CANQUA 2026

MONTRÉAL

PROGRAM

Canadian Quaternary Association
Biennial Meeting 2026

JUNE 3–6, 2026

MONTRÉAL, QUÉBEC, CANADA

WORKSHOP & FIELDTRIP | ORAL PRESENTATIONS | POSTER SESSIONS | NETWORKING & EXCHANGE

Contents

Wednesday, June 3, 2026

Opening reception keynote and Public Lecture: Dr. Paulette Steeves

The Indigenous Paleolithic of The Western Hemisphere

Room 132, Leacock Building, McGill University

19:00 – 20:30 PM

Paulette Steeves. Ph.D. (Cree- Metis) is an Indigenous archaeologist. Focusing on Native American and First Nations histories and decolonization of academia and knowledge production. She is a Professor in Geography, Geology, and Land Stewardship at Algoma University. Dr. Steeves was awarded a five-year Canada Research Chair Tier II in Healing and Reconciliation 2019-2024 and 2024-2029. Dr. Steeves's primary research focuses on the Western Hemisphere's Indigenous Paleolithic, healing, and reconciliation. Her book, The Indigenous Paleolithic of the Western Hemisphere, was published in July 2021 and received the American Library Association's Choice 2022 Outstanding Academic Title award.

Abstract: The Western archaeological narrative of the first people in the Americas posits that Indigenous peoples have been present in the Western Hemisphere (WH) for 12-15 thousand years. Archaeologists' denial of the deep Indigenous past of the WH has cleaved Indigenous people's links to their homeland and created them as recent immigrants to the Americas. By studying evidence from paleo-environmental, paleontological, and archaeological sites, as well as oral histories, I argue that Indigenous peoples were present in the WH before the Last Glacial Maximum (24,000 kya) and as early as 200,000 years ago. Reclaiming and rewriting Indigenous histories and reconnecting Indigenous people to their ancient homelands is a path to healing for Indigenous people. Understanding Indigenous people's links to homelands in the Quaternary informs and decolonizes minds and hearts and pushes back on misinformation, racism and discrimination in the present.

Thursday, June 4, 2026

1. Environments and ecosystems in transition

8:30 – 10:30 AM
Room 219, Leacock Building

Session Conveners: Cocker, S.L. (Department of Geological Sciences and Centre for Palaeogenetics, Stockholm University); Brinkmann, I. (Department of Geological Sciences and Centre for Palaeogenetics, Stockholm University)

50 - Holocene evolution of permafrost-dominated nearshore environment and carbon source variability in Tuktoyaktuk Harbor, Canadian Beaufort Sea

Blanda Matzenbacher[1, 2], Tommaso Tesi[3], Petra Zahajska[4], Michael Fritz[5], Lisa Bröder[6], Malin Kylander[1, 2], Katharina Schwarzkopf[1, 2], Julie Lattaud[1, 2], Inda Brinkmann[1, 2], Peter Heintzman[1, 2], Paul Overduin[5], Dustin Whalen[7], Matt O'Regan[1, 2]

[1]Stockholm University, [2]Bolin Center, [3]Consiglio Nazionale delle Ricerche Istituto di Scienze Polari, [4]University of Bern, [5]Alfred Wegener Institut, [6]ETH Zürich, [7]Natural Resources Canada

The Canadian Beaufort Sea is characterized by predominantly permafrost coastlines that are particularly vulnerable to coastal erosion due to high amounts of unconsolidated sediments. Additionally, the Mackenzie River transports suspended sediments and discharges large amounts of remobilized carbon nearshore. The rate at which marginal coasts erode and sediment accumulates is expected to increase with rising sea level and enhanced fluvial sediment transport. To understand how these coastal systems develop over time it is essential to investigate their past evolution. Here, a 9m long sediment core from Tuktoyaktuk Harbor was investigated to resolve past variability in sediment and terrestrial carbon delivery to the nearshore environment. The core is constrained by an age model spanning the last 10,000 years. Our results show that the site initially hosted a freshwater fen in the Early Holocene before transitioning into a thermokarst lake during the mid-Holocene. Initial marine inundation occurred at 4315±514 cal yr BP. Continued transgression transformed the site into a lagoon with strongly anoxic bottom waters. Reduced anoxia over time led to the establishment of a brackish lagoon. Over the last millennium deposits exhibit a notable increase in petrogenic carbon delivery, indicating enhanced erosion of ancient carbon stocks within the Mackenzie River watershed.

Submission type

Oral

54 - At the Edge of Ice - pollen-inferred vegetation communities from a unique Late Glacial site in the eastern Lake Huron region (Georgian Bay-Lake Simcoe)

Florin Pendea[1], Lily Edmunds[1], Samantha Mitchell[1], Brin Schat[1]

[1]Lakehead University

We present here a new pollen-based vegetation reconstruction from one of the earliest Late Glacial sites in the northern Great Lakes region. A former kettle depression, the Langman site hosts more than 8 meters of continuous sedimentation starting with ~3 meters of Pre-Younger Dryas lacustrine deposits overlaid by an organo-mineral Younger Dryas-Early Holocene gyttja and further, by a Holocene pond-wetland complex still functional today. Although the basal AMS ^{14}C date of 20,000 cal years BP remains to be confirmed by additional dating, the sequence records a clear Late Glacial pollen assemblage reconstructed as Pre-Younger Dryas spruce parkland with a low but non-trivial hardwood component (*Betula, Quercus, Ulmus,* and *Fagus grandifolia*), followed by a dry herbaceous tundra of Younger Dryas age. The overlying deposits (lake marl and peat) preserved the pollen signature of a classic Great Lakes-St. Lawrence Forest Holocene succession, common to many published records from South-Central Ontario. This site offers an opportunity to reassess our current understanding of Deglaciation chronologies in the Georgian Bay and the nature of Pre-Younger Dryas vegetation communities in the northern Great Lakes.

Submission type

Oral

110 - Quantitative reconstruction of North American land cover from the Last Glacial Maximum to present: a comparison of REVEALS and machine learning-based methods

Riley F. Hayes[1], Andria Dawson[2], John W. Williams[3]

[1]Nelson Institute for Environmental Studies and Center for Climatic Research, University of Wisconsin-Madison, [2]Department of Mathematics and Computing, Department of Biology, Mount Royal University, [3]Department of Geography and Center for Climatic Research, University of Wisconsin-Madison

Multiple statistical methods permit the quantitative inference of past land cover from fossil pollen networks, but direct comparisons of land cover reconstructions from these differing approaches remain rare. We develop and compare reconstructions of North American land cover for the last 21,000 years using data from the Neotoma Paleoecology Database, for two approaches: REVEALS, which infers land cover given estimates of taxon-level pollen productivity and dispersal, and supervised machine learning (ML) models that predict cover based on empirical relationships between modern pollen assemblages and remotely-sensed fractional land cover.

Prior to deployment of ML models on fossil pollen records, we assessed performance on modern assemblages during a cross-validation procedure structured to avoid optimistic bias resulting from spatial autocorrelation among assemblages. We then deployed and compared REVEALS and ML approaches for a network of harmonized fossil pollen records. We hypothesize that cover estimates would diverge for regions where dominant plant taxa lack accurate REVEALS parameterizations and back towards the Last Glacial Maximum due to increasing violation of model assumptions. Although true accuracy of the paleovegetation reconstructions

cannot be assessed, contrasts between cover estimates reveal interactions between the two model architectures and differing aspects of the non-analog conditions encountered in the geologic past.

Submission type

Oral

129 - Northern caves and southern fens on late Pleistocene Vancouver Island, Canada record shifting ecosystems, dynamic climate, and occupation by ancient peoples ca. 14,000 years ago

McIntyre A. Barrera[1], Danielle M. Grant[1], Flavio A. da Silva Coelho[1, 2], Christopher F. G. Hebda[1, 3], Libby Natola[1], Andrew Watson[4], Morley Eldridge[4], Rute B. G. Clemente Carvalho[1], Duncan S. McLaren[1], Linda Y. Rutledge[1, 5], Tyler J. Murchie[1, 6]

[1]Biodiversity Genomics, Hakai Institute, Heriot Bay, Canada, [2]Biology Department, Trent University, Peterborough, Canada, [3]Department of Geography, University of Victoria, Victoria, Canada, [4]Millennia Research Ltd., Victoria, Canada, [5]Faculty of Forestry & Environmental Stewardship, University of British Columbia, Vancouver, Canada, [6]Department of Anthropology, McMaster University, Hamilton, Canada

Palaeogenomics is a growing field at the intersection of archaeology, palaeoecology, and palaeoclimatology, leveraging ancient DNA (aDNA) technologies to recover ecosystem-level biodiversity and reconstruct detailed phylogenetic relationships among past and present biota. Here, we present results from aDNA analysis of late Pleistocene and early Holocene faunal remains and sediments from two distinct regions of Vancouver Island, Canada. From northern caves, phylogenetic reconstructions of brown and black bear, red fox, and Vancouver Island marmot reveal complex patterns of divergence, extirpation, and persistence in glacial refugia through periods of landscape transformation. At the southern tip of the island, an ancient wetland was home to giant bison and ground sloth (*Megalonyx*). Intermittent connection to the mainland and nearby islands would have provided varying conditions for migration and vicariance during the terminal Pleistocene. Ongoing palaeogenomic analyses estimate the timing and extent of divergence among these colossal mammals and their known relatives, widespread across continents and time. Further, archaeological evidence from both regions establishes human presence by ~14,000 ybp. As northern steppe-tundra transitioned to dense rainforest and southern wetlands disappeared, dynamic periods of migration, coexistence and competition with ancient peoples may have influenced the persistence or disappearance of these fauna.

Submission type

Oral

147 - Biotic and climate velocity of North American trees: A story of Holocene coupling following Late Glacial independence

Andria Dawson[1], Antonio Castilla[2], Adam Smith[3], John Robinson[4], Allan Strand[5]

[1]Mount Royal University, [2]Oklahoma State University, [3]Missouri Botanical Garden, [4]University of Georgia, [5]College of Charleston

Paleoecological evidence, such as fossil pollen data, indicates that many tree taxa responded to rapid warming during deglaciation after the last glacial maximum by shifting their ranges. However, these movement rates, or biotic velocities (BVs), have not been quantified with uncertainty. Further, the extent to which these BVs were driven by climate as opposed to other factors (i.e. traits) is not known. Using a network of fossil pollen records, we develop a Bayesian spatio-temporal model to jointly estimate relative abundance of tree taxa with uncertainty. Using these estimates, we calculate BV with uncertainty for each taxon over 1000-year intervals from 21,000 years ago to present. We do this using several measures of biotic velocity (e.g. centroid, northern and southern edge). We also calculate climate velocities (CVs) for the time intervals using a gradient-based approach for a set of climate variables from a Global Circulation Model. We find that BVs and CVs are more strongly coupled during the Holocene than the Late Glacial. We hypothesize that BV during the Late Glacial was a function of niche filling, and hence primarily trait limited, while BV during the Holocene was a function of community reshuffling primarily limited by climate.

Submission type

Oral

148 - Fire regime shifts in central Yukon during the mid-Holocene

Mickey Chen[1], Trevor Porter[1], Michael Phillips[2]

[1]Department of Geography, Geomatics and Environment, University of Toronto Mississauga, [2]Department of Biology, University of Toronto Mississauga

In recent years, record-setting wildfire seasons in northern Canada have had significant socioeconomic impact. To understand future fire trends, it is insufficient to rely solely upon recent historical data. We take a paleoenvironmental perspective to investigate postglacial changes in the boreal fire regime in response to climate and ecological forcing. This study uses pyrogenic chemical biomarkers, including polycyclic aromatic hydrocarbons (PAHs) and anhydrosugars preserved in lake sediments from Tombstone Territorial Park (central Yukon), to infer changes in the Holocene fire regime. Our method takes advantage of differences in production conditions between PAHs and anhydrosugars to understand fire severity, where PAHs are preferentially produced by high-intensity burns and anhydrosugars are an indicator for low-intensity burns. The PAH results show the dominance of conifer-based fire regime until ~6,000 cal yr BP. By ~4,000 cal yr BP, conifer combustion inputs had significantly declined, a response that is corroborated by a conifer retreat and expansion of shrub tundra reflected in local pollen records. Forthcoming anhydrosugar results will help to determine if this transition also led to an increase in low-intensity smouldering fire activity. Our findings contribute to a more refined understanding of the implications of climate change on the Canadian boreal ecosystem.

