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	Abstract
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Data and Resources

URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/291c2943-7c02-4e47-b059-90064ce01f69/download/matthes_lisa.pdf
Name	Lisa Matthes (2021)
Description	**Title:** Light propagation in ice-covered environments: seasonal progression and biological implications Beginning in the 1960s and increasing through to the present, regulation of reservoirs for hydroelectric generation has become more prevalent in the Nelson Churchill River Basin and the La Grande Rivière Complex, together making up close to half of the total freshwater flux entering Hudson Bay annually. Coincident with hydroelectric development, the effects of climate change have intensified and are more pronounced at higher latitudes, affecting the majority of the Hudson Bay Drainage Basin (HBDB). Whether the effects of climate change and hydroelectric regulation are additive or offsetting is unclear, creating uncertainty as to the driving cause of the observed changes; with added complication due to the relatively poor representation of regulation in continental-scale hydrologic models. This work aims to quantifiably distinguish the impacts of climate change and hydroelectric regulation on the majority of the freshwater supply to Hudson Bay by running two parallel sets of hydrological simulations using the HYPE model. The first set improves reservoir regulation in HYPE, and the second creates a wholly re-naturalized set of simulations with no anthropogenic influence. An ensemble of the Phase 5 Climate Model Intercomparison Project (CMIP5) general circulation models (GCMs) and representative concentration pathways (RCPs) drive simulations over the HBDB at a daily time-step from 1981 to 2070. By subjecting both models (regulated and re-naturalized) to climate change, the effects of hydroelectric regulation can be isolated and quantifiably distinguished from climate change. This research improves the performance of a hydrological model in a highly regulated system, and further succeeds in distinguishing the spatio-temporal scales of different change factors. Intra-annual changes of flow timing are primarily due to hydroelectric regulation, inter-annual change is driven by upstream storage, and inter-decadal impacts are the result of climate change. With these results, a variety of additional simulations (i.e., sea-ice, carbon-cycling, biogeochemical) can be run to ascertain the overall health of Hudson Bay and the effects of climate change and reservoir detention can be attributed quantitatively.
Format	PDF
Resource Category	documents
URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/2c573b14-b317-4f23-b62d-e53e2b56c884/download/rajtantra_lilhare.pdf
Name	Rajtantra Lilhare (2020)

Description	**Title:** Assessing the effects of uncertainty and climate change on hydrological simulations across a permafrost gradient in North-Central Canada Hudson Bay, a vast inland sea in northern Canada, receives the highest average annual freshwater from the Nelson River system among all other contributing rivers. A rapidly changing climate and flow regulation from hydroelectric developments alter Nelson River streamflows timing and magnitude, affecting Hudson Bay's physical, biological, and biogeochemical state. Despite recent developments and advances in climate datasets, hydrological models, and computational power, modelling the Hudson Bay system remains particularly challenging. Therefore, this dissertation addresses crucial research questions from the Hudson Bay System (BaySys) project by informing how climate change impacts variability and trends of freshwater-marine coupling in Hudson Bay. To that end, I present a comprehensive intercomparison of available climate datasets, their performance, and application within the macroscale Variable Infiltration Capacity (VIC) model, over the Lower Nelson River Basin (LNRB). This work aims to identify the VIC parameters sensitivity and uncertainty in water balance estimations and investigates future warming impacts on soil thermal regimes and hydrology in the LNRB. An intercomparison of six climate datasets and their equally weighted mean reveals generally consistent air temperature climatologies and trends (1981–2010) but with a prominent disagreement in annual precipitation trends with exceptional wetting trends in reanalysis products. VIC simulations forced by these datasets are utilized to examine parameter sensitivity and uncertainties due to input data and model parameters. Findings suggest that infiltration and prescribed soil depth parameters show prevailing seasonal and annual impacts, among other VIC parameters across the LNRB. Further, VIC simulations (1981–2070) reveal historical and possible future climate change impacts on cold regions iii hydrology and soil thermal conditions across the study domain. Results suggest that, in the projected climate, soil temperature warming induces increasing baseflows as future warming may intensify infiltration processes across the LNRB. This dissertation reports essential findings in the application of state-of-the-art climate data and the VIC model to explore potential changes in hydrology across the LNRB's permafrost gradient with industrial relevance of future water management, hydroelectric generation, infrastructure development, operations, optimization, and implementation of adaptation measures for current and future developments. **Link to University of Northern British Columbia library :** https://unbc.arcabc.ca/islandora/object/unbc%3A59110?solr_nav%5Bid%5D=6bd9d43960a3ad30cf63&solr_nav%5Bpage%5D=0&solr_nav%5Boffset%5D=0
Format	PDF
Resource Category	documents
URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/5663f328-27da-4011-9b05-c9fcafcf1431/download/36652.pdf
Name	Marie Pierrejean (2020)

