BaySys Publications List – Nov 2019

Team 1

Published/Submitted

Harasyn, M.L., Isleifson, D., Chan, W. and Barber, D.G. (submitted). Multi-scale observations of the co-evolution of sea ice thermophysical properties and microwave brightness temperatures during the summer melt period in Hudson Bay. *Elementa: BaySys Special Issue.*

Kirillov S, Babb D, Dmitrenko I, Landy J, Lukovich J, Ehn J, Sydor K, Barber D, Stroeve J. (2019). Atmospheric forcing drives the winter sea ice thickness asymmetry of Hudson Bay. *Journal of Geophysical Research: Oceans.* Submitted

Petrusevich VY*, Dmitrenko IA, Niemi A, Kirillov SA, Kamula CM, Kuzyk ZA, Barber DG, Ehn JK. (2019). Impact of tidal dynamics on diel vertical migration of zooplankton in Hudson Bay. *Ocean Science*. Submitted

Eastwood RA, Macdonald R, Ehn JK, Heath J, Arragutainaq L, Myers PG, Barber DG, Kuzyk ZA. (2019). Role of river runoff and sea-ice brine rejection in controlling stratification throughout winter in southeast Hudson Bay. *Estuaries and Coasts*. Revision Requested

Petrusevich, V., I. A. Dmitrenko, I. E. Kozlov, S. A. Kirillov, Z. A. Kuzyk, A. S. Komarov, J. P. Heath, D. G. Barber, and J. K. Ehn, (2018) Tidally-generated internal waves in southeast Hudson Bay. *Continental Shelf Research*, 167, 65-76, doi:10.1016/j.csr.2018.08.002, 2018.

Barber, D.G., Babb, D.G., Ehn, J.K., Chan, W., Matthes, L., Dalman, L.A., Campbell, Y., Harasyn, M.L., Firoozy, N., Theriault, N., Lukovich, J.V., Zagon, T., Papakyriakou, T., Capelle, D.W., Forest, A., and Gariepy, A. (2018) "Increasing Mobility of High Arctic Sea Ice Increases Marine Hazards Off the East Coast of Newfoundland". *Geophysical Research Letters*, DOI: 10.1002/2017GL076587.

Landy, J.C., Ehn, J.K., Babb, D., Thériault, N., and Barber, D. (2017). Sea ice thickness in the Eastern Canadian Arctic: Hudson Bay Complex & Baffin Bay. *Remote Sensing of Environment*. 200, 281-294, 2017. DOI: https://doi.org/10.1016/j.rse.2017.08.019

Anticipated/In Prep

Elementa

Title: Sea Ice Climatology of Hudson Bay – a Review and Update.
Authors: Barber et al. (multiple authors from teams 1 and 6)
Brief Description: Provide a coordinated analysis of PMW derived dynamic and thermodynamic processes bay wide at a daily time scale between 1978 and 2017

Objectives Addressed:

- What are the sea ice concentration anomalies through the time series (Task 1.1)
- What are the sea ice dynamic patterns through the time series (Task 1.1)
- What are the patterns and processes driving i and ii at the scale of the Nelson Estuary, the NW polynya, and James Bay (Task 1.1)

Status of Publication: First draft should be ready fall 2019.

Title: Sea Surface Temperature Trends in Hudson Bay, 2009 – 2018
Authors: Ehn J., et al.
Brief Description: Provide an updated analysis of satellite-derived SST of Hudson Bay that builds on the paper by Galbraith and Larouche (2011) that considered the period 1985–2009.
Objectives Addressed:

- SST trends, patterns, and variability (Task 1.1)
- Relationship to sea ice breakup and air temperatures (Task 1.1)

Target Journal: JGR, JMS, or Elementa special issue
Status of Publication: First draft ready by fall 2019.

Title: Increasing Freshwater Content of Hudson Bay: Causes and Consequences on the Seasonal Cycle
Authors: Ehn J. et al. (multiple authors from team 1 and team 6)
Brief Description: BaySys AN01 mooring data shows significant freshening compared to the only other mooring record from the same location 35 years ago (Prinsenberg 1987).
Objectives Addressed:

- Describe time series in relation to seasonal cycle (Task 1.1)
- Investigate causes of this freshening, i.e. is it related to Arctic-wide trends (climate change) or the change in seasonality of local freshwater input in Hudson Bay (regulation) (Task 1.1, 1.2)
- Use historical data to describe period between 1981 and 2017 (Task 1.3)
- Use NEMO for trace water masses to help explain objective ii. (Task 1.3)

Target Journal: GRL, Nature SR, or Elementa special issue TBD
Status of Publication: First draft in spring 2019.

