakou, T., 2006, Are greenhouse gas emissions related to plant community composition or edaphic conditions at Churchill, MB?, ArcticNet Annual Science Meeting, 1, Published

Churchill, J., M. Tenuta, R. Bello, and T. Papakyriakou, 2006, Greenhouse gas emissions related to landscape elements in the subarctic environment of Churchill MB, ArcticNet Annual Science Meeting, 1, Published

Else, B. J. Yackel, and T. Papakyriakou, 2006, Bulk aerodynamic estimates of carbon dioxide flux in Hudson Bay, ArcticNet Annual Science Meeting, 1, Published

Granskog, M.A., Mundy, C.J., Macdonald, R.W. and Barber, D.G., 2006, Distribution, characteristics and potential impacts of colored dissolved organic matter (CDOM) in the Hudson Strait and Bay, Canadian arctic, ASLO Summer Meeting, 45, Published

Granskog, M.A., Kuzyk, Z.Z., MacDonald, R.W., Mundy, C.J. and Barber, D.G., 2006, River and sea-ice melt freshwater components in the Hudson Bay mixed layer - using oxygen isotopes (^{18}O) and colored dissolved organic matter (CDOM) as tracers, ArcticNet Annual Science Meeting, 69, Published

Knight, T.W., Simpson, A., Rowell, J., Cote, D. and Merkuratsuk, J., 2006, Developing a long-term monitoring program for the Torngat Mountains National Park: An ArcticNet partnership, Atlantic Society of Fish and Wildlife Biologists Annual General Meeting, 1, Published

Kuzyk, Z.A., Granskog, M. A. Macdonald, R.W., Scharien, R.K., Stern, G., D.G. Barber, 2006, River influence on the coastal waters of western Hudson Bay during the winter-spring transition, ASLO Summer Meeting, 69, Published

Kuzyk, Z.A., Macdonald, R.W., Granskog, M.A., Scharien, R.K., Galley, R.J., Michel, C., Barber, D. and Stern, G., 2006, Sea ice, hydrological, and biological processes in the Churchill river estuary region, Hudson Bay, ArcticNet Annual Science Meeting, 16, Published

Laidou A, Ouellet, N., Pereg, P., Dewailly, E. and Ayotte, P., 2006, DNA Damage in Relation to Exposure to Food-Chain Contaminants in Inuit Adults from Nunavik, ArcticNet Annual Science Meeting, 1, Published

Langlois, A., Barber D.G., Thompson B., Crossman B., Wilson L., Fleming M., Moss crop D. and Oakes, J., 2006, Community Based Monitoring (CBM) on Sea Ice Variability and Change, ArcticNet Annual Science Meeting, 1, Published

Langlois, A. and Barber, D.G, 2006, Community Based Monitoring (CBM) on Sea Ice Variability and Change: Two ways of Knowing, CEOS CBM Pamphlet, 1, Published

Lapenskie, K., Lobb, D., Stern, G., Wang, F., Tenuta, M., Papkyriakou, T., Armstrong, D., Bello, R., Young, K. and MacDonald, R., 2006, Preliminary investigation into the contribution of the terrestrial ecosystems of surrounding lowland to carbon and mercury observed in the water of Hudson Bay, ArcticNet Annual Science Meeting, 1, Published

McCullough, G.K., Granskog, M.A. and Barber, D.G., 2006, Mixing of suspended solids and CDOM-rich runoff in the Nelson-Hayes estuary, Hudson Bay, ArcticNet Annual Science Meeting, 71, Accepted

Mojdehi, P. and Bello, R., 2006, The role of methane release and aeolian deposition in the carbon budget of tundra ponds, ArcticNet Annual Science Meeting, 1, Published

Scharien, R.K., Yackel, J.J. and Geldsetzer, T., 2006, C-Band Polarimetric Scatterometer Studies Over Landfast First-year Sea Ice in the Canadian Arctic during Spring-Summer Melt, RADARSAT-2 Symposium, Saint-Hubert, Quebec, 1, Published

Scott, G. and Papakyriakou, T., 2006, Inter-seasonal air-surface flux variability on coastal Hudson Bay, ArcticNet Annual Science Meeting, 1, Published

Simpson, A., Rowell, J., Knight, T., Cote, D., and Merkuratsuk, J., 2006, Building partnerships, establishing baseline inventory, and developing a long-term marine monitoring program for Nachvak fiord, northern Labrador: ArcticNet project 3.7. , ArcticNet Annual Science Meeting, 1, Published

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Tenuta, M., Churchill, J., Bello, R. and Papakyriakou, T., 2006, It's a Gas: Greenhouse Gas Studies in the Subarctic Environment of Churchill, Manitoba, Oral presentation at the Annual Churchill Northern Studies Centre Symposium, Dec 6, 2006, University of Winnipeg, Winnipeg, MB., 1, Published

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Langlois A., Oakes, J., Imrie, D. and Barber, D.G., 2007, Community Based Monitoring (CBM), Engaging Inuit Communities into Research, Developing a community environmental monitoring system to respond to the concerns and needs of the community, Sanikiluaq, 1, Published

Poulin, M., 2007, Ice aboriginals, Science, First Hand 5(10), 25, 47. [4(10): 43, 65 in Russian], Published

Hamilton, J., Prinsenberg, S., 2007, Measuring Volume, Freshwater and Heat Transports Through Lancaster Sound, 2007 ArcticNet Annual Conference Proceedings, 21, Published

McCullough, G., Colline, P., Barber, D., Granskog, M., Sydor, K., Aziz, T., 2007, The Development and Dispersal of the Nelson-Hayes Estuary Sediment and CDOM Plumes in Hudson Bay, 2007 ArcticNet Annual Conference Proceedings, 27, Published

Bentley, S., Hülse, P., Church, I., Brucker, S., 2007, A Remarkable Sediment Depocenter and Environmental Archive Off the Great Whale River, Hudson Bay, Quebec, 2007 ArcticNet Annual Conference Proceedings, 37, Published

Hülse, P., Bentley, S., 2007, River-Ocean Interactions in Hudson Bay, 2007 ArcticNet Annual Conference Proceedings, 62, Published

Jackson, J., Ingram, G., Allen, S., Carmack, E., McLaughlin, F., 2007, Identification of a Near-Surface Temperature Maximum in the Southern Canada Basin, Arctic Ocean, 2007 ArcticNet Annual Conference Proceedings, 64, Published

Specialized Publications

Langlois, A. and Mundy, C.J. , 2006, Community-Based Monitoring on Sea Ice Climate Variability and Change: Protocols and Setup, CEOS Technical Report 06-12-1, 1, Published