Description	**Title:** Current and future impacts of climate change on benthic communities in the Canadian Arctic The Arctic Ocean is emerging as one of the regions that is most affected by climate change. A significant increase in precipitation and sea surface water temperatures are expected and will undeniably lead to a significant loss of sea ice cover. Because of their effects on physicochemical parameters, these changes are expected to directly impact the surface primary producers (sea ice algae and phytoplankton), thereby limiting organic matter input towards the seafloor. It is thus commonly accepted that climate change will affect the distribution, diversity and abundance of benthic communities, due to its impact on environmental parameters (pelagic-benthic coupling and physicochemical parameters), and on ecosystem services and functions (e.g., benthic remineralization). As a consequence, the decrease in sea ice cover, the desalination of the surface layer or the increase in shipping traffic in the Hudson Bay Complex and in the eastern Canadian Arctic will likely lead to major changes in benthic community structure and biogenic structural habitats. In this context and since the impacts of climate change on benthic arctic ecosystems were still poorly understood, the objectives of this thesis were to i) describe the diversity and distribution of epibenthic communities in the Hudson Bay Complex and ii) understand the effects of climate change on biodiversity and benthic ecosystem functioning. The outcomes of this thesis allowed us to i) provide the most recent survey on epibenthic organisms in the Hudson Bay Complex and their relationships with environmental variables; ii) identify diversity hotspots sensitive to climate change; and iii) document and compare benthic biodiversity and fluxes within biogenic structures and adjacent bare sediments in the Canadian Arctic. A total of 380 taxa have been identified from 46 stations sampled across the Hudson Bay Complex. Despite the relatively low spatial coverage of our sampling, we estimated that our survey represented 71% of the taxa present in the Hudson Bay Complex. We showed that biomass, abundance, diversity and spatial distribution of epibenthic communities were strongly influenced by substrate, salinity, food supply and sea ice cover. We also showed that freshwater inputs were responsible for the lowest biomass, abundance and diversity observed along the coasts. In contrast, data collected from polynyas, further offshore, showed strong pelagic-benthic coupling resulting in high productivity in terms of biomass, abundance and diversity. Moreover, hierarchical modelling of species communities highlighted the influence of sea ice and indirectly of sea ice algae on the epibenthic communities occupying the central Hudson Bay. Projections of the structure of epibenthic communities under a RCP4.5 climate scenario revealed that the central Hudson Bay emerges as the most vulnerable area to climate change with a future diversity loss related to the decrease of sea ice. On the contrary, it would appear that coastal areas will serve as refuges and increase the diversity. In addition, our study showed that the presence of biogenic structures in deep habitats improved the trapping of organic matter, leading to a higher density of infauna in these environments compared to bare sediments. Their presence has also been found to enhance sediment nutrient release in the form of nitrates and ammonium. However, our study could not demonstrate these effects in a shallower sponge habitat. By providing new knowledge on the current and future distribution of epibenthic communities in the Hudson Bay Complex and the benthic ecosystem functioning in habitats with biogenic structures, results obtained during this thesis will contribute to the designation of Ecologically and Biologically Significant Areas, as well as to the establishment of Marine Protected Areas and conservation strategies in the Arctic Ocean. Document Type:
Format	PDF
Resource Category	documents
URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/d97c09cb-3083-4796-aaf0-a11971096fb2/download/9055d3ea-e749-43c0-9eab-deb1cb1c4491.pdf
Name	Natasha A. Ridenour (2020)