Title: Dynamic Properties of the Hudson Bay Seasonal Ice Cover: A View from Below
Authors: Babb, D., Kirillov, S., Ehn, J., Landy, J., McCullough, G., Barber, D., et al.
Brief Description: Provide an in depth analysis of the ice draft time series from the moored ULS, quantifying ridge frequency, lead frequency, the evolution of the ice thickness distribution across the ice season.
Objective Addressed:

- H1.1 – The spatial and temporal pattern of Bay-wide sea ice growth and decay as a dominant factor forcing FW-marine coupling processes in HB (Task 1.1, 1.3)

Status of Publication: Preliminary outline and exploration of data – manuscript by late 2019

Title: Identification and Characterization of the Polynya in NW Hudson Bay
Authors: Babb, D., Landy, J., Ehn, J., McCullough, G., Kirillov, S., Barber, D., Gunn, J., (?)
Brief Description: Identify the frequency, size and forcing of the NW polynya and quantify its influence on sea ice volume within HB. Furthermore, address its impact on the oceanography (brine rejection) and biogeochemical (air-sea int.) processes of NW HB.
*Potential NEMO comparison to see how it represents the polynya
Objective Addressed:

- H1.1 – The spatial and temporal pattern of Bay-wide sea ice growth and decay as adominant factor forcing FW-marine coupling processes in HB (Task 1.1, 1.3)

Status of Publication: Outline and start of data processing – manuscript late 2019.

Title: Influence of Nelson River Discharge on the Sea Ice Timing, Dynamics and Morphology in Southwestern Hudson Bay
Authors: Babb, D., Ehn, J., Kirillov, S., Barber, D., McCullough, G., Team 2 (?)
Brief Description: Explore the relationship between discharge from the Nelson River and the sea ice environment (timing, thickness, landfast ice extent) in southwestern Hudson Bay. 2017 was a high flow year, while 2018 was a low flow year – allowing direct comparison of these two years.
Objectives Addressed:

- H1.1 – The spatial and temporal pattern of Bay-wide sea ice growth and decay as a dominant factor forcing FW-marine coupling processes in HB (Task 1.1)
- H1.2 – The seasonality and magnitude of river runoff is a dominant factor controlling freshwater-marine coupling processes in HB (Task 1.1, 1.3, 2.3)

Status of Publication: Preliminary outline and data recruitment

Title: In Situ Observations of Ice Drift, Dynamics and Atmospheric Forcing of Sea Ice Across the Sea Ice Season in Hudson Bay
Authors: Lukovich, J., Babb, D., Landy, J., Ehn, J., Barber, D.
Brief Description: Using the arrays of ice beacons deployed during winter (churhcill) and summer (Amundsen), we will characterise the small scale drift and forcing of sea ice motion. Floes were highly mobile and show a strong tidal influence on ice drift. Arrays were dynamic and highlight shoreward convergence.
Objective Addressed:

- H1.1 – The spatial and temporal pattern of Bay-wide sea ice growth and decay as a dominant factor forcing FW-marine coupling processes in HB. (Task 1.1, 1.3)

Status of Publication: Outline and start of data processing – manuscript late 2019.

Title: Investigation of waves and vertical currents as a result of storm events in Hudson Bay using ADCPs.
Authors: Campbell, Y., Ehn, J., Kirillov, S., Barber, D.
Brief Description: Examine the use of ADCPs for estimating wave characteristics during storm events and the effect of these storms on vertical current velocities.
Objectives Addressed:

- To investigate the reliability of ADCPs for determining wave characteristics-validation with wave buoy measurements. (Task 1.1)
- To use this ADCP-Buoy relationship to analyze the wave conditions during major storm events at several mooring sites in Hudson Bay. (Task 1.1)
- To examine the effects of these storm events on current velocities and determine the potential for vertical mixing during storms using vertical currents as a proxy. (Task 1.1)