Submission type

Oral

149 - Time series of Holocene climates of North America

K Gajewski[1], C Tamo[1], M Briere[1], T Lacourse[2]

[1]University of Ottawa, [2]University of Victoria

We analyzed time series of the Holocene climate of North America at continental, IPCC region and subregional scales using data from Temp12k (Kauffman et al. 2020. Scientific Data) and Legacy (Herzschuh et al. 2023. Earth Sys Sci Data), as well as previous regional syntheses. At continental scales, several reconstructions are broadly coherent, although with still some discrepancies between reconstructions, for example in the timing of the Holocene Thermal Maximum (HTM). Regional means computed for the IPCC regions show coherence between regions and in some cases, close correspondence with transient model simulations (TraCE-21ka; Fordham et al. 2017. Ecography). At subregional scales, these results indicate regional differences in the timing of the Holocene Thermal Maximum across the continent. At this scale, some regions still contain too few sites to reliably compute a subregional average.

Submission type

Oral

179 - Hydrographic development of the Sea of Japan during the Pliocene-Pleistocene transition: the intensification of Northern Hemisphere glaciation

Saif Al-Silwadi[1]

[1]University of Toronto

The Pliocene-Pleistocene transition marks the significant intensification of Northern Hemisphere glaciation (iNHG) and evolution of the climate state. While many mechanisms have been proposed, the role of the Pacific Ocean remains poorly constrained. The Sea of Japan is a sensitive recorder of climate change, and is ideally suited for understanding the response of the mid-latitude North Pacific during this transition. Dinoflagellate cysts and other palynomorphs are here used to elucidate hydrographic changes at Integrated Ocean Drilling Project (IODP) Site U1424, east-central Sea of Japan. A total of 125 samples were analysed across 2.85 Ma to 2.41 Ma, and results reveal significant shifts in the marine palynomorph assemblages coinciding with the different phases of iNHG. The first phase (~ 2.72 Ma) sees significant cooling, with increased subarctic water influence. As icesheets expanded into the mid-latitudes with the second phase of iNHG (~2.64 Ma), a major hydrographic shift is recorded, and assemblages generally exhibit greater distinction between glacial and interglacial conditions. The acritarch *Cymatiosphaera*? *invaginata* shows an association with cooling and reflect a broader northern North Pacific signal. Results are compared with a dinocyst analysis in the South China Sea to help understand western Pacific paleoceanography across the Pliocene-Pleistocene transition.

Submission type

Oral

29 - Reconstructing human-environment interactions in the Maya lowlands using lipid biomarkers

Benjamin Gwinneth[1], Kevin Johnston[2], Andy Breckenridge[3], Isabel Strachan[4], Alexis Marcoux[1], Haydar Martínez Dyrzo[5], Priyadarsi Roy Roy[5], Peter Douglas[4]

[1]Université de Montréal, [2]Independent Scholar, [3]University of Wisconsin-Superior, [4]McGill University, [5]Universidad Nacional Autónoma de México

The lowland Maya of Mesoamerica were affected by multiple environmental stresses throughout their history, and many experienced a major demographic and political decline, or collapse, during a period of inferred intense multidecadal drought, approximately 1200- and 1000-years BP. Given regional variation in the timing and character of the collapse, much remains to be discovered about the complex interactions between climate and society in the Maya lowlands. To this end, we combine carbon and hydrogen isotopic analyses of leaf wax *n*-alkanes with quantification of stanols and polycyclic aromatic hydrocarbons from a lake sediment core from the southwest lowlands to assess whether (1) palaeoecological evidence of land use is related to population change; and (2) whether population and land use are linked to changing precipitation. Our data reveal a transition from generally more intense fire use and C_4 plant agriculture during the Preclassic (3500-2000 BP) to dense populations and reduced fire use during the Classic (1600-1000 BP). We do not find evidence of drought in the hydrogen isotope leaf wax record, implying that local drought was not a primary driver of observed variability in land use or population change in the Classic-period southwestern lowlands. We present preliminary data from lake sediment cores from the northern lowlands.

Submission type

Poster

49 - Investigating the modern distribution of Non-Pollen Palynomorphs (NPP) in northwest Canada and their paleoenvironmental potential

Mikayla Cote[1], Lauren Nesbitt[1], Francine Mccarthy[1], Joshua Thienpont[2], Michael Pisaric[1]

[1]Brock University, [2]York University

Non-Pollen Palynomorphs (NPPs) are microscopic, organic acid-resistant remains of once living organisms, now preserved in sediments. Although relatively widely studied in mid-latitude regions, the ecological and climatic controls on NPP assemblages in northern (Arctic and subarctic) environments are less constrained. The aim of this research is to reconstruct climate and environmental change over the past ~150 years in Inuvik, NT from the palynological record of lake sediments. To achieve this, a modern surface-sediment training set will be developed from lakes spanning the Tuktoyaktuk coastlands to Fort McPherson to examine relationships between NPP assemblages and environmental variables. Surface sediments and water chemistry measurements will be collected from each site, and NPP assemblages will be analyzed and statistically compared to environmental variables to determine species-environment relationships. This modern calibration data will be applied to a sediment gravity core from Airport Lake, located near the Inuvik airport approximately 12km southeast of the town of Inuvik, to interpret temporal changes in NPP communities. Slide residues will also be analysed for pollen and embryophytes, recording climate-driven environmental shifts over time. This research will improve our understanding of NPP ecology in northern regions and enhance their application as bioindicators of recent climate change in northern systems.

Submission type

Poster

51 - A spatially resolved multi-proxy reconstruction of paleoenvironmental change and human response in the Maya region of Mesoamerica

Isabel Strachan[1], Peter Douglas[1], Benjamin Gwinneth[2], Alexis Marcoux[2]

[1]McGill University, [2]Université de Montréal

Proxy-based environmental reconstructions and archaeological evidence have been widely used to explore how climate variability shaped past civilizations. The ancient Maya provide a key case study of climate vulnerability and adaptation, with severe droughts between ~750-900 CE coinciding with demographic and political decline. While high-resolution paleoclimate proxies such as oxygen isotopes from lake sediments and speleothems document these droughts, existing frameworks for climate-society interactions lack paired climate and human-environment datasets at comparable resolution, limiting assessments of how land-use strategies evolved under environmental stress.

This project adopts a spatially comparative, multi-proxy approach to examine how climate variability influenced Maya societies across diverse ecological and cultural landscapes. Lake sediment cores from the Yucatán Peninsula, the Guatemalan highlands, and El Salvador will be analyzed to reconstruct hydroclimatic change and societal responses. Leaf wax hydrogen isotopes quantify spatial variation in drought severity, while fecal stanols, polycyclic aromatic hydrocarbons (PAHs), preliminary macroscopic charcoal data, and stable carbon isotope ratios ($\delta^{13}C$) will infer population trends, fire histories, and agricultural transitions, respectively. Integrating these proxies will generate a novel cross-regional dataset mapping spatial heterogeneity in environmental conditions, land use, and demographic trends, offering new insights into the resilience and adaptive strategies of Maya societies.

Submission type

Poster

56 - Distribution and diversity of modern organic-walled microfossil assemblages from Anticosti Island (Gulf of St. Lawrence)

Pietro Noga[1], Anne de Vernal[1]

[1]UQAM

This study aims to document the distribution and diversity of modern non-pollen palynomorph (NPP) assemblages from surface sediments collected on Anticosti Island, a UNESCO World Heritage Site located in the Gulf of St. Lawrence, Canada. Samples from various environmental settings, including lake, river and peat bog, were analyzed using standard palynological procedures to determine total and relative abundances. Assemblage composition and spatial distribution were evaluated in relation to environmental parameters such as salinity, temperature, pH, organic matter content, and sediment provenance, in addition to establish a modern reference framework for paleoenvironmental reconstructions and to improve understanding of Quaternary environmental change. The assemblages show taxonomic diversity, comprising dinoflagellate cysts, other marine and freshwater microalgae, ciliates, testate amoebozoans, zoological remains, fungal spores, and various ornamented microfossils. The occurrence of reworked acritarchs indicates sediment remobilization and

incorporation of older Paleozoic material, consistent with the island's sedimentary bedrock. Despite the strong influence of deglaciation and subsequent relative sea-level fluctuations during the Late Pleistocene and Holocene, the island's postglacial environmental history remains poorly understood due to limited paleoecological records. These results provide an essential baseline for interpreting fossil NPP assemblages and reconstructing postglacial sea-level dynamics, depositional processes, and environmental variability along Quaternary sedimentary sequences.

Submission type

Poster

106 - Ecosystem changes induced by double-crested cormorants : linking modern processes to past changes

F. Henri[1], J. Talbot[1], C. Von Sperber[2]

[1]Université de Montréal, [2]Mcgill University

Large seabird colonies act as ecosystem architects by chemically and physically transforming their environments. Double-crested cormorants, a widespread tree-nesting species in North America, are known for altering temperate forests, yet their role in shaping boreal ecosystems remains understudied.

Our research links contemporary ecosystem changes caused by cormorants to past events using complementary ecological and paleoecological approaches. We analyzed vegetation composition, soil physical and chemical properties in a cormorant-transformed balsam fir forest, alongside paleoecological markers in a nearby ombrotrophic bog on an island in Minganie, Quebec.

Our results on contemporary changes induced by the cormorant colony suggest that tree regrowth has been inhibited for decades, likely due to the high-density presence of nitrophilous raspberry bushes. The organic soil surface layer in areas altered by cormorants sees high concentrations of phosphorus and nitrogen, key nutrients transferred from the sea to land in large quantities by the birds. This chemical signature extends into the adjacent bog, which preserves evidence of earlier cormorant influence. Our data suggests that cormorant-driven nutrient transfer may have long-term effects on the structure of our study site and that the bog may archive past periods of colony activity, potentially dating back to the early 20th century and earlier.

Submission type

Poster

165 - Persistence of Ancient Flora in Montreal's Urban Landscape

François Plourde[1, 2, 3]

[1]Department of Geography, Université du Québec à Montréal, [2]Laboratoire en géomatique appliquée et d'Analyse Spatiale, [3]Geotop Research Centre in Earth System Dynamics

Mes recherches portent sur le palimpseste urbain, c'est-à-dire l'idée que le territoire conserve, sous les couches de l'urbanisation, les traces des paysages anciens. À Montréal, malgré une transformation importante du

territoire, il subsiste encore des fragments de forêts anciennes dans des friches, le long des voies ferrées ou dans des boisés fragmentés. Ces milieux agissent comme de véritables archives écologiques vivantes.

À partir de cartes anciennes, de photos aériennes, d'archives et de relevés de terrain, cette recherche analyse la persistance de vestiges floristiques dans le paysage urbain contemporain. Certaines espèces indicatrices — notamment le caryer ovale, le noyer cendré ou certains chênes — semblent correspondre à d'anciens paysages forestiers ou à des usages humains très anciens. Ces fragments pourraient également refléter des pratiques territoriales autochtones ou des formes historiques d'occupation du territoire.

Les résultats préliminaires montrent une corrélation spatiale entre les vestiges floristiques et les arrière-lots agricoles historiques, tandis que les friches et corridors ferroviaires agissent comme micro-refuges écologiques favorisant leur persistance.

Ces vestiges écologiques constituent à la fois un patrimoine naturel et historique et fournissent des arguments supplémentaires pour favoriser leur conservation plutôt que leur remplacement par des plantations compensatoires.

Submission type

Poster

7. Quaternary permafrost landsystems and their influence on contemporary permafrost distribution and landscape sensitivity

8:30 – 10:30 AM
Room 232, Leacock Building

Session Conveners: Froese, D.G. (University of Alberta); Wolfe, S.A. (Natural Resources Canada); Rahman, T. (Université Laval); Roy-Léveillée, P. (Université Laval)

43 - Younger Dryas winter conditions in the Richardson Mountains reconstructed from relict ice wedges

Trevor Porter[1], Atlas Changulani[1], Thomas Opel[2], Hanno Meyer[2]

[1]University of Toronto, [2]Alfred Wegener Institute

Thaw slumps in the Richardson Mountains, N.W. Canada, reveal a stratigraphic record of landscape evolution and permafrost development since the last glacial termination. Horizontal ice profiles of five ice wedges exposed in thaw-slump headwalls were collected to study post-glacial climate variability. The ice contains elongated bubbles, suggesting a snowmelt origin. Wedge-ice δ^2H and $\delta^{18}O$ values (n = 325) match the co-isotope profile of local precipitation and can be interpreted as a first-order temperature proxy. Detrital plant tissues from pristine ice were AMS ^{14}C dated and confirm at least two generations of wedge ice: Younger Dryas (YD) and Late Holocene (LH). The YD and LH ice samples have similar d_{excess} values, suggesting that the precipitation was deposited under comparable ocean-atmosphere boundary conditions and precipitation seasonality. However, the YD ice is 2.1‰ more negative in $\delta^{18}O$ than the LH ice, indicating that YD winters

were ~5°C colder on average. This study offers rare insights on post-glacial winter climate variability in the Canadian Arctic and is only the second case of ice wedges to capture the YD. More broadly this work highlights the potential to use relict permafrost to address knowledge gaps in the Quaternary sciences.