Description	**Title:** On the circulation and freshwater dynamics of the Hudson Bay Complex. **Abstract:** The Hudson Bay Complex (HBC), which includes Hudson, James, and Ungava Bays, Foxe Basin, and Hudson Strait, is currently undergoing change from two anthropogenic sources; industry and global warming. The communities surrounding this region use the sea for travel, hunting, and social connections, year round. Changes in the food chain and ice conditions thus impact the daily lives of the locals. The HBC also has a large drainage basin, receiving about 900 km3 of freshwater annually, making it an ideal location for the production of hydroelectricity. This riverine water traverses Hudson Bay and is advected to the North Atlantic via Hudson Strait, the main pathway for exchange between the HBC and the global ocean. Hudson Strait is also the third largest source of advected freshwater to the Labrador Sea after Fram and Davis Straits. However, our understanding of the role of riverine water in the bay is limited, and downstream effects of changes in river discharge is presently unknown. Additionally, knowledge of circulation in areas, such as Hudson Strait, is limited to a few observational datasets. These datasets focus mostly on the southern side of the strait which contains fresh eastward flow, and while valuable, there are no recent published data for the north side of the strait containing westward flowing waters entering the bay. I begin by presenting the first multi-year freshwater budget for the HBC. Using four model simulations and three river discharge datasets, I show that river discharge impacts freshwater fluxes out of the region on timescales longer than a year. Decreased river discharge and seasonality led to reduced freshwater and volume exchange within the HBC and to the North Atlantic. Model resolution had minimal impact on freshwater and volume fluxes in areas with simple flow dynamics. I also provide estimates of the Ekman, mean, and turbulent ii components of freshwater exchange between the interior and boundary regions of the bay. The mean and Ekman components import freshwater to the interior in spring and summer, and export it in the fall. Residence times of discharge in the HBC are calculated using an offline Lagrangian passive tracer tool, with an upper limit of 32 years. Using the highest resolution model simulation available at the time, I revisited the summer circulation pattern in Hudson Bay, which historically was thought to be cyclonic. Using satellite altimetry data along with model output, I showed that in summer, steric height gradients due to increased river discharge in summer, generate small scale features, including anticyclonic geostrophic flow in eastern Hudson Bay. Given this result, I present a revised summer surface flow pattern for Hudson Bay. Finally, to increase our understanding of flow and water exchange in Hudson Strait, I present the first year long observed measurements of flow on the northern side of Hudson Strait. Mooring data show a saline, weakly stratified inflow with reduced seasonality on the northern side compared to the southern side of the strait, which contains the fresh, discharge laden outflow. Source waters are from the Baffin Island Current, comprised mainly of Arctic water, with small contributions from Transitional Water and West Greenland Irminger Water.
Format	PDF
Resource Category	documents
URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/53af6828-20df-487c-9bd1-1f84e42505ee/download/singer_james.pdf
Name	James Singer (2020)