Status of Publication: First draft should be ready by spring 2019

Title: The Remote Detection of Sea Ice Concentration During the Summer Melt Period in Hudson Bay
Authors: Harasyn, M., D. Isleifson, D. G. Barber. et al.
Brief Description: Analyzing the accuracy of passive microwave sea ice concentration estimates within Hudson Bay during the summer melt period
Objective Addressed:

- Identifying areas/times of ice concentration inaccuracies in Hudson Bay (Task 1.1, 1.2)

Status of Publication: In preliminary data analysis (ready for Fall 2019)

Title: Hi-Resolution Modelling of Hudson Bay Ice Dynamics and Ice-Related Freshwater Transport Sea Ice Evaluation with Mooring Data, Ice Drift and Thickness
Authors: Kirillov, S., Lukovich, J., Ridenour, N., Myers, P., Barber, D.
Brief Description: The NEMO data on sea ice extent, thickness and drift will be evaluated by comparison with mooring (2016-2018) and satellite information (1979-2018). It will be determined if NEMO fairly reproduces the typical scenarios of atmospheric forcing during winter: cold/warm, CW/CCW wind pattern.
Objective Addressed:

- NEMO evaluation (Task 1.3)

Status of Publication: Data processing is awaiting for pre-2002 NEMO outputs. Manuscript by spring-summer 2019

Title: Wind-Driven Synoptic Variability of the Hudson Bay Hydrography
Authors: Dmitrenko, I., Kirillov, S., Petrusevich, V., Babb, D., Ehn J., and Barber D.
Brief Description: Analyzing time series of temperature, salinity and velocity from AN01 mooring.
Objectives Addressed:

- Variability of temperature, salinity and velocity (Task 1.1)
- Forcing: Atmosphere and sea-ice (Task 1.1)
- Generation of inertial oscillations (Task 1.1)

Status of Publication: First draft should be ready before April 2019.

Title: Dynamicity of the Nelson-Hayes River Plume Extent (Hudson Bay): An Optical Remote Sensing Study
Authors: Basu, A., McCullough, G., Doxaran, D., Barber, D., Bélanger, S., and Ehn J.
Brief Description: Correlating the climatic, hydrographic variables to NH plume extent detected though empirical optical algorithm.
Objective Addressed:

- How wind influences N-H plume extent (Task 3.1, 3.2)
- Tidal impact on N-H plume extent (Task 3.1, 3.2)
- Impact of regulation on plume extent (Task 3.3, 3.4)

Team 2

Published/Submitted

Déry S, Stadnyk TA, MacDonald, M., Sharma B. 2016. Recent Trends and Variability in River Discharge across Northern Canada. *Hydrol. and Earth Sys. Sci.* 20(12): 4801-4818.

Déry, S.J., T.A. Stadnyk, M. MacDonald, K. Koenig, C. Guay. 2018. Flow alteration impacts on Hudson Bay river discharge. *Hydrol. Process.* 32(24): 3576-3587.

Lilhare, R., Dery, S. J., Pokorny, S., Stadnyk, T. A., & Koenig, K. A. 2019. Inter-comparison of multiple hydro-climatic datasets across the Lower Nelson River Basin, Manitoba, Canada. Atmosphere-Ocean. https://doi.org/10.1080/07055900.2019.1638226

Lilhare, R., Pokorny S., Déry S. J., Stadnyk T. A., and Koenig K. Submitted. Sensitivity analysis and uncertainty assessment in water budgets simulated by the Variable Infiltration Capacity model for Canadian sub-arctic watersheds. In review, Hydrological Processes.

MacDonald, M., T.A Stadnyk, S.J Dery, D Gustafsson, K Isberg, B Arheimer. Submitted. Improved hydrologic model representation of landscape-based storage in the Hudson Bay Drainage Basin. Submitted to *Hydrol. Process.* HYP-17-0803

Macdonald, M., TA Stadnyk, SJ Dery, K Koenig. 2018. Impacts of 1.5°C and 2.0°C warming on pan-Arctic river discharge in the Hudson Bay Complex through 2070. *Geophys. Res. Lett.* 45(15): 7561-7570.