Submission type

Oral

76 - Ice-wedge development in the Barrens of northeastern Manitoba

Tabatha Rahman[1, 2], Pascale Roy-Léveillée[1, 2], Duane Froese[3]

[1]Université Laval, [2]Centre d'études nordiques, [3]University of Alberta

Ice-wedge development near the southern limit of continuous permafrost is sensitive to slight variations in climatic and environmental conditions, leading to transitions between ice-wedge growth, inactivity, and degradation. This study reconstructed ice-wedge development in response to climatic and surface condition shifts during the mid- to late Holocene in the Barrens of northeastern Manitoba. Ice wedges from 5 sites along a 50-km latitudinal transect were sampled using a portable drilling system. Wedge ice was identified based on cryostructures and stable water isotopes. Ice-wedge growth and degradation was assessed from wedge and pool-ice morphology. Timing of ice-wedge development was determined from AMS radiocarbon dating of dissolved organic carbon in wedge ice. Timing of land emergence, forest cover, and fire disturbances was assessed via macrofossil analyses and AMS radiocarbon dating. Ice wedges in the Barrens developed thousands of years after land emergence and after the aggradation of persistent permafrost, due to the compounding effects of regional cooling (Little Ice Age) and the loss of widespread forest cover. Most ice wedges underwent at least one episode of degradation followed by rejuvenation. Wedge ice morphology and radiocarbon dates suggest that local changes to ground surface conditions led to changes in cracking direction at several sites.

Submission type

Oral

170 - Surficial geology and permafrost conditions within the involuted terrain near Tuktoyaktuk, Northwest Territories, Canada

Bailey R. Grondin[1], Alexandre Chiasson[1, 2], Alejandro Alvarez[1], Steven V. Kokelj[2], Duane G. Froese[1]

[1]Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, T6G 2E3, Canada, [2]Northwest Territories Geological Survey, Government of the Northwest Territories, Yellowknife, Northwest Territories, X1A 2L9, Canada

The Arctic coastal community of Tuktoyaktuk, Northwest Territories, faces severe coastal erosion and permafrost thaw hazards driven by the presence of ice-rich terrain. Near Tuktoyaktuk, the involuted terrain is characterized by ice-cored hills (involuted hills) with ridge forms along their crests separated by thermokarst basins. We are updating and improving surficial geology mapping last conducted prior to high resolution imagery and onset of increased climate-driven thaw. Since ground ice content is the primary driver of

permafrost thaw sensitivity, mapping the spatial distribution and understanding the development and degradation of involuted hills is crucial for interpreting landscape history and land use planning. In 2025, we undertook fieldwork, and began developing the first high-resolution surficial geology and geohazard assessment of the involuted terrain, including: (i) producing 1:10,000 and 1:50,000 scale surficial geology and permafrost landsystems maps; (ii) establishing relations between surficial geology and ground ice from borehole data and thaw slump exposures; and (iii) analysing multi-temporal LiDAR datasets (2011-2024) to assess the distribution of thermokarst features, and classify geohazards. This work will establish surficial geology-ground ice relations to improve our prediction of thaw sensitive terrain and climate-driven landscape change, and to provide information for infrastructure planning and hazard mitigation in the area.

Submission type

Oral

177 - Permafrost landsystem approaches provide the key to understanding regional variability in climate change effects on northern environments

S.V. Kokelj[1]

[1]Northwest Territories Geological Survey

INVITED SPEAKER - Anticipating the vast array of environmental and societal consequences of climate-driven permafrost thaw requires knowledge of terrain and subsurface conditions, which prove challenging to obtain at spatial scales necessary for rigorous prediction and decision-making. Here, we analyze a robust, systematic inventory of permafrost-associated landforms from across northwestern Canada and demonstrate that *landform assemblages* co-develop with ecosystems, distinguishing fundamental permafrost properties across a continental-scale ecoclimatic gradient (10^6 km^2) and among smaller ecological regions (10^3 to 10^4 km^2). This approach quantifies variation in geological and climate legacies and enables demarcation of diverse, predictable consequences of thaw. *Permafrost landsystems*, defined by characteristic *landform assemblages,* express the spatial variation in fundamental permafrost properties, including soil, ground ice, geochemical, and carbon characteristics, enabling the often-sparse data on these conditions to be inferred through integrated mapping and analyses. Permafrost landsystem approaches also provide a conceptual framework that informs potential trajectories of thaw-driven change, supports prediction and decision-making, and enables the formulation, sharing, and application of permafrost knowledge with appropriate context across scales, disciplines, and ways of knowing.

Submission type

Oral

190 - Dendritically-Drained Peat Plateaus: A Distinctive Thaw-Sensitive Organic-Rich Permafrost Landsystem in Northwestern Canada

Alexandre Chiasson[1, 2, 3], Catherine La Farge-England[4], Jurjen Van der Sluijs[5], Ashely Rudy[3], Steve Kokelj[3], Duane Froese[1, 2]

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Peatlands in northwestern Canada comprise one of the most thaw-sensitive and carbon-rich permafrost landscapes in North America. Dendritically-drained peat plateaus (DPPs) are a distinctive permafrost landform assemblage characterized by branching networks of unfrozen channelized fens and collapse scars dissecting raised peat plateaus with thin, permafrost underlain by ice-rich till. Using remote sensing, field observations, and geophysical methods, we describe the morphology, permafrost conditions, and developmental history of DPPs and map their distribution across the Northwest Territories. These assemblages cover ~22,500 km² of the Taiga Plains, forming in the early Holocene (~10,000 cal yr BP) on gently sloping till plains above glacial Lake Mackenzie. DPPs consist of ~2 m of peat over ice-rich diamict with abundant ground ice. Electrical resistivity tomography surveys indicate permafrost is less than 20 m thick beneath peat plateaus. Taliks underlie channelized fens, promoting advection and lateral heat transfer, explaining thin permafrost and rapid lateral plateau erosion. A latitudinal climate gradient drives contrasting morphologies: southern regions feature larger basins, collapse scars, and wide fens, while northern landscapes have higher densities of narrower fens, smaller collapse scars, and more extensive permafrost. Long-term interaction between ground ice, geology, ecology, and climate defines these assemblages as a regional permafrost landsystem.

Submission type

Oral

198 - Continental-scale Assessment and Controls on Permafrost Mass Wasting across the Northwest Territories, Canada

Joseph Young[1], Patrick O'Brien[2], William Bender[1], Seamus Daly[3], Duane Froese[2], Trevor Lantz[4], William Quinton[1], Ashley Rudy[5], Jurjen van der Sluijs[6], Steven Kokelj[5]

[1]Wilfrid Laurier University, [2]University of Alberta, [3]Aurora College, [4]University of Victoria, [5]NWT Geological Survey, [6]NWT Centre for Geomatics

Changing climate has rapidly shifted permafrost slopes into geomorphic disequilibrium with increasing climate-driven thaw manifesting as thaw-driven mass wasting. Local to regional studies document order-of-magnitude increases in permafrost mass wasting over the past 25 years. However, territorial-scale assessments remain lacking, as geologic, physiographic, and climate heterogeneity across >1 million km² of permafrost terrain in the NWT gives rise to different mass wasting processes, distributions, and drivers of slope response. This study characterizes spatial patterns and frequency of varied permafrost mass wasting types and their geomorphic characteristics across the NWT using two inventories: (1) the Northwest Territories Thermokarst Mapping Collective, a mass wasting inventory derived from satellite imager of >41,000 grid cells at 7.5×7.5 km resolution with 25 geomorphic classifiers, and (2) >7,900 oblique aerial observations of permafrost landforms. We also apply logistic regression and random forest approaches to investigate the relative importance of terrain and climate variables on permafrost mass wasting distributions. Results reveal surficial geology and dominant

geomorphons as the most influential spatial controls on permafrost mass wasting distributions at this scale. These quantified relationships provide a framework for predicting future permafrost landscape instability under continued climate warming and support evidence-based adaptation planning across northern Canada.

Submission type

Oral

72 - Géomorphologie et régime thermique des lacs et des étangs en terrain organique pergélisolé des Basses-terres de la baie d'Hudson (BTBH), nord du Manitoba

Alyce Morel[1, 2], Pascale Roy-Léveillée[1, 2], Tabatha Rahman[1, 2], Mireille Adam[1, 2]

[1]Université Laval, [2]Centre d'études nordiques (CEN)

Les Basses-terres de la baie d'Hudson (BTBH) forment une vaste plaine glacio-marine couverte de tourbières et s'étendent à travers les zones de pergélisol continu et discontinu. Ce territoire comporte une myriade de lacs et d'étangs, mais la relation entre les plans d'eau et le pergélisol demeure peu documentée dans le géosystème des BTBH. Cette recherche a pour but de mieux comprendre cette relation dans la zone de pergélisol continu des BTBH en déterminant l'étendue et la distribution des dimensions des corps d'eau, leurs taux d'expansion, leur influence sur le régime thermique du sol sous-jacent et la viabilité actuelle et future du pergélisol sous les corps d'eau peu profonds. La collecte de données implique l'analyse diachronique de photographies aériennes, un suivi thermique dans 14 plans d'eau (dont sept milieux lacustres munis d'un système vertical de capteurs de température dans les sédiments sous-jacents), et l'échantillonnage hivernal du continuum glace, couche active et pergélisol dans un étang peu profond par site d'étude. Les résultats préliminaires confirment la présence d'un dépôt de débris organiques non consolidés au fond des plans d'eau, d'une épaisseur allant de 0,75 m à plus de 2 m, ainsi que la présence de pergélisol sous les étangs peu profonds.

Submission type

Oral

74 - Thermokarst domains of Canada

Stephen Wolfe[1], Brendan O'Neill[1], Steve Kokelj[2], Caroline Duchesne[1], Ryan Parker[1]

[1]Natural Resources Canada, Geological Survey of Canada, [2]Northwest Territories Geological Survey, Government of the Northwest Territories

Thermokarst refers to landforms and processes resulting from the thaw of ice-rich permafrost. Thermokarst landform types vary across periglacial landscapes in relation to permafrost terrain conditions. Recognizing how thermokarst manifests across permafrost regions provides a means to understand related effects, including sediment fluxes, carbon cycling, and other environmental changes. Herein, we present a conceptual model summarizing the associations between thermokarst landforms and permafrost terrain conditions based on compilation and analysis of 15,999 observations of thermokarst landforms. The resulting thermokarst domains, which broadly parallel permafrost distribution zones in Canada, synthesize broad-scale permafrost terrain

conditions that control thermokarst landform types and distribution. Among these conditions, contemporary ground ice and the impacts of past permafrost thaw are paramount. Recognition of thermokarst domains and associated landforms helps interpret the effects of past thaw and identify future thermokarst trajectories.

Submission type

Poster

91 - PERMAFROST CONDITIONS IN ISOSTATICALLY UPLIFTED GLACIOMARINE DEPOSITS IN THE EASTERN HUDSON BAY REGION (NUNAVIK)

Diana Martins[1], Pascale Roy-Léveillée[1]

[1]1. Centre d'Études Nordiques (CEN), Université Laval, Quebec City, QC G1V 0A6, Canada

Permafrost viability, conditions, and degradation patterns near the southern limit of its distribution may provide insight into the future of analogous permafrost landscapes further north. In the eastern Hudson Bay region, Nunavik, river valleys host networks of degrading palsa and lithalsa fields in isostatically uplifted glaciomarine deposits, but the evolution of these permafrost systems has not been examined regionally. This project investigates permafrost dynamics in glaciomarine deposits of four river valleys along a latitudinal gradient extending from sporadic to extensive discontinuous permafrost. Objectives are to 1) characterize permafrost conditions in palsa and lithalsa fields using thermal monitoring; 2) elucidate the geotechnical characteristics of permafrost using permafrost cores; and 3) compare thermokarst expansion rates along the latitudinal gradient using aerial photographs and satellite imagery (1950-2025). Preliminary results suggest strong latitudinal contrasts: lithalsas are widespread in northernmost valleys while, in southernmost valleys, permafrost persists in palsas and widespread thaw ponds suggest a past abundance of lithalsas. This project will improve understanding of permafrost dynamics while helping address community concerns over potential links between permafrost degradation and recent flowslide activity in the southernmost valleys.

Submission type

Poster

104 - Understanding ground deformation patterns in Yukon's Communities and transportation corridors.

Moya Painter[1]

[1]Yukon Geological Survey

Recent releases of regional InSAR products provide new opportunities to assess permafrost-related ground deformation across key infrastructure corridors and communities in the southern Yukon. This project uses multi-year InSAR time series to delineate areas of surface subsidence around highways, communities, and other priority locations, and to evaluate the environmental and surficial contexts in which deformation occurs. We aim to show that within the sporadic discontinuous permafrost zone, permafrost persists only where ground ice is present; therefore, most remaining permafrost should exhibit measurable thaw-driven deformation detectable in InSAR datasets.