Description	**Title**: Mercury cycling in hydroelectric reservoirs of northern Manitoba decades after impoundment **Abstract** As the global climate changes and demand for renewable electricity increases, construction of hydroelectric dams is increasing globally though the impacts of regulating the worlds rivers are still understudied. Northern Manitoba, Canada, has extensive hydroelectric development since the 1950s; fish mercury (Hg) concentrations in on-system lakes were observed to have increased above human consumption guidelines upon impoundment and have taken decades to decrease towards natural concentrations. To better understand the long-term impacts of hydroelectric regulation on Hg in fish and other biota in Northern Manitoba, we determined methylmercury (MeHg) production potential in soil from the water fluctuation zone in on- and off-system lakes through a soil flooding incubation experiment in the laboratory. We further studied the historic flux of MeHg and Hg to the sediments in on- and off-system lakes and links to organic matter in these waterbodies. We found that MeHg production was highest in the water fluctuation zone of the on-system lakes, which may represent an increased source of MeHg to the food web in these environments even decades after impoundment. In addition, sedimentation rates were found to greatly affect Hg fluxes to the sediment in those waterbodies where increased water flows result in higher erosion and sedimentation. These findings provide new insight in our understanding of the long-term recovery of Hg cycling within on-system lakes decades after impoundment.
Format	PDF
Resource Category	documents
URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/bd959f4c-443b-44b6-aea6-1a9c4871cb37/download/pokorny_scott.pdf
Name	Scott Pokorny (2019)
Description	**Title**: Assessing the Relative Contributions of Input, Structural, Parameter, and Output Uncertainties to Total Uncertainty in Hydrologic Modeling The simulation of physical environments by hydrologic models has become common as computational power has increased. It is well known that, to simulate the hydrology of a physical environment, simplifications of that environment are needed. The simplified versions of hydrologic processes generate uncertainty, in addition to ingesting uncertainty from input data. The uncertainty from one modeling step affects the next through propagation. Although computational power has increased through time, the computational demand for uncertainty analysis still remains a common limiting factor on the level of detail an uncertainty analysis can be conducted with. This thesis generates an estimate of total uncertainty propagated from input, structural, and parameter uncertainties for the Nelson River in the Lower Nelson River Basin near the outlet to Hudson Bay, as part of the BaySys project. Each source of uncertainty was relatively partitioned for determination of the most valuable source of uncertainty for consideration in an operational environment with a limited computational budget. The results of this thesis show the complex spatial and temporal variation present in gridded climate data. This thesis also presents an ensemble-based methodology to account for the input uncertainty associated with gridded climate data subject to propagation. The ensemble of input data was propagated through an ensemble of hydrologic models. Relative sensitivities of model parameters were shown to vary temporally and based on performance metrics, suggesting that aggregated performance metrics obscure information. Lastly, relative partitions of uncertainty were compared through cumulative distribution functions. Accounting for all sources of uncertainty appeared valuable towards improving streamflow predictability, however, structural uncertainty may be the most valuable in an operational environment with a limited computational budget followed by input, and parameter uncertainty.
Format	PDF
Resource Category	documents
URL	https://mspace.lib.umanitoba.ca/handle/1993/34021
Name	Madison Leigh Harasyn (2019)

Description	**Title**: Integrated passive microwave and unmanned aerial vehicle studies of Hudson Bay sea ice during the summer melt period **Abstract**: Inaccuracies in sea ice observations from passive microwave satellite sensors increase during the summer melt period due to the evolution of sea ice thermophysical properties driving complexity in ice emissivity. Research from this thesis examines variations in sea ice thermophysical properties in Hudson Bay throughout summer melt and relates them to ice surface emissivity. This is achieved through the collection and analysis of a time-series of in situ passive microwave and unmanned aerial vehicle measurements of sea ice. Contributions from this thesis are made under two overarching categories: 1) the influence of sediment presence on sea ice passive microwave signature and; 2) the evolution of in situ and satellite-based sea ice emissivity throughout the melt period in Hudson Bay. Results from this research link non-uniform distribution of sediment across the ice surface to increased surface topography, as a result of enhanced melt rates from decreased surface albedo. The in situ passive microwave signature of sediment-laden ice is then examined, in relation to the surface roughness and liquid water presence on the ice surface. This thesis also verifies the evolution of in situ sea ice emissivity during the melt period in relation to the existing literature, and distinct periods of ice emissivity during ice melt are highlighted. In situ and satellite-based microwave brightness temperatures are compared, facilitated by a multi-sensor approach. To the authors' knowledge, these results contribute the first multi-sensor in situ observations of sediment laden sea ice, and the first comprehensive analysis of the emissive properties of Hudson Bay sea ice throughout the summer melt period.
Format	PDF
Resource Category	documents
URL	https://mspace.lib.umanitoba.ca/handle/1993/34477
Name	Yanique S. Campbell (2019)
Description	**Title**: The evolution of wind-driven surface waves in partial sea ice cover in the southern Beaufort Sea **Abstract** Surface waves play an important role in how energy is transported and distributed to both sea ice and atmosphere in Arctic seas. The region of marginal sea ice, termed the Marginal Ice Zone (MIZ), has been increasing alongside temperature, introducing even more open water spaces within the sea ice field. Little research has focused on the development of waves within these open water spaces, and how the wave field evolves under such restricted fetch environments. This study considers a set of observations collected using moorings from ASL Environmental Sciences in the southern Beaufort Sea. These observations suggest local wave development as the dominant source of wave energy tens of kilometers in the MIZ throughout the month of August. The significant wave heights (H_s) and peak periods (T_p) were kept low throughout the month, mainly remaining below a H_s of 0.6 m and a T_p of 6 s in sea ice. At the end of the month, open water waves were able to influence the wave characteristics and there were notable increases in both heights and periods. This study examines how the attenuation of such waves by sea ice differs from the attenuation of open water waves moving into the MIZ. The coherence and positive correlation between H_s and T_p were found to be predominant in the sea ice field. This differs from the classic attenuation of open water waves in sea ice where peak periods increase while wave heights decrease, producing a distinct negative relationship with distance in sea ice. There was no preferential increase or lengthening of the dominant waves under easterly and southerly winds where the wave fetches were long, and the wind speed was found to have limited influence on wave growth after development. Estimations of fetch using empirical relationships, supplemented by satellite imagery, indicate that the short fetches were the dominant factor in terms of wave growth, which indicates an evolution similar to open water waves until they reach an sea ice floe interface and are scattered, a process which depends greatly on the sea ice type, size, rheology and the length of the waves. The interplay among the sea ice (size, structure and concentration) and the wind during a storm event provides an interesting look at the behavior of locally developed waves and the transition to more open water characteristics and development as the sea ice becomes eroded close to the end of the month. While waves developed locally in sea ice are expected to be fairly low compared to open water waves, they play an important role in the fluxes of energy and momentum in the MIZ and the expansion of this region has implications for the overall energy balance in Arctic marine systems.
Format	PDF