Pokorny, S., Stadnyk T., Lilhare, R., Ali, G., Dery, S., Koenig, K. Submitted. Towards assessing input data uncertainty in hydrologic models from ensemble-based gridded climate data. Submitted to *J. Hydromet.* JHM-D-19-0239.

Ridenour, N., Hu X., Jafarikhasragh S., Landy J.C., Lukovich J.V., Stadnyk T.A., Sydor K., Myers P.G., Barber D.G. 2019. Sensitivity of freshwater dynamics to model resolution and river discharge forcing in Hudson Bay Complex. *J. Marine Sys.* 196: 48-64.

Tefs, A.A.G.; MacDonald, M.K.; Stadnyk, T.A.; Koenig, K.A.; Hamilton, M.; Slota, P.; Crawford, J. Submitted. Simulating river regulation and reservoir performance in a continental-scale hydrologic model. Submitted to *The Journal of Environmental Modelling and Software*.

Book Chapters

Stadnyk, T.A., Déry S, MacDonald M, and Koenig K. 2019. Theme I: Physical Environment: iv. The Freshwater System. In ZA Kuzyk, and Candlish, LM *From Science to Policy in the Greater Hudson Bay: An Integrated Regional Impact Study IIRIS) of Climate Change and Modernization*. ArcticNet, Québec City, QC, Canada. 424 pp.

Theses

Pokorny, S. 2019. Assessing the relative contributions of input, structural, parameter, and output uncertainty in hydrologic modelling. MSc Thesis, Dept of Civil Engineering, University of Manitoba. 170 pp. http://hdl.handle.net/1993/34108

Tefs, A. 2018. Simulating hydroelectric regulation and climate change in the Hudson Bay drainage basin. MSc Thesis, Dept of Civil Engineering, University of Manitoba. 183pp. http://hdl.handle.net/1993/33613

Broesky, M. 2019. Analysing past, present and future trends of modeled pan-arctic freshwater discharge. BSc Thesis, Dept of Civil Engineering, University of Manitoba. 61 pp.

Lilhare, R. In preparation. Impacts of climate change on the lower Nelson River basin. PhD candidate, Environmental Science and Civil Engineering Programs, University of Northern British Columbia, Prince George, BC. Anticipated graduation Winter 2020.

Anticipated (in preparation)

Déry, S. J., Stadnyk, T. A., Assani, A., Koenig, K. A. (in preparation). Hydropeaking effects on daily flows across Canada's principal regulated rivers. To be submitted to Environmental Research Letters.

Lilhare, R., Déry S. J., Stadnyk T. A., and Koenig K. (in preparation). Quantifying projected changes in water availability of the Lower Nelson River Basin, Manitoba, Canada", in preparation, Climatic Change.

Pokorny, S., Stadnyk, T. A., Ali, G. (In Preparation). A Conceptual Framework for the Estimation and Evaluation of Hydrometric Flow Data Uncertainty. To be submitted to Hydrology and Earth System Sciences.

Pokorny, S., Stadnyk, T. A., Ali, G., Déry, S. J. , Lilhare, R., Koenig, K. A. (In preparation). Cumulative Effects of Uncertainty on Flow Predictability in a Hydrologic Modeling Environment. To be submitted to Water Resources Research.

Pokorny, S., Tefs, A., Stadnyk, T. A., Ali, G., Koenig, K. A. (In Preparation). Projecting Hydrologic Modeling Uncertainty across Varying Basin Scales and Temporal Periods. To be submitted to Water Resources Research.

Tefs, A.A.G.; Stadnyk, T.A.; Koenig, K.A.; Déry, S.J.; Guay, C.; Thiemonge, N. (in preparation). Comparing the effects of climate change and hydro-electric regulation on Hudson Bay freshwater. To be submitted to *The Journal of the Canadian Water Resources Association*.

Tefs, A.A.G.; Stadnyk, T.A.; Koenig, K.A.; Déry, S.J.; Ali, G.; Guay, C.; Pokorny, S. (in preparation). Uncertainty in projections of freshwater supply to the Hudson Bay Complex: How quantifying uncertainty leads to greater confidence. To be submitted to *Journal TBA*.

Tefs, A.A.G.; Stadnyk, T.A.; Koenig, K.A.; Déry, S.J.; Guay, C.; MacDonald, M.K; Thiemonge, N. (in preparation). The changing face of freshwater to Hudson Bay: Modelling the effects of climate change and hydroelectric regulation (1981 to 2070). To be submitted to a special BaySys issue of *Elementa*.