Initial efforts focus on identifying subsidence within selected communities and transportation corridors, and examining associations with surficial materials, depositional and ecological settings, and disturbance history. Validation is done using lidar-based elevation change and borehole information to confirm InSAR signals and help rule out non-permafrost mechanisms. Together, these datasets provide a basis for mapping permafrost extent, ground-ice content and sensitivity in a warming climate.

This work contributes to broader efforts to understand the distribution, behaviour, and vulnerability of ice-rich permafrost in the southern Yukon.

Submission type

Poster

142 - Testing ground ice content models in the proposed Mackenzie Valley Highway Corridor, NWT

Evan Francis[1], Alexandre Chiasson[2], H. Brendan O'Neill[3], Jurjen van der Sluis[4], Steve Kokelj[2], Duane Froese[1]

[1]University of Alberta Department of Earth and Atmospheric Sciences, [2]Northwest Territories Geological Survey, [3]Natural Resources Canada, [4]Northwest Territories Centre for Geomatics

The magnitude of ground subsidence when permafrost thaws is primarily controlled by ground ice content, yet ground ice is a challenging permafrost property to predict and map. This creates considerable uncertainties for hazard management across northern Canada as ground temperatures increase and thaw of permafrost landscapes accelerates. Previous ground ice models have primarily used assumed relations between surficial geology, landscape history, and ground ice, or are circumpolar in scale, and remain untested in many areas. There is potential for use of statistical ground ice models to progress beyond heuristic approaches, but permafrost regions generally lack adequate training and validation data. Here, we use legacy geotechnical data including >7000 boreholes, multi-year LiDAR, and airborne electromagnetic data along the proposed Mackenzie Valley Highway Corridor. This uniquely data-rich corridor provides an opportunity to test assumptions in existing ground ice models and develop new data-driven models at scales relevant to informing early stages of infrastructure planning. Resulting characterizations of uncertainty will guide further ground truthing in data-sparse regions of the central Mackenzie Valley. We present a summary of the data sources available along the Mackenzie Valley Highway Corridor, and initial results testing previous and new ground ice models at scales of 1:5M to 1:25k.

Submission type

Poster

189 - Recent wildfire as a driver of permafrost thaw in the central Mackenzie Valley, NWT

Médéric Lorry[1], Evan Francis[1], Bailey R. Grondin[1], Alejandro Alvarez[1], Qingsong Du[1], Steve Kokelj[2], Duane Froese[1]

[1]University of Alberta, [2]Northwest Territories Geological Survey

The increasing frequency and extent of wildfires pose a major threat to permafrost stability and thermokarst development across boreal and subarctic regions. Within the extensive discontinuous permafrost zone of the Sahtú region (Central Mackenzie Valley, Northwest Territories), the intense wildfire disturbance such as 2023 and 2024 have triggered rapid thawing of ice-rich ground. While the recovery of thermokarst landscapes following historic wildfire is increasingly studied, the immediate landscape evolution following recent wildfires remains poorly documented. This study investigates regional-scale spatial relations between multi-temporal thermokarst inventory and wildfire history datasets. Using an internal thermokarst mapping framework, we mapped surface features, including active layer detachment slides, to examine their distribution in relation to wildfire parameters, including burn severity, time since fire, and the presence of ice-rich permafrost zones. The aim of this research is to provide a regional assessment of wildfire-thermokarst interactions and identify landscape conditions where wildfire may precondition terrain for rapid permafrost thaw. Monitoring these initial stages is critical to predict future thaw trajectories and refining models of landscape carbon vulnerability in the central Mackenzie Valley.

Submission type

Poster

192 - InSAR monitoring of thermokarst development following wildfire disturbance in the central Mackenzie Valley, NWT

Qingsong Du[1], Evan Francis[1], Médéric Lorry[1], Bailey R. Grondin[1], Duane Froese[1]

[1]University of Alberta

Wildfire activity has increased across boreal and subarctic regions in recent decades, with consequences for permafrost stability and landscape change. In the discontinuous permafrost zone of the central Mackenzie Valley, Northwest Territories, wildfire disturbance can alter surface insulation, vegetation, and ground thermal regimes, potentially accelerating thermokarst processes. Detecting and monitoring these changes over large and remote regions remains challenging using field observations alone.

This study explores the use of multi-temporal interferometric synthetic aperture radar (MT-InSAR) to detect and map ground surface deformation associated with thermokarst processes in recent wildfire-affected areas. MT-InSAR enables the measurement of millimetre-scale ground motion, providing a tool to identify areas experiencing subsidence linked to permafrost thaw and loss of ground-ice. By distinguishing cyclic seasonal heave/subsidence from irreversible settlement deformation patterns across burned landscapes, this approach can highlight zones where thermokarst activity may be developing or intensifying following fire disturbance.

The early results demonstrate the potential of InSAR as a regional monitoring tool for identifying thermokarst-related ground deformation in northern permafrost environments. Satellite-based observations provide valuable spatial coverage that complements field investigations and geomorphological mapping, helping improve our understanding of how wildfire disturbance influences permafrost degradation and landscape change in the central Mackenzie Valley.

Submission type

Poster

17. Carbon-cycling in the Quaternary: From paleo-records to processes

8:30 – 10:30
Room 26, Leacock Building

Session Conveners: Douglas, P. (Geotop and McGill University); Sanderson, N. (Geotop and Université du Quebec à Montréal); Garneau, M. (Geotop and Université du Quebec à Montréal); Francus, P. (Geotop and Institut National de la Recherche Scientifique)

39 - Differential organic matter accumulation and preservation in a large continental basin on orbital timescales driven by the East Asian monsoon

Mingxuan Zhang[1, 2], *Peter Douglas[1], Jikang Wang[2], Dong Ni[3], Suhe Yun[3]

[1]McGill University, [2]China University of Geosciences, [3]Inner Mongolia Geological Engineering Corporation

Floodplains in continental basins represent potentially important long-term sinks for organic carbon, but floodplain carbon cycle dynamics and their response to climate change are not well understood. We analyze two drill cores from opposite ends of the large Hetao Basin of China, including grain size, TOC, $\delta^{13}C_{org}$, and n-alkane isotope measurements ($\delta^{13}C_{31}$, δD_{31}) to reconstruct Quaternary climate effects on organic matter (OM) accumulation. Hetao Basin sedimentary environments are sensitive to glacial-interglacial cyclicity, including strong changes associated with the Mid-Pleistocene transition (MPT). During the post-MPT interglacials of Marine Isotope Stages (MIS) 13, 15, and 17, a strengthened East Asian Summer Monsoon led to consistent responses across the Hetao basin, including increased precipitation, enhanced C_3 vegetation input, reducing depositional conditions, and elevated OM accumulation. However, prior to the MPT, the basin exhibited more spatial variability with the further upstream and more arid Linhe Depression recording enhanced aeolian C_4 plant input and increased OM accumulation during MIS 36, 38, and 40. Based on these records we propose two distinct modes of continental floodplain carbon accumulation: (1) a “moderate-input-high-preservation” mode, characterizing by both basins following the MPT, and (2) a “high-input-high-degradation” mode characterizing the more arid Linhe Basin prior to the MPT.

Submission type

Oral

55 - Quantification and mapping of carbon stocks in wetlands from southern Quebec, Canada

Guillaume Primeau[1, 2, 3], Koreen Millard[3], Michelle Garneau[1, 2]

[1]Institut des sciences de l'environnement (ISE), Université du Québec à Montréal, Montreal, QC, Canada, [2]Centre Geotop, Université du Québec à Montréal, Montreal, QC, Canada, [3]Geography and Environmental Studies, Carleton University, Ottawa, Ontario, Canada

Wetlands provide essential ecosystem services, including atmospheric carbon sequestration. The conservation of these stocks acts as nature-based climate solution to mitigate climate change.

This project aims to document the distribution and quantify the carbon stored in southern Quebec's wetlands that span over 75,000 km2 and covering 9 different ecoregions. The study implies the development of a new dataset on peat depth, compiling over 40,000 data across marshes, swamps, fens, bogs, and forested peatlands. Using this database, we will compare three modeling approaches (Random Forest, LightGBM, and Generalized Additive Models [GAMs]) to identify the most important predictors of carbon storage. These models integrate the new peat depth dataset, some topographic indices derived from a DEM and reconstructed paleoclimatic data.

Furthermore, the study will explain how topographic and past climatic conditions influenced carbon distribution and composition across different wetland types. The results of this research will be synthesized into a map that will support decision for wetland conservation and management strategies, as well as for assessing carbon losses due to the alteration or destruction of some of these ecosystems. This project specifically focuses on identifying carbon hot spots, the areas with the largest carbon stocks, to prioritize their conservation.

Submission type

Oral

69 - Synergies between long-term carbon accumulation and microbial consumers across a historical pollution gradient in Sudbury (ON)

Samantha Mitchell[1], Florin Pendea[1], Nathan Basiliko[1]

[1]Lakehead University

Peatlands are globally significant long-term carbon sinks, yet their stability can be altered by chronic industrial pollution. The Sudbury (Ontario) smelting region provides a natural experiment to examine how sulfur emissions and toxic metals (e.g. Ni, Cu, Pb, As) have restructured peatland carbon dynamics and microbial communities over the past century. We analyzed radiocarbon-constrained peat cores from three poor fens situated along a pollution gradient, integrating high-resolution geochemical profiles with testate amoeba stratigraphies to evaluate linkages between long-term apparent rates of carbon accumulation (LARCA) and microbial consumer restructuring. All sites recorded pronounced industrial-era enrichments of S and metal contaminants. The two proximal peatlands exhibit persistent geochemical alteration, including downward migration of pollutants and shifts in carbon composition. Variation partitioning and canonical correspondence analysis indicate that carbon composition explains the largest independent fraction of microbial community variation, exceeding the unique contributions of toxic metals and sulfur-mediated acidification. These results suggest that industrial contamination not only imposed chemical stress but also restructured peat carbon pools, with cascading effects on microbial consumers. Across the gradient, carbon accumulation trajectories and

microbial assemblages are tightly coupled, highlighting persistent legacies of pollution and the importance of carbon-microbe feedbacks in peatland recovery and long-term climate function.

Submission type

Oral

108 - Postglacial carbon accumulation in a boreal watershed

Julie Talbot[1], Paul del Giorgio[2], William Brais[1], Aude Flamand[1], Jean-François Lapierre[1], Chavaillaz Yann[3], Luc Pelletier[3]

[1]Université de Montréal, [2]Université du Québec à Montréal, [3]Hydro-Québec

Boreal ecosystems have been generally acting as slow but persistent carbon sinks over the Holocene. Boreal landscapes are a complex mosaic of interconnected ecosystems that have their own carbon functioning that depends on a variety of factors including climate and disturbances, but also on the spatial arrangement of the different ecosystem units in the landscape. Traditionally, studies assessing the long-term carbon accumulation of boreal landscapes have focused on individual components such as peatlands, forests or lakes. In this study, our goal is to assess watershed-scale soil and sediment carbon accumulation following deglaciation in the 64 km^2 Bernard river watershed, located within the greater Romaine watershed in the Côte-Nord region (Quebec). We found that wetlands, while covering a small proportion of the landscape, have been storing a disproportionate amount of carbon since deglaciation due to their high carbon density. Overall, the watershed has stored around 2 Mt of belowground carbon since deglaciation, at an average rate of about 6 g C m^{-2} yr^{-1}. The watershed is currently monitored to evaluate the carbon balance dynamics of its different components, to derive an estimate of a complete contemporary watershed net carbon balance, allowing us to compare the Holocene-integrated balance with recent, short-term dynamics.

Submission type

Oral

119 - Permanence of minerally stabilized carbon and its geochemical signals in sedimentary archives

Yeganeh Mirzaei[1, 2], Thomas Blattmann[3], Benedict Mittelbach[4], Timothy Eglinton[5], Yves Gelinas[1, 2]

[1]Concordia University, [2]Geotop Research Centre, [3]Nanyang Technological University, [4]California Institute of Technology, [5]ETH Zürich

The protection of organic carbon (OC) by mineral phases represents an important mechanism for carbon stabilization in aquatic sediments; however, long-term stability and reactivity of minerally protected OC remain uncertain under changing regimes. To evaluate the permanence of mineral-OC from source to sink and diagenesis, we quantified and characterized different preserved pools in surface and deep subsurface sediments of a land-ocean transect. Selective and sequential dissolution of sediment fractions was combined with multi-proxy comparison of mineralogical properties, elemental concentrations, dual isotopes and molecular compositions, enabling us to track changes in organo-mineral complexes across spatiotemporal gradients. Our

results reveal contrasting fates in protection and retention of OC by different minerals, demonstrating that these pools are dynamic and significantly evolving. Depending on mineralogy and environmental controls, organo-mineral associations are shown to be restructured and overprinted to different extents, storing modified quantity and composition of OC in sedimentary records. Therefore, we highlight the need to consider the effect of pre- and post-deposition alterations on preserved geochemical signals when reconstructing paleoenvironmental and carbon cycle dynamisms in quaternary studies.

