

Long-Term Observatories in Canadian Arctic Waters

Summary

Project Leader(s)

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The Arctic is rapidly changing! Preliminary observations show that the Arctic ice cover was 20% smaller in September 2007 than in 2005, the year with the smallest ice cover on record. The ice cover is the insulation between the atmosphere and the ocean. A shrinking ice cover means that more light and more heat are going to penetrate in the Arctic Ocean and totally change the Arctic environment. The objective of this project is to monitor these changes in physical, biological and geochemical properties of the Canadian Arctic waters. We plan to deploy twelve ocean observatories in Hudson bay, Baffin Bay, Beaufort Sea and the Eastern Arctic Ocean. These observatories are the oceanic equivalent of atmospheric meteorological stations. They will be deployed and recuperated one year later. While in the water, they will record temperature, salinity, velocity, dissolved oxygen, nutrients, light intensity, fluorescence (an indicator of micro-algae biomass) and ice motion. Hydrophones will also record the vocalization of whales and other marine mammals. The data will be used to describe the seasonal and annual variations in the Arctic environment and its local ecosystems. This will, in turn, enable us to understand how global warming is affecting the Arctic and how fast.

People

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Partners

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 Imperial Oil Resources Ventures Limited
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Publications

Articles Published in Refereed Publications

Barber, D. G., Asplin, M.G., Gratton, Y., Lukovich, J.V., Galley, R.J., Raddatz, R.L., Leitch, D., 2010, The International Polar Year (IPY) Circumpolar Flaw Lead (CFL) System Study: Overview and the Physical System, Atmosphere-Ocean, v48, no4, 225-243, Published

Barber, D., Asplin, M.G., Gratton, Y., Lukovich, J., Galley, R., Raddatz, R.L. and Leitch, D., 2009, The international Polar Year (IPY) Circumpolar Flaw Lead (CFL) system study: overview and the physical system, Atmosphere-Ocean, 1-20, Submitted

Bélanger, C., Y. Gratton, D. Dumont, A. Forest and Fortier, L., 2010, Observations of remote-wind-induced pulses of current under ice cover in the Canadian Beaufort Shelf Region, Geophys. Res. Letters, 1, Submitted

Benoit, D., Simard, Y., and Fortier, L., 2008, Hydro-acoustic detection of large winter aggregations of Arctic cod (*Boreogadus saida*) at depth in ice-covered Franklin Bay (Beaufort Sea). , Journal Geophysical Research, VOL. 113, C06S90, doi: 10.1029/2007JC004276, 1, Published

Mundy, C.J., Gosselin, M., Ehn, J., Gratton, Y., Rossnagel, A., Barber, D., Martin, J., Tremblay, J.-E., Palmer, M., Arrigo, K., Darnis, G., Fortier, L. Else, B. and Papakyriakou, T., 2009, Contribution of under-ice primary production to an ice-edge upwelling induced phytoplankton bloom, *Geophysical Research Letters*, 1-20, Submitted

Pogson, L., Tremblay, B., Lavoie, D., Michel, C., Vancoppenolle, M., 2010, Development and validation of a one-dimensional snow-ice-algae model against observations in Resolute Passage, Canadian Archipelago, *J. Geophys. Res.*, 1, Submitted

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*, , Accepted

Sampei M, Forest A, Sasaki H, Hattori H, Makabe R, Fukuchi M, Fortier L. , 2008, Attenuation of the vertical flux of copepod fecal pellet under Arctic sea ice: further evidence for an active detrital food web in winter., *Polar Biology*, DOI 10.1007/s00300-008-0523-z, Published

Sampei M, H Sasaki, H Hattori, A Forest, L Fortier., 2008, Significant contribution of passively sinking copepods to downward export flux in Canadian Arctic waters. , *Limnology and Oceanography*., 1-15, Submitted

Sampei, M., Forest, A., Sasaki, H., Hattori, H., Makabe, R., Fukuchi, M., and Fortier, L. , 2009, Attenuation of the vertical flux of copepod fecal pellets under Arctic sea ice: evidence for an active detrital food web in winter, *Polar Biology*. 32, 225–232, Published

Sampei, M., Sasaki, H., Hattori, H., Forest, A., Fortier, L., 2009, Significant contribution of passively sinking copepods to the downward export flux in Arctic waters, *Limnology and Oceanography*, 54(6), 1894-1900, Published