Team 3

Published/Submitted

Anticipated (in preparation)

Barber, D.G., Harasyn, M.L., Babb, D.G., McCullough, G., Capelle, D., Dalman, L., Mathes, L., Basu, A., Fayak, M., Schembri, S., Kirillov, S., Papkyriakou, T., Ehn, J.K., Rysgard, S., Stroeve, J. and Sydor, K. (2020) Sediment laden sea ice in southwestern Hudson Bay: entrainment, transport and biogeochemical significance. *Elementa*.

Dalman, L.A., Matthes, L., Barber, D., Kuzyk, Z.Z., Tremblay, J.É., Lee, J., Jacquemot, L., Mundy, C.J. (2020). Response of microalgal communities to a seasonal freshwater gradient in southwestern Hudson Bay, Canada. *Elementa*.

Deschepper, I. et al. from T4, T3, T2 (2019/20). The impact of regulation and climate change on the nutrient cycles within the Hudson Bay*. Elementa, Biogeosciences or GBC.*

Deschepper, I. et al. from T4, T3, T2 (2020). Impact of past physical environmental variability on the nitrogen and carbon cycles within the Hudson Bay Complex. *Glob. Biogeochem. Cycl?*

Deschepper, I. et al. from T4, T3, T2 (2020). Validation and sensitivity of BiGCIIM to varying spatial inputs of river nutrient (N and C) inputs. *TBD*.

Freitas, L.B., Belanger, S., Tremblay, J.É. (2020). Climatic changes impact on phytoplankton marginal ice zone blooms in Hudson Bay System. *Elementa: Science of the Anthropocene*.

Freitas, L.B., Lukovich, J., Belanger, S., Myers, P., Tremblay, J.É. (2020). Atmosphere cooling triggers phytoplankton fall bloom in Hudson Bay. *Journal Geophysical Research: Oceans*.

Freitas, L.B., Belanger, S., Tremblay, J.É. (2020). Performance and sensibility of phytoplankton production estimates to the complex bio-optical properties of the Hudson Bay and Baffin Bay. *TBD*.

Jacquemot, L., Kalenitchenko D., Tremblay, J.É., Lovejoy, C. (2020). Diversity and distribution of microbial eukaryotes in the Churchill - Nelson River Basin. *Elementa*.

Jacquemot, L., Lovejoy C., and others (2020). Succession of microbial communities in the northwest Hudson Bay polynya during sea-ice breakup. *TBD*.

Lee, J., Tremblay, J.É., Tefs, A., Stadnyk, T. and others (2020). Nutrient input from subarctic rivers into Hudson Bay. *Elementa*.

Lee, J., Tremblay, J.É., and others (2020). A contemporary nutrient budget for the Hudson Bay System. *TBD*.

Matthes, L., Mundy, C.J., Belanger, S., Dalman, L.A., Basu, A., Babb, D., Barber, D., Tremblay, J.É., Lee, J., Ehn, J.K. and others (2020). Spring primary production in Hudson Bay: Environmental control and photophysiological response*. Elementa (special issue).*

Matthes, L., Babb, D., Dalman, L.A., Ehn, J.K., Harasyn, M., Kirillov, S., Tremblay, J.É., Lee, J., Pierrejean, M., Archambault, P., Kuzyk, Z., Capelle, D., Barber, D., Mundy, C.J. and others (2020). First observations of Melosira arctica on seasonal, mobile pack ice in the Hudson Bay system*. Scientific reports, PLOS ONE, Frontiers of Marine Science or Geophysical Research Letters (GRL).*

Pierrejean, M., Archambault, P., Nozais, C., Maps, F. and others (2020). How are benthic communities structures in the Hudson Bay Complex?. *Marine Ecology Progress Series*.