Submission type

Oral

139 - Disturbance effects of road construction on carbon dynamics in boreal peatlands of Eastern Canada

Chloé Giraud[1, 2, 3, 4], Antonin Prijac[1, 2], Marie Larocque[1, 2, 4], Monique Poulin[5], Michelle Garneau[1, 2, 3, 4]

[1]Université du Québec à Montréal, [2]GEOTOP, [3]Centre d'études nordiques (CEN), [4]Groupe de recherche interuniversitaire en limnologie (GRIL), [5]Université Laval

Peatlands represent the largest soil carbon stock on the planet. Despite the increasing amount of road construction across peatlands, its impacts on carbon accumulation remain largely unquantified. We investigated how roads affect carbon accumulation in boreal peatlands. We collected six peat cores along two transects within four peatland complexes adjacent to paved and gravel roads in Québec. Analyses included testate amoebae, plant macrofossils, loss-on-ignition, C:N ratios, and radiocarbon and ^{210}Pb dating. Our results reveal shifts in water table depths and vegetation composition following road construction in cores up to 25m from the road, with ligneous species replacing former *Sphagnum* mosses cover. Surface peat exhibited higher ash content and lower carbon content compared to undisturbed peat. In peatlands crossed by gravel road, elevated dust concentration persisted up to 100m from the road. Apparent carbon accumulation rates declined sharply at the time of road construction in cores 5m from the road. Indicators of peat decomposition suggest that long-term carbon accumulation may be reduced, although responses vary depending on road position relative to water flow. Despite variation in time since disturbance (≤30 years) among sites, road impacts were consistent up to 25m. This knowledge is crucial in the context of accelerating road development.

Submission type

Oral

145 - Spatial modeling of Canadian boreal peatland carbon sinks. An integrative framework to support climate and development policy

Sophie(*) Piret[1, 2], Quinn Saul[1, 2], Simone Chatelier[1, 2]

[1]Earth System Science, [2]McGill

Peatlands are effective carbon sinks, yet their stability is increasingly threatened by land use and infrastructure development. Information remains limited on where Canadian boreal peatlands combine strong CO_2 sink

potential with low human pressure. To support conservation prioritization, we mapped growing-season CO_2 sink strength and low-disturbance areas using climate and human footprint data. Using AmeriFlux data from four sites, we modeled controls on net ecosystem exchange (NEE) of CO_2 and upscaled predictions with ERA5-Land data. A linear regression using air temperature, soil temperature, and shortwave radiation explained 57% of NEE variance. The model predicted the strongest sinks in the Northwest Territories, with weaker sinks toward the northern boreal margin and mountainous regions. Accounting for peatland coverage, we derived Predicted Carbon Sink Strength (PCSS). We then combined PCSS with inverted human footprint to construct a Boreal Peatland Conservation Index (BPCI), which prioritizes high sink strength and low human pressure. High BPCI values were concentrated in the Hudson Bay Lowlands. Because predictions are based on four sites and growing-season CO_2 exchange, the results are best interpreted as screening-level guidance. Overall, this study provides a framework for identifying boreal peatland regions where protecting CO_2 sinks could yield climate benefits with low development conflict.

Submission type

Oral

173 - Protecting Carbon Landscapes: Peatland Stocks Across National Parks in Canada

Nicole Sanderson[1, 2], Gabriel Magnan[1, 2], Léonie Perrier[1, 2], Alison Cassidy[3], Adam Collingwood[3], Karen Richardson[3], Michelle Garneau[1, 2]

[1]Département de géographie, UQAM, [2]Geotop, [3]Climate and Conservation Science, Office of the Chief Scientist, Parks Canada

Peatlands represent one of the largest terrestrial carbon (C) reservoirs, formed through millennial-scale accumulation of organic matter in soils. Despite the importance of these ecosystems for climate change mitigation, the carbon storage in peatlands remains poorly documented, particularly within protected landscapes. This project examines peatland C reservoirs within 11 Canadian national parks spanning temperate and boreal regions from across Canada (8 provinces and 1 territory). Field inventories of organic soils (peat) and aboveground woody biomass were conducted using the standardized protocol developed by the C-PALEO laboratory (UQAM). Since 2024, 727 stations were surveyed across a range of peatland types, geomorphic settings, and hydrological conditions. Peat cores (n = 46; 82 m total) were collected from dominant peatland types (bogs, fens, forested peatlands) to determine peat C density and peat C mass. Radiocarbon dating provides the age of peat inception during the Holocene and long-term rates of C accumulation. Results highlight strong variability in peat depth, C density, and accumulation histories among peatland types. This cross-Canada dataset provides a foundation for quantifying protected peatland C reservoirs and will support national efforts to map, monitor, and conserve C-rich landscapes under changing environmental and climatic conditions.

Submission type

Oral

183 - Field inventories reveal large carbon reservoirs in southern Quebec wetlands

Gabriel Magnan[1, 2], Léonie Perrier[1], Guillaume Primeau[1], Nicole Sanderson[1, 2], Martin Joly[3], Simon Lamoureux[3], Michelle Garneau[1, 2]

[1]Geotop Research Center, UQAM, [2]Department of Geography, UQAM, [3]Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs

INVITED SPEAKER - In southern Québec, wetlands represent major terrestrial carbon (C) reservoirs that are increasingly threatened by human activities (e.g. drainage). However, the spatial distribution of wetland C stocks and differences in storage capacity among wetland types remains largely unknown, limiting our ability to effectively manage these ecosystems and avoid C losses. The C-PALEO laboratory (UQAM) developed a field-based method to estimate wetland C stocks combining soils and aboveground biomass. This approach uses peat depth measurements to estimate soil organic C mass using a database of wetland soil C densities. Recent improvements include the analysis of soil cores from understudied wetland types including swamps and marshes, increasing the precision of C mass estimates. Since 2022, 1,678 inventory stations were surveyed across Quebec's temperate and boreal regions. These inventories show that wetlands are the largest C reservoirs in the landscape while revealing substantial differences among wetland types. C stocks are ~10 times higher in open peatlands (bogs and fens) than in swamps and marshes, and are underestimated in forested peatlands. Field inventory data are compiled into a geospatial database used to map C hotspots from local to regional scales, supporting conservation and management strategies to protect C-rich landscapes as nature-based climate solutions.

Submission type

Oral

187 - Impact of vegetation succession on the carbon accumulation and active layer in ice-wedges peatlands in Salluit, Nunavik.

Dorine Maslard[1, 2, 3], Pascale Roy-Leveillée[1, 2], Michelle Garneau[2, 3, 4]

[1]CRYO-UL: Permafrost research laboratory, department of geography, Laval University, Québec city., [2]Centre for Northern Studies (CEN) - Laval University, Québec city., [3]Geotop research centre in earth system dynamics, Montréal., [4]Department of geography, Université du Québec à Montréal, Montréal.

Permafrost peatlands are a globally significant carbon store. In polygonal peatlands of the continuous permafrost zone, the development and degradation of ice wedges create micro- to mesotopography that controls hydrological and ecological conditions. This project studies the interactions and feedbacks between the geomorphological evolution of polygonal peatlands and the associated vegetation succession near Salluit, Nunavik. More specifically, we focus on 1) the composition of vegetation in the peat from different types of polygons, 2) the comparison of carbon accumulation rates within the different polygon conditions 3) the impact of peat accumulation on active layer depth and ground thermal regime. Peat monoliths were collected from the centre of three different types of polygons (low, intermediate and high) to reconstruct the recent vegetation succession through macrofossil analysis, loss-on-ignition, and ground temperature data. Preliminary results show that peat from the low-centred polygon (composed mainly of *Sphagnum* moss) has accumulated more

than the high-centred polygon (1.7 mm/year vs 0.2 mm/year), which also has an impact on carbon accumulation: 42.37 $gCm^{-2}y^{-1}$ for the low centre vs. 8.80 $gCm^{-2}y^{-1}$ for the high centre.

Submission type

Oral

196 - Carbon Stocks and Dynamics in Saltmarsh Sediments of Eastern Canada

Arunabha Dey[1], Gail L. Chmura[1], Marlow G. Pellatt[2]

[1]McGill University, Department of Geography, [2]Ecosystem Science Laboratory, Parks Canada Agency

Tidal saltmarsh and mangrove sediments are the world's most efficient sinks of organic carbon (OC). Globally, saltmarsh sediments have been estimated to store ~ 1.44 Pg OC over a 1 m depth. These stocks are largely derived by converting LOI measurements (representing soil organic matter) to OC using a relationship based upon a North Carolina saltmarsh that misrepresents the OC stocks in Eastern Canada. Missing from global saltmarsh carbon budgets is inorganic carbon (IC) as measurements have been limited to 8 marshes in Europe and 8 on Canada's Pacific coast. We have measured IC in sediments of 22 marshes and with new site-specific calibrations of OC from LOI can report the first carbon budget that includes both OC and IC for saltmarsh sediments of Eastern Canada.

In Eastern Canada many saltmarsh sediments have been accumulating for the last ~3,000. However, extensive areas of these marshes were drained for agriculture beginning with Acadian settlement on the Bay of Fundy ~350 years ago and continued by others into the 1960s on the St. Lawrence Estuary. In this presentation we report on the first complete carbon budget for saltmarshes of Eastern Canada and assess the climate feedback of this historical drainage.

Submission type

Oral

197 - Projecting Future Carbon Storage and Greenhouse Gas Emissions at Two Burns Bog Sites

Joyson Ahongshangbam[1], June Skeeter[2], Yeonuk Kim[3], Mark Johnson[3], Zoran Nesic[3], Rosie Howard[1], Sara Knox[1]

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Peatlands serve as both sinks and sources for greenhouse gases (GHG) and they have a complex, non-linear impact on the global climate system. Peatland restoration via rewetting is an important climate mitigation strategy, but restored peatland GHG dynamics are complex, particularly over longer time horizons. In this study, we modelled the future CO_2 and CH_4 fluxes at two contrasting rewetted peatland sites (actively and passively rewetted) using machine learning models under future warming scenarios. Our results indicate that the actively rewetted site (BB1) acts as a strong net CO_2 sink (-159 g C m^{-2} yr^{-1}) but emits more CH_4 (18 g C m^{-2} yr^{-1}), whereas the passively rewetted site (BB2) exhibits near neutral CO_2 exchange (6 g C m^{-2} yr^{-1}) and lower CH_4

emissions (10 g C m^{-2} yr^{-1}) during future late 21st century. This is mainly due to elevated summer WTD at BB1 relative to BB2 under future warming scenarios. Despite high emissions of CH_4, BB1 will serve as net cooling impact during late 21st century due to the strong and sustained CO_2 uptake over time while BB2 will shift from net cooling to warming under future scenarios. This study underscores the importance of different peatland restoration strategies in controlling the dynamics of GHGs and their climate impact as mitigation planning.

Submission type

Oral

200 - The CARBONIQUE project: Carbon cycling in Quebec's wetlands

M. Garneau[1, 2], S. Knox[3, 4], O. Sonnentag[2, 5], P. del Giorgio[1, 6], S. Davidson[1, 6], V. Maire[7, 8], A. Roy[7, 8], E. Thiffault[9, 10], M. Schlaipfer[1], L. Perrier[1], D. Trejo Cancino[1], M. Ladeira de Melo[1, 5, 6], L. Lessard[7, 8], J.-B. Leblond-Chouinard[2, 9], Z. Nesic[11, 12], M.-A. Bourgault[2, 9]

[1]Université du Québec à Montréal, [2]Département de géographie, [3]Mc Gill University, [4]Department of geography, [5]Université de Montréal, [6]Département des sciences biologiques, [7]Université du Québec à Trois-Rivières, [8]Département des sciences de l'environnement, [9]Université Laval, [10]Département des sciences du bois et de la foret, [11]University of British Columbia, [12]Biometeorology and Soil Physics Group

The CARBONIQUE project seeks to better understand the carbon storage capacity of the main wetland types in southern Quebec - open and treed peatlands, coastal freshwater marshes and swamps. By quantifying their contributions, the project highlights the role these ecosystems can play within a broader portfolio of approaches for addressing climate change. This focus is particularly important in southern Quebec, where wetlands are under the greatest anthropogenic pressure and where informed management decisions can have the largest impact.