Resource Category	documents

URL	https://mspace.lib.umanitoba.ca/handle/1993/33851
Name	Shabnam Jafarikhasragh (2019)
Description	**Title:** Numerical modeling of Hudson Bay Complex, sea ice regime and sea surface temperature **Abstract** This thesis presents the numerical simulations in Hudson Bay Complex (HBC) in regards to its mass and surface energy balance. First, the Sea Surface Temperature (SST) from four NEMO (Nucleus for European Modelling of the Ocean) model simulations are analysed to study the bulk flux parameterization to compute SST over the Hudson Bay Complex for the summer months (August and September) from 2002 to 2009. Results from these different sensitivity experiments showed the low impact of the model resolution and runoff on the simulated SST in HBC. Second the seasonal cycle of sea ice variability in the HBC, together with the dynamic and thermodynamic processes that control it, were examined. Results showed that the thermodynamic fluctuations are the dominant term in the total ice tendency variations for all HBC sections and the dynamic term plays a minor role in the total ice thickness trends.
Format	PDF
Resource Category	documents

URL	Staintonhttps://mspace.lib.umanitoba.ca/handle/1993/33788
Name	Tassia M. Stainton (2019)
Description	**Title:** An initial investigation into the sources and transport of particulate organic matter in the Nelson River system, Manitoba **Abstract** The Nelson River, a subarctic river in north-central Manitoba, is the largest river discharging to Hudson Bay and its watershed has seen extensive land-modification in the upper reaches, permafrost thaw in the lower reaches, and hydroelectric development throughout. To characterize sources of sediment and particulate organic matter (OM) in the Nelson River system, and to identify processes influencing its transport to Hudson Bay, water quality parameters, Compound-Specific Stable Isotope (CSSI) fingerprinting, and Bayesian unmixing models were employed on terrestrial and instream samples. Distinct regional, longitudinal, and temporal differences in water quality parameters and particulate OM sources were observed among all three regions of the Nelson River system (upper Nelson River, Rat-Burntwood River, lower Nelson River). The application of CSSI fingerprinting and unmixing models showed that the dominant sources of OM to suspended sediment in the lower reaches of the Nelson River are proximally derived and comprise soils, upstream suspended sediment, river bed sediment, and tributary suspended sediment.
Format	PDF
Resource Category	documents

URL	https://mspace.lib.umanitoba.ca/handle/1993/34108
Name	Scott Pokorny (2019)