Pierrejean, M., Archambault, P., Blanchet, G., Gravel, D., Nozais, C., Maps, F. and others (2020). Future predictions of benthic communities in Hudson Bay: where and why?. *Elementa.*

Schembri, S., Deschepper, I., Bouchard, C., Sirois, P., Myers, P., Fortier, L. (2020). *Boreogadus saida* hatching strategies in Hudson Bay; further testing of the freshwater winter refuge hypothesis. *TBD.*

Schembri, S., Pontbriand, T., Fortier, L. (2020). Mesozooplankton communities in the Hudson Bay system. *TBD.*

Schembri, S., Fortier, L. (TBD). Ichtyoplankton communities at the ice edge in the Hudson Bay. *TBD.*

Team 4

Anticipated (In Preparation)

Capelle, D and T4 members, 2019 Inorganic carbon dynamics of Hudson Bay during the Winter and Spring. *Elementa*. (Possible collab w/ Azetsu-Scott, ZK data from fall 2016 DesGrosseillers). Anticipated submission – Jan 2020

Examine spatial distribution of inorganic carbon during spring 2018. Additional parameters will be used to assess influence of physical and biological processes, and environmental factors (e.g. primary production, remineralization, air-sea flux, rivers, sea ice, freshwater distributions, and circulation). The paper builds upon previous bay-wide inorganic carbon surveys by including data from the NW polynya, the spring and winter, and improved river measurements.

Team 4 -River delivery of Carbon to Hudson Bay during spring. (Team 3, 5 collab?) *Likely merged with Hudson Bay C-cycle update.*

Characterize the total input of inorganic and organic carbon, and spatial differences between rivers, to the HBC using data collected during June-July 2018 (~18 rivers).

Capelle and T4. 2019. First assessment of CH_4 dynamics and sea-air CH_4 flux in the Hudson Bay complex. *Biogeosciences or Elementa Anticipated submission to Elementa – Mar 2020*

Characterize the distribution of pCH_4 and sea-air CH_4 flux. Distribution will be attributed to abiotic and/or biotic processes, forced by environmental factors including composition of water mass, sea ice and water circulation. (bulk CH_4, 13C-CH_4, EC-flux?)

Capelle, D. and multiple authors from T4, T2, T3, T5, Carbon Budget of the Hudson Bay Complex In review at Progress in Oceanography

Present our current understanding on the full carbon budget (organic and inorganic) for Hudson Bay Complex. The research will consider both organic and inorganic pathways/processes, quantifying interconnections between internal and external carbon stores.

Sims et al. Application of Eddy covariance measurements in HB, *Anticipated submission to JGR Biogeosciences/Atmospheric Chemistry and Physics – May 2020*

Evaluate the use of EC method to characterize gas exchange coefficients in marginally ice covered, open water, and correcting for small scale vertical gradients in near-surface pCO2 (Hudson Bay – spring 2018).

Munson Kuzyk Capelle et al. (and multiple authors from T4, T3, T2, T1, 2020). LOICZ box model of Nelson River Estuary System. Anticipated submission to…Elementa special issue (May 2020)

Examine the distribution and evolution of inorganic carbon parameters and water mass composition over the river-to-sea continuum within the Nelson River estuary and attribute variability to abiotic and biotic processes. pull from Dalman Thesis, Kazmiruk Thesis, Petrusevich, Basu). Can incorporate additional data from other teams.

Miller et al. Biogeochemical processes in Hudson Strait in the context of the HBC and as a link to the Labrador Sea. Anticipated submission to Elementa – Jan 2021

Pull on available datasets from Hudson Strait to characterize rates of primary production, remineralization, air-sea flux and burial, to develop a C-budget. Estimate C-inputs and exports from Hudson Strait. Focus on role of Hudson Strait in terms of modifying Carbon en route from Hudson Bay to N. Atlantic...collab with Team 3? Team 1?

Ahmed, M and T4 members, 2019. Impacts of water stratification on surface water pCO2sw variations in Hudson Bay. *Anticipated submission to* Elementa– *November 2019*

The objectives of this study are three-fold: (1) characterize stratification in Hudson Bay during the spring season, and explain its origins and characteristics; (2) understand the impact of stratification (within the upper few meters of the ocean) on the vertical and spatial variability of pCO_2; and (3) develop a method to correct for underway pCO_2 measurements in areas of strong stratification.

Ahmed, M and T4 members, 2019. Surface Water pCO2 Variations and Sea-Air CO2 Fluxes during the spring in Hudson Bay. *Anticipated submission to JGR Oceans or Biogeosciences – February 2020*

Describe the spatial variability of pCO2sw and air-sea CO_2 flux in Hudson Bay during the 2018 spring season. Identify key biogeochemical factors controlling the pCO2sw variability.