The project will quantify both the carbon and water cycles at paired natural and disturbed sites for each wetland type (alongside one restored marsh) and examine how these two cycles interact. Atmospheric carbon exchange will be measured using eddy covariance flux towers and integrated with measurements of above and belowground carbon stocks, lateral carbon fluxes and hydrological processes. As of spring 2026, six sites have been equipped with an eddy covariance flux tower. Three additional sites will be instrumented in summer 2026, expanding the network and enabling robust comparisons across all wetland types and disturbance regimes.

The reseults will provide crucial predictive understanding to inform policy, guide wetland conservation and management, and support the design of effective climate change mitigation strategies.

Submission type

Oral

180 - Detecting Carbon-Rich Wetland Edges with Portable Gamma Spectrometry

Alexis Landry[1], Xavier Francescutti[1], Nicole Sanderson[1, 2], David O'Leary[3]

[1]Département de Géographie, UQÀM, [2]Geotop, [3]Ryan Institute Geospatial Analytics Laboratory, University of Galway

Peatlands represent major terrestrial carbon reservoirs, yet their spatial extent and boundaries remain difficult to map accurately, particularly in forested or transitional environments. Improving the detection of peat-mineral transitions is critical for quantifying wetland carbon stocks and their distribution across landscapes.

Over the past year, we conducted pilot studies testing the detectability of peatlands using portable gamma spectrometry across multiple spatial scales. Radiometric signals from ground surveys were compared with UAV and airborne datasets to evaluate how signal attenuation in peatlands—controlled by peat thickness, moisture content, vegetation cover, and site geometry—affects the ability to distinguish peat from mineral substrates and identify wetland boundaries. Radiometric estimates of peat thickness and carbon stocks were compared with field-based manual inventories derived from peat depth measurements. Case studies from southern Québec and Cape Breton, Nova Scotia include both open and forested peatlands, representing contrasting hydrological and ecological settings. Results highlight the practical limits and advantages of radiometric data to detect carbon-rich peat deposits and delineating wetland edges. These experiments provide new insights into the potential of radiometric methods for mapping peatland carbon reservoirs and improving carbon inventory approaches across scales.

Submission type

Poster

105 - Using peat cores to track impacts of road dust on carbon stocks over the last 60 years in Moose Cree First Nation traditional territory

Marianne Vogel[1], Bronwyn Kirby[1], Daisy Zou[1], Sarah Finkelstein[1]

[1]Department of Earth Sciences, University of Toronto

Road development in remote regions is often proposed to increase connectivity among communities and also to facilitate access for resource development. Here, we analyze the changing impacts of dust inputs from roads built in the 1960's for hydroelectric infrastructure in the Moose River watershed of Northern Ontario. Nutrient inputs from road dust can enhance productivity of peatlands in nutrient-poor settings however hydrological disturbances associated with roads may reduce those increases. Two road sites were selected. Road material was collected and peat cores were sampled on each side of the road at 5, 100 and 200 m from the edge of the road. Down-core changes in peat carbon masses were determined and trace element concentrations were measured by ICP-MS and compared with the fine fraction of road material to determine road dust influence. Peat cores also included sections pre-dating the road development to track baseline fluxes of mineral nutrients. Given that these access roads have been in place for more than 60 years, this study can be used to determine long-term effects of road development in the boreal biome, with the goal of informing road planning strategies that support carbon storage in fragile peatland ecosystems in the context of the Anthropocene.

Submission type

Poster

Thursday, June 4, 2026

Keynote: Dr. Sarah Finkelstein

Tracing the Quaternary origins of wetland soil carbon stocks to assess their resilience in a warming world

Room 219, Leacock Building, McGill University

11:00 – 12:00 PM

Sarah Finkelstein is a Professor of Earth Sciences at the University of Toronto. She received her PhD from the University of Toronto and completed an NSERC post-doctoral fellowship at the University of Ottawa focussing on paleolimnology of Nunavut lakes. Her research interests include Quaternary paleoclimates, paleoecology of wetland development, carbon cycling in wetlands, and using pollen, diatoms and other microfossil proxies to reconstruct long-term environmental changes. Most recently, Sarah is engaging in collaborative research with Mushkegowuk communities linking scientific and Indigenous knowledge of peatlands and coastal wetlands in support of climate change mitigation and conservation in Yehewin Aski / Hudson Bay Lowlands in Ontario's Far North. Sarah is also a past board member of CANQUA and served as President from 2013-2015.

Abstract: Peatlands and mineral soil wetlands contain more than one third of the existing global soil carbon pool. Due to the long residence time of organic matter in waterlogged, anoxic soils, these significant carbon pools have accumulated over Quaternary time scales. Long-term carbon accumulation in wetland soils is highly sensitive to hydroclimatic changes, vegetation dynamics and landscape processes including glacial isostatic adjustment. Thus, reconstructing Quaternary paleoenvironments is key to understanding how these vast carbon stocks formed, and is also critical to developing improved predictions of its fate given climate warming and associated cryosphere changes. This talk highlights approaches to quantifying apparent rates of carbon accumulation in both peatlands and mineral soil wetlands over the Holocene and Late Pleistocene. It will explore what paleo-net carbon uptake models reveal about wetland sensitivities to hydroclimatic and vegetation changes, and evaluate how integrating metrics of organic matter quality can refine our understanding of wetland soil vulnerability to disturbance.

8. Advances in Glacial and Deglacial Dynamics of the Québec-Labrador Dome of the Laurentide Ice Sheet

13:30-17:00
Room 219, Leacock Building

Session Conveners: Brouard, E. (Natural Resources Canada, Geological Survey of Canada-Québec Division); Roy, M. (Department of Earth and Atmospheric Sciences, GEOTOP Research Center, University of Québec at Montreal); Dubé-Loubert, H. (Ministry of Energy and Natural Resources of Québec); Godbout, P.-M. (Natural Resources Canada, Geological Survey of Canada-Central Division)

38 - The retreat of the Laurentide Ice Sheet on the Ungava Peninsula (Nunavik, Canada): Implications for deglaciation dynamics and ice-dammed lake reconstructions

Alex Proulx[1, 2], Simon Hébert[1], Martin Roy[2]

[1]Ministère des Ressources naturelles et des Forêts (MRNF) & Direction de l'Acquisition des connaissances géoscientifiques (DACG), [2]Department of Earth and Atmospheric Sciences & GEOTOP Research Center, University of Quebec at Montreal

Despite its strategic position for constraining the final deglaciation of the Québec-Labrador Dome, the retreat pattern across the Ungava Peninsula remains poorly resolved, particularly in relation to dynamics in the adjacent Hudson Strait region. This uncertainty is reflected by widespread unmolded till plains and limited geomorphic landforms. In contrast, postglacial lake remnants features provide key constraints on ice-margin positions and inland ice dynamics.

To constrain deglaciation models, field-based and remote mapping of glacial-lake landforms was integrated with striation data, eskers, and meltwater channels to reconstruct ice-dammed lake extents and associated ice-margin configuration.

Results show that early deglaciation in the Deception Bay region and tributaries of the upper Puvirnituq River controlled initial lake development. Progressive lake-level lowering reflects fragmentation of the ice margin, marked by the retreat of opposing ice fronts into the Deception Bay and Puvirnituq River valleys. This pattern persisted throughout deglaciation, while continued damming of northern river valleys promoted lake formation. As retreat progressed westward, lower stages of glacial lakes Vanasse and Puvirnituq constrain the position of the ice divide separating eastern and western ice fronts. Our reconstructions indicate that topography and variability in the subglacial thermal regime strongly influenced late-stage ice dynamics and lake development.

Submission type

Oral

62 - Complete disappearance of the Laurentide Ice Sheet on glacial-interglacial timescales

Nicolás Young[1], Giff Miller[2], Allie Balter-Kennedy[3], Joerg Schaefer[1]

[1]Lamont-Doherty Earth Observatory, Columbia University, [2]INSTAAR; Univeristy of Colorado - Boulder, [3]Earth and Climate Sciences, Tufts University

Projected to disappear in the next few hundred years, Barnes Ice Cap, located on the central Baffin Island plateau, is the last remaining vestige of the Laurentide Ice Sheet. Beneath Holocene-age ice rests ice from the last glacial period which in turn overlies ice with d^{18}O values similar to Holocene values. This ice stratigraphy highlights Barnes Ice Cap's position as an endpoint for an ice-age deglacial sequence and, conversely, a primary inception point for subsequent continental-scale glaciation. Here we present paired in situ cosmogenic ^{26}Al-^{10}Be measurements from bedrock just emerging from beneath Barnes Ice Cap to assess how often this bedrock becomes ice free during Pleistocene interglacial periods. We combine these measurements with additional paired ^{26}Al-^{10}Be measurements in a 3-meter bedrock core and a novel surface exposure-burial modeling exercise to further quantify how often the Laurentide Ice Sheet achieved dimensions similar to or more retracted than today during the Pleistocene. Our results indicate that the Laurentide Ice Sheet rarely got this small during the Pleistocene.

Submission type

Oral

67 - Manually mapping glacial greatness: questioning the quirks of Ontario's Quaternary

Riley Mulligan[1]

[1]Ontario Geological Survey

Regional scale terrain models greatly improve the capacity to build compilations of glacial landforms over large areas. Over the past ten years, a growing database has been in development for Ontario. Beginning in the south, where the first high-resolution terrain models were released, then the north, initially using coarse SRTM data, then improved with the release of >300 000 km^2 of lidar data. Currently the database contains >45000 moraine ridges, >7000 eskers, >45000 streamlined bedforms (rock, sediment and composite cored), >50, 000 relict shoreline points, >1000 landslide scars.

The data highlight spatial (and temporal?) changes in regional bedform genesis through the overprinting of small bedforms onto larger isolated patches of streamlined till; time transgressive genesis of interlobate moraines, large tunnel valleys and streamlined bedforms around the Peterborough drumlin field; the identification of landforms associated with hydraulic jacking and glacial ripping; and relationships between moraine systems and glacial lake shoreline extents and drainage evolution.

Collectively, these highlight potential areas for improvement in refining understanding of deglacial ice dynamics, including the onset and demise of paleo-ice streams and in the patterns of regional deglaciation.

Submission type

Oral

87 - Late Pleistocene-early Holocene proglacial lakes and estuaries in the Ontario, St. Lawrence, and Champlain Lowlands and their paleoclimatic implications

David Franzi[1], Brian Carl[2], Wolfe Stephen[3]

[1]Center for Earth and Environmental Science, SUNY Plattsburgh, Plattsburgh, NY 12901, [2]Department for Earth and Environmental Science, SUNY Potsdam, Potsdam, NY, [3]Natural Resources Canada, Geological Survey of Canada, Ottawa, ON K1A 0E8

The retreat of the Laurentide Ice Sheet (LIS) between ~14.5 and 8.2 ka created three large proglacial lakes in the Ontario, St. Lawrence, and Champlain lowlands. An endorheic waterbody in the Ontario basin and two estuarine phases in the St. Lawrence and Champlain lowlands followed drainage of the proglacial lakes. Lake and estuarine shorelines adjusted continuously due to isostatic changes, outlet incision, and sea level changes. Two major breakout floods caused rapid regional water level drops. The final breakout (~12.8 ka) established a connection to the Goldthwait Sea and North Atlantic, creating the Champlain Estuary.

The sequence of development of proglacial lakes and estuarine waterbodies occurred amid late Pleistocene and early Holocene climate changes. Paleowind proxies, including dune fields, beach ridges, and iceberg scours, reveal both temporal and spatial variations in wind patterns. Between 13 and 11 ka, LIS-derived northeasterly winds dominated the western St. Lawrence and Champlain lowlands, while westerlies shaped dunes farther south. The transition zone between easterly and westerly winds was likely narrow and moved north as the LIS retreated. Easterly flow ended at ~8.2 ka with the LIS dome collapse, leading to present-day Great Lakes drainage and prevailing westerlies.

Submission type

Oral

102 - Proglacial lake drainage events drive fast grounding line advance in a warming climate

Kai Hu[1], Marianne Haseloff[2], Natalya Gomez[1]

[1]McGill University, [2]University of Wisconsin-Madison

Observations suggest that proglacial lakes along the retreating Laurentide Ice Sheet (LIS) were ubiquitous during the last deglaciation. Proglacial lake levels likely fluctuated due to the opening and closure of spillways as the ice sheet retreated. However, the role of these processes in ice sheet dynamics is not fully understood. Here, we investigate the interplay between proglacial lake drainage and ice-sheet extent using a flowline ice sheet model. Our results show that sudden lake drainage, triggered by spillway opening as the ice sheet retreated, can lead to temporary grounding line advance in a warming climate. Additionally, if an ice shelf was present, it could reground on the retrograde lake bed following lake drainage, further amplifying ice sheet stabilization and advance past the proglacial lake. We also illustrate that successive lake drainage events can lead to multiple ice sheet advance and retreat cycles, which potentially explains the observed moraines which appear out of sync with climate proxies. These results highlight the importance of proglacial lakes in past and future ice sheet behavior. Building on this framework, our ongoing research explores how the lake drainage-

driven ice dynamics are further modulated by the effects of ice mélange buttressing and glacial isostatic adjustment (GIA).