Simard, Y. and Fortier, L., 2008, Listening at climate change in ice-covered seas: example with AURAL autonomous hydrophones in the Arctic., *Proc. IEEE Oceans'08. MTS/IEEE - Quebec*, 1-2, Published

Vancoppenolle, M., Goosse, H. de Montety, A., Fichefet, T., Tremblay, B. and Tison, J-L., 2010, Modeling brine and nutrient dynamics in Antarctic sea ice: The case of dissolved silica, *Journal of Geophysical Research*, , Accepted

Other Refereed Contributions

Handegard, N.O., Demer, D.A., Kloser, R., Lehodey, P., Maury, O., and Simard, Y. 2009., 2010, Toward a global ocean ecosystem Mid-trophic Automatic Acoustic Sampler (MAAS)., *Community white paper. OceanObs'09 Venice, Italy.* <https://abstracts.congrex.com/scripts/jmevent/abstracts/FCXNL-09A02a-1739018-1-cwp09A02a.pdf>, 1-8, Published

Non-Refereed Contributions

Dumont, D., Gratton, Y. and Arbetter, T., 2009, Modélisation du pont de glace du détroit de Nares, au nord de la mer de Baffin, *Ateliers de Modélisation de l'Atmosphère 2009 Conference Proceedings*, 1, Published

Dumont, D., Martin, J. and Tremblay, J.E., 2008, Modelling the subsurface chlorophyll maximum in the Amundsen Gulf, 2008 Arctic Change Conference Proceedings, 208, Published

Gratton, Y., A. Roy-Gobeil, C. Brouard, C.J. Mundy, and L. Prieur, 2009, . Ice edge upwelling during CFL, ArcticNet Annual 2009 Scientific meeting, 1, Published

Gratton, Y., L. Prieur, D. Bourgault, P. Galbraith, V. Tsarev and C. Bélanger, 2009, Team 1 overview: physical oceanography, CFL 2009 meeting, 1, Published

Gratton, Y., L. Prieur, J.-É. Tremblay, A. Mucci and V. Tsarev,, 2009, The Amundsen Gulf Eddies, CMOS XXX annual meeting, 1, Published

Gratton, Y., Prieur, L., Tremblay, J.E. and Mucci, A., 2008, Structure and dynamics of the Amundsen Gulf eddies, 2008 Arctic Change Conference Proceedings, 85, Published

Lansard, B., Mucci, A., Miller, L., Macdonald, R.W., and Gratton, Y., 2008, Winter variability of carbonate system parameters in the water column of Franklin Bay, 2008 Arctic Change Conference Proceedings, 253, Published

Mundy, C.J., Gosselin, M., Rossnagel, A., Barber, D., Martin, J., Tremblay, J.E., Gratton, Y., Darnis, G., Fortier, L., Palmer, M. and Arrigo, K., 2008, Dynamics of under-ice phytoplankton blooms observed in two adjacent coastal Arctic bays, 2008 Arctic Change Conference Proceedings, 273, Published

Roy-Gobeil, A., Y. Gratton, C. Brouard, C.J. Mundy, and L. Prieur, 2009, Ice edge upwelling during CFL, CFL 2009 meeting, 1, Published

Sévigny, C., P. Galbraith and Y. Gratton, 2009, Processus de mélange dans la couche de surface du Haut-Arctique et la baie de Baffin, Assemblée générale 2009 de Québec-Océan, 1, Published

Sibert, V., Zakardjian, B., Gosselin, M., Starr, M. and Senneville, S., 2008, Understanding the spatial and temporal variability of primary production over the Hudson Bay, Foxe Basin and Hudson Strait marine system via coupled bio-physical models, 2008 Arctic Change Conference Proceedings, 150, Published

Sibert, V., Zakardjian, B., Saucier, F., Gosselin, M., Starr, M. and Senneville, S., 2009, Understanding the spatio-temporal variability of primary production over an Arctic/Sub-Arctic marine ecosystem (the Hudson Bay) via coupled bio-physical models, ASLO Aquatic Science Meeting 2009 Conference Proceedings, 1, Published

Simard, Y., 2009, Applications of active and passive acoustics to marine mammal ecosystem understanding, 43rd Congress of the Canadian Meteorological and Oceanographic Society, 1, Published