Description	**Title:** Assessing the relative contributions of input, structural, parameter, and output uncertainties to total uncertainty in hydrologic modeling **Abstract** The simulation of physical environments by hydrologic models has become common as computational power has increased. It is well known that, to simulate the hydrology of a physical environment, simplifications of that environment are needed. The simplified versions of hydrologic processes generate uncertainty, in addition to ingesting uncertainty from input data. The uncertainty from one modeling step affects the next through propagation. Although computational power has increased through time, the computational demand for uncertainty analysis still remains a common limiting factor on the level of detail an uncertainty analysis can be conducted with. This thesis generates an estimate of total uncertainty propagated from input, structural, and parameter uncertainties for the Nelson River in the Lower Nelson River Basin near the outlet to Hudson Bay, as part of the BaySys project. Each source of uncertainty was relatively partitioned for determination of the most valuable source of uncertainty for consideration in an operational environment with a limited computational budget. The results of this thesis show the complex spatial and temporal variation present in gridded climate data. This thesis also presents an ensemble-based methodology to account for the input uncertainty associated with gridded climate data subject to propagation. The ensemble of input data was propagated through an ensemble of hydrologic models. Relative sensitivities of model parameters were shown to vary temporally and based on performance metrics, suggesting that aggregated performance metrics obscure information. Lastly, relative partitions of uncertainty were compared through cumulative distribution functions. Accounting for all sources of uncertainty appeared valuable towards improving streamflow predictability, however, structural uncertainty may be the most valuable in an operational environment with a limited computational budget followed by input, and parameter uncertainty.
Format	PDF
Resource Category	documents
URL	https://mspace.lib.umanitoba.ca/handle/1993/33613
Name	Andrew A G Tefs (2019)
Description	**Title:** Simulating hydroelectric regulation and climate change in the Hudson Bay drainage basin **Abstract** Beginning in the 1960s and increasing through to the present, regulation of reservoirs for hydroelectric generation has become more prevalent in the Nelson Churchill River Basin and the La Grande Rivière Complex. Coincident with hydroelectric regulation (HR), the effects of climate change have intensified and are more pronounced at higher latitudes, affecting the majority of the Hudson Bay Drainage Basin (HBDB). Whether the effects of climate change and HR are additive or offsetting is unclear, creating uncertainty as to the driving cause of the observed changes; with added complication from relatively poor representation of HR in continental-scale hydrologic models. This work aims to quantifiably distinguish the impacts of climate change (1981 – 2070) and HR on the majority of the freshwater supply to Hudson Bay by running two sets of hydrological simulations using the HYPE hydrologic model. The first set improves HR in HYPE, and the second simulates wholly re-naturalized conditions.
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Resource Category	documents
URL	https://canwin-datahub.ad.umanitoba.ca/data/dataset/31740642-18a1-4b3c-b6f0-58082f4404ff/resource/7f4cc6b9-b002-489d-b84c-92296ae6f1fb/download/tefs_andrew.pdf
Name	Andrew Tefs (2018)

Description	**Title:** Simulating hydroelectric regulation and climate change in the Hudson Bay drainage basin. Beginning in the 1960s and increasing through to the present, regulation of reservoirs for hydroelectric generation has become more prevalent in the Nelson Churchill River Basin and the La Grande Rivière Complex, together making up close to half of the total freshwater flux entering Hudson Bay annually. Coincident with hydroelectric development, the effects of climate change have intensified and are more pronounced at higher latitudes, affecting the majority of the Hudson Bay Drainage Basin (HBDB). Whether the effects of climate change and hydroelectric regulation are additive or offsetting is unclear, creating uncertainty as to the driving cause of the observed changes; with added complication due to the relatively poor representation of regulation in continental-scale hydrologic models. This work aims to quantifiably distinguish the impacts of climate change and hydroelectric regulation on the majority of the freshwater supply to Hudson Bay by running two parallel sets of hydrological simulations using the HYPE model. The first set improves reservoir regulation in HYPE, and the second creates a wholly re-naturalized set of simulations with no anthropogenic influence. An ensemble of the Phase 5 Climate Model Intercomparison Project (CMIP5) general circulation models (GCMs) and representative concentration pathways (RCPs) drive simulations over the HBDB at a daily time-step from 1981 to 2070. By subjecting both models (regulated and re-naturalized) to climate change, the effects of hydroelectric regulation can be isolated and quantifiably distinguished from climate change. This research improves the performance of a hydrological model in a highly regulated system, and further succeeds in distinguishing the spatio-temporal scales of different change factors. Intra-annual changes of flow timing are primarily due to hydroelectric regulation, inter-annual change is driven by upstream storage, and inter-decadal impacts are the result of climate change. With these results, a variety of additional simulations (i.e., sea-ice, carbon-cycling, biogeochemical) can be run to ascertain the overall health of Hudson Bay and the effects of climate change and reservoir detention can be attributed quantitatively.
Format	PDF
Resource Category	documents
URL	https://mspace.lib.umanitoba.ca/handle/1993/33641
Name	Laura Dalman (2018)
Description	**Title:** Physical gradient influences on sea ice algae in the Canadian Arctic **Abstract** Ice algae living within the bottom interstices of sea ice significantly contribute to the amount of the primary production in the Arctic Ocean in the late-winter/spring. This thesis examines the influence of physical gradients, namely sub-ice currents and riverine input, on ice algal concentration and composition during the spring bloom. Through two separate case studies, it was found that (i) increased sub-ice currents in tidal straits enhance nutrient supply to bottom ice, supporting greater ice algal biomass, (ii) improved mechanisms of nutrient supply were proposed that explain the increased biomass as a result of strong sub-ice currents, and (iii) freshwater inflow to the marine system also has a negative influence on biomass, reducing biomass associated with decreasing salinity. These findings will help identify new biological hotpots of ice algal production in the Arctic, while highlighting a negative, yet limited, influence surrounding hydroelectric controlled river output during winter.
Format	PDF
Resource Category	documents
URL	https://mspace.lib.umanitoba.ca/handle/1993/33646
Name	Zakhar Kazmiruk (2018)