Submission type

Oral

117 - The signature of feldspar luminescence in sedimentary processes in a glacigenic sedimentary basin

Michel Lamothe[1], Laurence Forget Brisson[1], François Hardy[1]

[1]Département des sciences de la Terre et de l'atmosphère, GEOTOP, Université du Québec à Montréal

The reliability of feldspar luminescence chronology in sedimentary environments is strongly dependent on so-called initial conditions, such as proper bleaching before deposition and stability of the luminescence signal over geological time. Recently developed luminescence dating methods require measurements of both IRSL at 50°C thus of unstable but more bleachable traps, followed by that of higher temperature known as pIRIR225, arising from more stable but difficult to bleach traps.

In spite of several successful dating case studies, there are limitations for sediments that had not been properly bleached before burial. In order to develop laboratory criteria to detect unwanted high luminescence residuals, we investigated the evolution of the IR_{50}/pIR_{225} ratio following laboratory bleaching and compared it to naturally observed IR_{50}/pIR_{225} luminescence signals in Quaternary sediments spanning the last glacial cycle in Southern Québec.

This systematic analysis of the natural IR_{50}/pIR_{225} ratio shows it to be indeed correlated with the length of pre-depositional sunlight exposure. It will be argued that IRSL is a potential proxy for assessing the landscape evolution from homeostasis in interglacial/interstadial time to destabilization, sedimentary aggradation and recycling in the context of a waxing and waning Laurentide Ice Sheet glacial margin.

Submission type

Oral

123 - Paleo-ice sheet dynamics of northern Quebec-Labrador constrained by till provenance analysis

M.* Ross[1], O. Baker[1], J.M. Rice[2], R.C. Paulen[2], E. Grunsky[1]

[1]University of Waterloo, [2]Geological Survey of Canada

Till provenance studies provide unique insights into major dynamical changes of paleo-ice sheets. In northern Quebec and Labrador, we applied principal component analysis and a ‘soft’ clustering technique, the Gaussian Mixture Model, to till matrix geochemical data to identify compositional assemblages. Using existing bedrock geology maps and selected open-access government lithogeochemical data as input, we then trained a Random Forest model and used it to estimate the relative proportion of bedrock source lithologies in the till's geochemical composition. Results provide estimates of the relative contribution of different bedrock source regions to the till, which allows us to determine where the till lies along the ‘proximal’ to ‘distal’ provenance spectrum. Dispersal maps, built using statistical and machine learning methods, are also used to assess the

degree of compositional inheritance from older ice-flow phases. These maps thus provide key information to improve our understanding of sediment dispersal, the glacial dynamics, and subglacial conditions of a region under the Quebec-Labrador Dome of the Laurentide Ice Sheet. The method should be applicable elsewhere, where both till and bedrock compositional data exist, to investigate paleo-ice sheets.

Submission type

Oral

202 - Cosmogenic nuclides in sediment and rock record ice sheet exposure and erosion history in Quebec and Labrador

Jeremy Shakun[1], Paul Bierman[2], Lee Corbett[2], Peyton Cavnar[2], Danielle LeBlanc[1], Ryan McGee[2], Gillian Galford[2], Pierre-Olivier Couette[3], Jean-Francoise Ghienne[4], Patrick Lajeunesse[3], Jérôme van der Woerd[4], Marc Caffee[5], Alan Hidy[6]

[1]Boston College, [2]University of Vermont, [3]Université Laval, [4]Université de Strasbourg, [5]Purdue University, [6]Lawrence Livermore National Laboratory

Glaciation was a defining feature of the Pleistocene in Quebec and Labrador; yet, the duration of ice cover and rate at which it eroded the landscape remain largely unconstrained. Here, we use cosmogenic nuclides in sediment and rock across the region to understand the exposure and erosion history of the Quebec-Labrador Ice Dome. We measured cosmogenic nuclides in sediments from deglacial-age deposits on land (n=18 samples) and a 750-kyr marine core off Newfoundland (n=47). We also collated published cosmogenic nuclide measurements of boulders (n=192) and bedrock (n=51) from eastern Canada, and using estimates of deglaciation timing, calculated initial nuclide concentrations when the material was exposed by the most recent deglaciation. All terrestrial and marine sediment samples (100%), and many bedrock outcrops (61%) and boulders (34%), contained ^{10}Be and ^{26}Al, equivalent on average to thousands of years of surface exposure. These data suggest that in eastern Canada the average depth of bedrock erosion by ice, and glacial sediment transport, were insufficient to remove material containing cosmogenic nuclides produced during interglacials. The ^{26}Al/^{10}Be ratio of these materials constrains the proportion of the Pleistocene sediment source areas were ice covered versus ice free.

Submission type

Oral

80 - Retreat of the southeastern Laurentide Ice Sheet margin in Québec-Labrador: Insights from cosmogenic nuclide exposure dating

Pierre-Olivier Couette[1], Jean-François Ghienne[2], Patrick Lajeunesse[1], Pascal Bernatchez[3], Vincent Rinterknecht[4], Jérôme van der Woerd[2]

[1]Université Laval, [2]ITES CNRS - Université de Strasbourg, [3]Université du Québec à Rimouski, [4]CEREGE, Aix-Marseille Université

The Laurentide Ice Sheet was the largest ice sheet in the Northern Hemisphere during the Last Glacial Maximum. The consequences of its demise on global climate and sea-level changes during the subsequent deglaciation are unequivocal. Despite its importance, the chronology of ice-margin fluctuations along its southeastern sector remains debated. Here, we present more than 100 cosmogenic nuclide exposure ages from multiple moraine systems in eastern Québec and Labrador, establishing a robust geochronological framework for the southeastern margin of the Laurentide Ice Sheet. This extensive chronological dataset documents several episodes of ice-margin stabilization and/or readvance during deglaciation. Some of these stillstands can be traced almost continuously over distances of up to 1000 km, indicating large-scale responses to climate forcing. The timing of these stabilization phases coincides with cooling events recorded in Greenland ice cores, highlighting the strong sensitivity of the southeastern Laurentide Ice Sheet margin to Northern Hemisphere temperature fluctuations. This new regional chronology provides important constraints on ice-sheet dynamics in North America and serves as an important analogue for assessing the response of modern polar ice sheets to ongoing climate change. Additional sampling across key moraine systems will expand the cosmogenic exposure-age dataset and further refine constraints on ice-sheet configurations.

Submission type

Oral

42 - Ice flow History Along the North Shore of Lake Superior

Grant Hagedorn[1]

[1]Ontario Geological Survey

Lake Superior’s north shore Quaternary geology is important because it connects broader ice flow shifts over northern Ontario and has active exploration for critical minerals. Till geochemistry, striation measurements and landform mapping were analyzed revealing southwest ice flow during thicker ice, with topographic influences increasing as the ice sheet thinned.

Till geochemistry shows a strong southwestward ice flow via carbonate content and dispersal of lithium from known pegmatite sources. Striations and landforms mirror each other closely and have crosscutting relationships for relative ice flow chronology. On mafic uplands, older southwestward ice flows are pervasive, with younger westward deglacial ice flows present. Topographic lows typically contain southward ice flows drawn down into the deep Lake Superior Basin. A late-stage surge of ice created northwest striations and faint northwest landforms around Thunder Bay.

Submission type

Oral

44 - LiDAR mapping of low-elevation strandlines in the Lake Abitibi basin (Ontario-Québec): insights into the late-stage to postglacial transition of Glacial Lake Ojibway

Michael Saoud[1], Martin Roy[1], Pierre-Marc Godbout[2]

[1]Department of Earth and Atmospheric Sciences & GEOTOP Research Center, University of Quebec at Montreal, C.P. 8888, Succ. Centre-Ville, Montreal, QC, H3C 3P8, Canada, [2]Geological Survey of Canada, Natural Resources Canada, 601 Booth Street, Ottawa, ON, K1A 0E8, Canada

Glacial Lake Ojibway left a strong geomorphological imprint across northern Ontario and Québec, with its latest stages recorded by numerous littoral landforms incised into the fine-grained glaciolacustrine sediments mantling the region. These wave-cut scarps (WCS) represent the lowest shorelines identified in the Ojibway basin, forming sequences of relict terraces that record successive lake-level stillstands and drawdowns - their regional continuity, however, remain poorly constrained.

This study builds on the recent availability of high-resolution LiDAR DTMs in Ontario and incorporates comparable datasets from Québec to systematically map WCS across the entire clay plain of the Lake Abitibi basin.

A total of 3,700 scarp segments were mapped, and median elevations extracted from the LiDAR DTMs ensured precise elevation control. Analysis of terrace-elevation trends using distance-elevation diagrams reveals two major clusters interpreted as distinct lake levels. The higher cluster spans 272-289 m and the lower 264-272 m, each extending over several tens of kilometres and indicating potential outlet locations in Ontario.

These results provide the first regional-scale reconstruction of late-stage Glacial Lake Ojibway lake-levels associated with drawdowns across the Lake Abitibi basin and document the transition to a postglacial basin that formed after the lake's final drainage.

Submission type

Poster

53 - Morphosedimentary mapping and deglaciation dynamics of the lake Matapédia area, Western Gaspésie, Québec

Jack Pleyers[1], Sydney, W Meury[1], Alexis, P Belko[1], Guillaume Allard[1], Bernard Hétu[2], Patrick Lajeunesse[1]

[1]Université Laval, [2]Université du Québec à Rimouski

The pattern and style of deglaciation of the Laurentide Ice Sheet (LIS) in the Gaspésie Peninsula, eastern Québec, is still poorly documented and a matter of debate. Due to limited data, it remains unclear whether glacial dynamics on the Peninsula was influenced directly by the LIS or by an independent ice system. Recent morphosedimentary mapping undertaken in the Lake Matapédia sector, in the northwestern Gaspésie Peninsula, eastern Québec, using recently available 1-meter resolution LIDAR data provide new insights of the last stage of glaciation in the area. A preliminary analysis of the dataset reveal several distinct morpho-sedimentary landform assemblages, including : 1) the presence of a radial esker system centered on the Lake Matapédia, suggesting the presence of an independent ice dome in the sector at least during deglaciation; 2) numerous

zones of hummocky terrain distributed across the entire study area suggesting in-situ melting; and 3) the presence of marginal meltwater channels and deposits allowing the delineation of a radial ice retreat pattern. The observed morphosedimentary record suggest that deglacial dynamics in the Lake Matapadia area was influenced by the presence of local ice.

Submission type

Poster

89 - Mid- to Late-Holocene GIA-induced hydrological reorganization in southeast Québec

Samuel Vaillancourt[1], Jean-François Bernier[1], Sydney W. Meury[1], Pierre-Marc Godbout[2], Etienne Brouard[2], Alexis P. Belko[1], Patrick Lajeunesse[1]

[1]Université Laval, [2]Geological Survey of Canada

Glacio-isostatic adjustment (GIA) induces crustal deformations that modify surface gradients and shoreline elevations of both marine and proglacial environments. These deformations can divert surface drainage, reorganize watershed boundaries, and potentially alter groundwater flow paths, reshaping hydraulic conditions governing river network evolution at the watershed scale. These effects are particularly pronounced near the migrating forebulge of the Laurentide Ice Sheet, where ongoing rebound continues to modify regional topographic gradients. While large-scale deformation patterns since the Last Glacial Maximum are well documented, residual isostatic adjustment remains active and may still influence present-day hydrological systems. GIA modeling based on the ICE-7G_NA (VM7) reconstruction, combined with paleotopographic analysis, fluvial landforms, and former sediment pathways interpretation, was applied to southeast Québec. Preliminary results suggest that postglacial rebound drove major watershed reorganizations during the mid- to late-Holocene. Tributaries of the Restigouche River and Mitis River watersheds were rerouted between ~5.5-5.0 ka BP. More recently, between ~1.5-1.0 ka BP, the Matapédia River shifted from the St. Lawrence River drainage system toward Baie-des-Chaleurs. These findings demonstrate that GIA-driven watershed reorganization is not solely a postglacial legacy. Ongoing forebulge migration continues to modify surface slopes and drainage divides, with implications for regional hydrology, landscape evolution, and water resource management.