Ahmed, M. and T4 members (Team 1 collab), 2019. Application of remote sensing techniques to estimate sea-air CO2 fluxes in Hudson Bay. *Anticipated submission to* Remote sensing of Environment – *May 2020*

Use remote sensing techniques to extrapolate the underway pCO2sw observations and estimate the Bay-wide sea-air CO2 fluxes, to reveal if Hudson Bay acts as a source or sink of CO2 during the spring season. Investigate potential for estimating the past (~decades) sea-air CO2 fluxes in Hudson Bay based on remote-sensing data.

Islam and Guéguen. Photochemical transformations of dissolved organic matter in surface Hudson Bay using a multi technique approach. JGR (Biogeosciences)

Examine the photochemical transformations of DOM in rivers, estuaries and coastal Hudson Bay. Photodecarboxylation and thus production of CO2 is discussed.

Islam, S. and Guéguen, C. Mar. Chem. Biological transformation of DOM in HB. Permafrost, rivers, algae were exposed to microbial remineralization using natural microbial communities from HB, rates of transformation were measured, using UVvis and high-res mass-spec in Churchill River System.

Kazmiruk, Zou Zou Kuzyk, Tim Papakyriakou, Søren Rysgaard, possibly others, Microbial degradation of dissolved organic carbon in riverine and coastal Hudson Bay waters under landfast ice as inferred from incubation experiments. Anticipated submission to Biogeosciences Jan 2020.

Short description: quantitative assessment of the microbial degradation of terrestrial dissolved organic carbon (TDOC) as well as estimating the relative proportions of labile, semi-labile and refractory TDOC in the coastal southwestern and southeastern Hudson Bay during winter season using incubation experiments

Kazmiruk, Kuzyk, Papakyriakou, others, Organic carbon degradation in the coastal Hudson Bay as inferred from water mass distribution and Apparent Oxygen Utilization dynamics in late summer (2005-2010). Anticipated submission to Elementa April 2020

Assessment of Apparent Oxygen Utilization in space and time in the coastal corridor of Hudson Bay using previously collected datasets (2005-2010) in order to support or refute the notion of potential microbial degradation of TDOC in the coastal Hudson Bay, and, if supported, describing where and to what extent the degradation happens (Collab with mooring data, sediment traps? NEMO model – water mass residence times at different places in HB)

Team 5

Published/Submitted

M Goharrokhi, H Pahlavan, DA Lobb, PN Owens, SP Clark. Submitted. Assessing Issues associated with a time-integrated fluvial fine sediment sampler. *Hydrological Processes.*

This study uses controlled laboratory conditions to validate the field measurements of particle size from the commonly used time-integrated fine sediment sampler.

T Stainton. 2019. An initial investigation into the sources and transport of particulate organic matter in the Nelson River System, Manitoba.

Historical and newly collected summer season physical and chemical water quality data from riverine stations in the Nelson River system are examined to characterize particulate sources (organic matter and mineral sediment) in each region of the study area. Longitudinal and temporal changes to these sources of particulate matter are also investigated.

Anticipated (in preparation)

Planned submissions to Elementa special issue:
J Singer, KM Munson, J Liu, DA Armstrong, TM Stainton, ZZ Kuzyk. In prep for thesis. Methylmercury production and fluxes due to water level fluctuations in hydroregulated boreal regions of northern Manitoba.

Methlymercury production is known to occur following flooding of reservoirs. We observed the flux of methylmercury out of nearshore and offshore soil material collected near northern Manitoba reservoirs. These fluxes are compared to the historical methylmercury measured from reservoir sediment cores.

KM Munson, P Chaudhuri, S Huyghe, S Ciastek, ZZ Kuzyk, G Stern, F Wang. Sediment production and redistribution of methylmercury in Hudson Bay.

The historical sedimentation, local production, and redistribution of methylmercury in Hudson Bay will be determined from analysis of sediment cores collected across the bay.

TM Stainton, G McCullough, ZZ Kuzyk. Sources and characteristics of particulate matter in the Nelson River system.