Description	**Title:** Potential for microbial degradation of terrestrial dissolved organic carbon in coastal Hudson Bay **Abstract** The fate of terrestrial organic carbon (OC) in the global ocean is largely unknown and it is speculated to be rapidly degraded in the coastal waters. Arctic marine waters, especially Hudson Bay, have a disproportionally large terrestrial dissolved organic carbon (tDOC) input compared to the global ocean, which is increasing due to climate change. The findings of these first studies of microbial degradation of terrestrial OC in Hudson Bay have revealed the presence of high Apparent Oxygen Utilization in a subsurface, winter-ventilated water mass that cannot be explained by respiration of settling marine-produced OC as currently understood. I hypothesize that tDOC deposited into coastal waters ultimately gets degraded (consuming oxygen) under the ice cover. The findings from incubation experiments that 20-50% of the tDOC deposited into Hudson Bay by southern rivers in late winter is biodegradable within a few weeks are consistent with this hypothesis.
Format	PDF
Resource Category	documents

URL	https://mspace.lib.umanitoba.ca/xmlui/handle/1993/31170
Name	Jack Landy (2016)
Description	**Title:** Characterization of sea ice surface topography using Light Detection and Ranging (LiDAR) **Abstract** Where once the Arctic basin held predominantly old, thick perennial sea ice, it is now increasingly occupied by young, thin seasonal ice. The sea ice surface topography, which affects and is affected by many of the physical processes operating at the interface between ocean, sea ice and atmosphere, is closely related to the age and type of sea ice cover. In this thesis, new methods are presented for measuring and understanding sea ice topography using Light Detection and Ranging (LiDAR) technology. A new technique is presented for parameterizing the micro-scale roughness of sea ice using terrestrial LiDAR. Field, laboratory and numerical experiments have been carried out to test the precision and accuracy of the technique, and calibrations have been developed for correcting field observations of surface roughness for known biases. Results obtained using this technique have been applied in several microwave remote sensing and electromagnetic-wave scattering model studies of snow-covered and melting sea ice. Terrestrial and satellite LiDAR observations are acquired and combined in a further study to examine how sea ice surface topography regulates the melting of ice during the Arctic summer. Observations from a field program in the Canadian Arctic show that minor variations in the roughness of pre-melt sea ice topography can affect significant variations in the melt pond coverage at the ice surface in summer. Numerical simulations are used to develop a quantitative understanding of these findings and, when applied to satellite observations, explain most of the spatial variation in Arctic summer ice melting rates. Results suggest that a recent reduction in sea ice roughness, caused by progressive changes in the type of sea ice resident in the Arctic Ocean, has accelerated the summer melting and decline of the Arctic sea ice cover.
Format	PDF
Resource Category	documents