Historical and newly collected summer season physical and chemical water quality data from riverine stations in the Nelson River system are examined to characterize particulate sources (organic matter and mineral sediment) in each region of the study area. Longitudinal and temporal changes to these sources of particulate matter are also investigated.

Planned submissions to other journals
M Goharrokhi, DA Lobb, PN Owens. In prep for resubmission. Evaluation of high-flow continuous-flow centrifugation and continuous-flow filtration techniques for sampling suspended sediment. *Hydrological Processes.*

This study compares the efficiency continuous-flow centrifugation and continuous-flow filtration to assess sample particulate matter from three different freshwater systems.

KM Munson*, WA Jansen*, GA Stern, F Wang. NOT this week! Recent increases in fish mercury concentrations from Northern Manitoba water bodies. *Environmental Science and Technology.*

Fish mercury commonly increases within 10 years of reservoir creation and subsequently decreases to background levels within 30 years. From long-term monitoring data, we have observed an increase in fish mercury In both unregulated and regulated water bodies in northern Manitoba since 2005.

KM Munson + T5/4. Data set compilation. Transport and transformation of methylmercury in a sub Arctic estuary.

This manuscript will accompany planned manuscripts from Team 1 (Babb/McCullough) on the sea ice dynamics in the Nelson River estuary and a Team 4 (Kuzyk, Guéguen?) manuscript presenting a biogeochemistry box model of the Nelson River estuary. This mercury manuscript will focus on interpreting unpublished prior data and BaySys data from the Nelson River estuary to determine controls on mercury biogeochemistry.

KM Munson, J Singer, Z Gao, S Huyghe, F Wang. Sample analysis ongoing. Methylmercury budget in the Hudson Bay.

The mass budget of Hudson Bay methylmercury will be determined from sediment, ice, and seawater reservoirs with a focus on the internal production of methylmercury versus freshwater sources.

S Huyghe, ZZ Kuzyk, P Lajeunesse. In prep for thesis. An expansion and reworking of the current sediment budget using previously published and newly collected geophysical and geochemical data.

This study updates previous studies of particulate matter sources, pathways, and distributions in Hudson Bay.

S Huyghe, ZZ Kuzyk, J Ehn. The seasonal processes affecting sediment deposition and transport using sediment trap data.

This study looks at temporal changes in sediment content and composition in discrete sample collected over an annual cycle.

T Stainton, ZZ Kuzyk, E Pettigrew, etc. Submitted thesis chapter. Compound-specific stable isotope (CSSI) fingerprinting of particulate organic matter in the Nelson River system, Manitoba.

Compound-Specific Stable Isotope (CSSI) analysis of fatty acids is used on terrestrial and in-stream samples to identify and characterize organic matter sources and quantify their relative contributions to downstream total suspended sediment using Bayesian statistical unmixing models in MixSIAR, an open source R package.

Team 6

Published/Submitted

Natasha A. Ridenour, Xianmin Hu, Shabnam Jarfari Khasragh, Jack C. Landy, Jennifer V. Lukovich, Tricia A. Stadnyk, Kevin Sydor, Paul G. Myers and David G. Barber, Sensitivity of freshwater dynamics to ocean model resolution and river discharge forcing in the Hudson Bay Complex, *Journal of Marine Systems*, 10.1016/j.jmarsys.2019.04.002, (2019).

JafariKhasragh, S., Lukovich, J., Hu, X., Myers, PG., Sydor, K., Barber D. 2019. Modelling Sea Surface Temperature (SST) in Hudson Bay Complex Using Bulk Heat Flux Parameterization: Sensitivity to Atmospheric Forcing and Model Resolution. *Atmosphere-Ocean* 57(2) pp.120-133. https://doi.org/10.1080/07055900.2019.1605974

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Anticipated (in preparation)

JafariKhasragh, S., et al. 2019. On the Hudson Bay sea ice regimes in an ocean-ice model: flux impacts.
Target Journal: Journal of Geophysical Research

Myers, P., et al. 2020. An overview of NEMO modelling for BaySys.
Target Journal: Elementa

Lukovich, JV., et al. 2020. Baseline Evaluation Paper
Target Journal: Elementa special issue

Lukovich, J.V., et al. 2020. The relative impacts of climate change and regulation on freshwater-marine coupling within the HBC from a modeling perspective using the NEMO model
Target Journal: Elementa special issue