Submission type

Poster

90 - Exploring topographic controls on ice-marginal dynamics during the retreat of the Québec-Labrador Dome (Manicouagan-Uapishka, eastern Québec)

Jean-François Bernier[1], Pierre-Olivier Couette[1], Léo Chassiot[2], Patrick Lajeunesse[1]

[1]Université Laval, [2]Université du Québec à Trois-Rivières

Topography acts as an important filter on the transmission of the climatic signal to ice margins during deglaciation. At the onset of the mid-Holocene, the Québec-Labrador Dome (QLD) entered its final retreat

phase, marked by a rapid acceleration. However, during this collapse, the southern margin of the QLD retreated across the Uapishka, a dissected plateau culminating at 1,104 m asl east of the Manicouagan crater. Many questions arise regarding the role this topographic obstacle played in the deglaciation of the region, namely whether retreat was delayed despite a phase of generalized withdrawal, and whether the ice flow regime was impacted. Preliminary results from geomorphological mapping and fieldwork reveal a strong meltwater signature on the massif and at the foot of its slopes, with the presence of major meltwater drainage corridors, sequences of glaciolacustrine terraces perched as high as 825 m asl, and several glaciofluvial landform-sediment assemblages. Furthermore, some summits display tor-like landforms indicating restricted subglacial flow and erosion at the highest elevations. Finally, a major moraine system followed by De Geer moraines was identified on the northern slope of the massif, marking a pause in a glaciolacustrine environment after the retreat of the QLD across the Uapishka.

Submission type

Poster

128 - Reconstructing Ice-Flow Phases and Subglacial Conditions in Eastern New Brunswick Using High-Resolution Mapping of Glacial Landforms and Sediment Provenance Analysis

Jacqueline Voisin[1], Martin Ross[1], Serge Allard[2], Michelle Gauthier[2]

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Reconstruction of past glaciations provides key insights into long-term ice sheet behaviour and how they respond to environmental changes. New research across Canada shows that shifting ice-bed interface conditions can preserve or alter the terrain, creating a fragmented landscape mosaic that changes our conceptual understanding of glacial landscapes. In Atlantic Canada specifically, uncertainties persist about the extent of the Laurentide Ice Sheet ice margin during deglaciation, as well as relative timing of ice flow phases and associated sediment deposits. New evidence from LiDAR and other data has revealed preserved patches of relict subglacial bed related to older ice flows, suggesting subsequent ice flows did not alter the landscape evenly.

In this study, we use the sediment composition alongside landform analysis to investigate discrete landform-sediment assemblages, which is used to reconstruct ice flow phases and to get insights into subglacial conditions. In addition, we aim to establish the bedrock source regions of subglacial sediment to get additional information about subglacial erosion, transport, and deposition, and enhance glacial reconstructions beyond landform mapping. This study thus applies an integrated analytical framework combining landform patterns and sediment composition in an eastern Canadian context to improve our understanding of the glacial history.

Submission type

Poster

195 - Paleo-ice sheet dynamics in Southeastern Ontario and its implications for tracking critical minerals

Eilidh Campbell*[1], Matteo Spagnolo[1], Lorna Linch[2], Riley Mulligan[3], Brice R. Rea[1], Martin Ross[4], Chris Yakymchuk[4]

[1]The University of Aberdeen, [2]The University of Brighton, [3]Ontario Geological Survey, [4]The University of Waterloo

The Denbigh area in the eastern Algonquin Highlands of Southeastern Ontario lies within the Central Metasedimentary Belt of the Grenville Province, a prospective region of the Canadian Shield for critical mineral deposits. Drift sampling in the region was undertaken in the 1980s, but these legacy data are insufficient to address current exploration and research needs. More generally, studies of ice flow directions, glacial dynamics, and deglaciation of Southeastern Ontario are somewhat conflicting and further, detailed work is required to resolve controversies. This PhD study aims to utilise multivariate till geochemistry and indicator mineral analysis from different size fractions of the tills in combination with surficial and lidar-based glacial landform mapping to understand glacial dispersal patterns associated with critical mineral deposits. Detailed glacial landform mapping using newly available high-resolution LiDAR data will underpin the empirical palaeo-icesheet flow reconstructions, providing the necessary framework to understand glacial dispersal patterns and trace geochemical and indicator mineral anomalies up-ice to mineralised bedrock sources. In this poster I will present an overview of the project and preliminary remote mapping revealing a variety of landforms indicative of ice-flow directions, dynamics and ice-margin positions, including streamlined sediment- and bedrock-cored subglacial bedforms, moraines and eskers.

Submission type

Poster

121 - Reconstructing Laurentide Ice Sheet margin dynamics from the Harricana Moraine: landform-sediment assemblages and cosmogenic ^{10}Be dating

Hugo Dubé-Loubert[1], Thomas Malo[2], Martin Roy[2], Simon Hébert[1], Alex Proulx[1, 2], Pierre-Marc Godbout[3], Joerg M. Schaefer[4]

[1]Ministère des Ressources naturelles et des Forêts du Québec, [2]Département des sciences de la Terre et de l'atmosphère, Centre GEOTOP, Université du Québec à Montréal, [3]Geological Survey of Canada, Natural Resources Canada, [4]Department of Earth and Environmental Sciences, Columbia University

The Harricana Moraine is among Canada's largest glacial landforms, forming a >1,000 km glaciofluvial complex extending from southwestern Quebec (46.7°N) to James Bay (52°N). Traditionally interpreted as marking the partitioning of the southern Laurentide Ice Sheet into two retreating ice fronts, detailed sedimentological and geomorphological evidence suggests a more complex origin. Minimum-limiting radiocarbon ages place the ice front near its southern end at ~11 cal ka BP, whereas the chronology of the central and northern sectors remains poorly constrained.

To better understand depositional dynamics and moraine genesis, glacial and deglacial landforms were systematically mapped using LiDAR-derived digital terrain models (DTMs), complemented by field

observations, clast petrography, and cosmogenic ^{10}Be surface-exposure dating of 22 boulders from eight sites along a 400 km transect.

Our results indicate three distinct depositional settings: a southern section showing uniform northeastward retreat, a central segment formed by a single western ice front, and a northern sector outlining interlobate formation. Petrography shows largely homogeneous lithologies in the southern and central sections, whereas the northern sector records carbonate contributions from the late Cochrane readvances.

Paleotopographic reconstructions highlight strong glacio-isostatic control on the moraine outline, while new ^{10}Be ages indicate rapid ice retreat and provide direct chronological constraints on regional deglaciation.

Submission type

Oral

9. Giant animals (megafauna) in palaeontology and archaeology: Indigenous and non-Indigenous perspectives

13:30-17:00
Room 232, Leacock Building

Session Conveners: Metcalfe, J. Z. (Lakehead University); Woywitka, R. (MacEwan University); Wanihadie, V. (Tsattine Land)

26 - Songs Our Ancestors Sing: Megafauna Relations in the Western Hemisphere Archaeological Record

paulette steeves[1]

[1]Algoma University

Our ancestors, known as the megafauna in Western Science, have left us many stories held in the land of their lives and times in the Western Hemisphere. It is the fossilized bones of these relations that have led to a deeper understanding of a human presence during the Pleistocene in the area known today as the Americas. Evidence of early humans' interactions with megafauna has supported the understanding of a much earlier human presence in the Americas than previously accepted. Many Pleistocene-aged archaeological sites in the Americas contain the fossilized remains of mammoths, mastodons, giant sloths, camelids, and other megafauna. Early humans in the Americas lived among their relations, the megafauna, for over 100,000 years. Some Indigenous communities continue to share oral traditions, songs, and dances to honour their relations, such as the Mammoths. I am grateful for the stories left in the land, the archaeological sites our relations, the megafauna, have left for us. It is their stories that have provided the evidence to reclaim over 100,000 years of our early human ancestors' history in the Americas.

Submission type

Oral

30 - How the media shaped our understanding of ice age history since the late 19th century

Edward Struzik[1]

[1]Princeton University Press

Since the 19th century newspapers and magazines have played a significant role in shaping the public's understanding of ice age history. Through words, drawings, and photographs, they created scenes that were more often fantastical than realistic. While there were notable exceptions, the reportage often tickled the fancy of a public that would be easily taken in by the audacity of films like *Quest of Fire*, a 1981 film about a community of Neanderthals who maintained their campfire religiously, but had no idea how to relight it after it was extinguished during an attack by rivals.

Since then, scientists from many disciplines have made great strides in debunking many of these fantasies. But in relying solely on fossils and artifacts to determine the movement of animals and people into North America, they often ignored indigenous people who had a different story to tell in art and oral history. Almost none of this indigenous knowledge is mentioned in modern day media reports.

The presentation is based on my upcoming book, *Animal Diaspora*, (Princeton University Press, Autumn 2026) which compares the movement of animals and people during the last Ice Age to the movement of animals and people in this rapidly warming world.

Submission type

Oral

70 - Powerful megafauna: Palaeontological and Indigenous perspectives on giant animals in western Canada

Jessica Metcalfe[1], Victoria Wanihadie[2]

[1]Lakehead University, [2]Tsattine Land (Alberta, Canada)

For centuries, the remains of giant animals (megafauna) have been removed from Indigenous lands and transformed into sources of power for colonizers. Academic careers (including the lead author's) have been built upon the scientific study of large mammalian fossils, and these remains have been used to reinforce narratives of settler discovery, linear time, and progress. Indigenous knowledge and Indigenous contributions to palaeontology have been systematically excluded from research and outreach. This exclusion contributes to larger systemic erasures of Indigenous histories, cultures, and knowledge. Therefore, paleontologists have an ethical responsibility to engage with Indigenous people and Indigenous knowledge. To begin that process, we discuss Dene perspectives on giant animals, drawing on insights from Tsattine, Dane-zaa, and Tr'ondëk H'wëch'in people. We aim to begin a conversation around two broad questions: (1) What can palaeontologists learn from Indigenous people? (2) How can palaeontologists work together with Indigenous people in a good way? We argue that by respecting Indigenous knowledge and adopting collaborative frameworks such as ethical spaces and two-eyed seeing, palaeontologists can take steps towards restorative justice and produce more rigorous interpretations of the past.

Submission type

Oral

115 - History of the Giant Beaver: Indigenous Knowledge and Palaeontology

Sidney Crawford[1], Jessica Metcalfe[1]

[1]Lakehead University

Giant beavers (*Castoroides* spp.) are extinct giant rodents that lived across North America during the Pleistocene. Giant beavers are referenced in many traditional Indigenous oral histories across Canada and are known by many names including Waub-Ameek and Manitou-Amik (Ojibwe), Tsácho (Dene), and Kopit (Mi'kmaq). Fossil evidence supports the coexistence of giant beavers and humans prior to extinction. This project summarizes western scientific and Indigenous oral knowledge of the northern giant beaver, *Castoroides ohioensis*. We argue that braiding western and Indigenous ways of knowing can expand our understanding of the giant beaver and other extinct animals and can help identify new directions for collaboration between palaeontologists and Indigenous people.

Submission type

Oral

171 - Understanding Nun Cho Ga the "big animal baby" from the Tr'ondëk Hwëch'in Traditional Territory and comparing Indigenous-woolly mammoth relationships across the circumpolar north.

Grant Zazula[1], Elizabeth Hall[1], Jeffrey Bond[2]

[1]Government of Yukon, Palaeontology Program, [2]Mammoth Terrain Inc.

The discovery of a near complete mummified baby woolly mammoth (*Mammuthus primigenius*) on June 21, 2022 from a gold mine in the Traditional Territory of the Tr'ondëk Hwëch'in in central Yukon, captivated the world as North America's most complete mammoth. The discovery was reported to palaeontologists who mobilized a team to recover the mammoth and scientifically document the site. A committee of Tr'ondëk Hwëch'in immediately named this mammoth "Nun Cho Ga", meaning Big Animal Baby in the Hän language and proclaimed it is an ancient ancestor with the power to heal. Since the initial discovery, stewardship of Nun Cho Ga is being led by the Tr'ondëk Hwëch'in to ensure it is treated in a culturally appropriate, respectful way. The journey of Nun Cho Ga provides a remarkable contrast to most previous mummified mammoths unearthed in Arctic Siberia, such as the "Adams Mammoth", discovered in 1799 by an Evenki hunter and "Lyuba" discovered in 2007 by a Nenets reindeer herder, where political and scientific interests of the State supplanted Indigenous values and protocols. This presentation will examine Indigenous interactions with woolly mammoth remains in the Circumpolar North and the roles that Indigenous people have played in their discovery, study and stewardship.

Submission type

Oral

176 - Tracking Native American coexistence with megafauna in the American Southwest

Edward Jolie[1], Sharon Gloshay[2], Matthew Bennett[3], Sally Reynolds[3]

[1]University of Arizona, [2]White Mountain Apache Tribe, [3]Bournemouth University

Indigenous peoples have long maintained histories that extend to time immemorial, far predating written records. Over the past hundred years, the scientific community has gathered increasing evidence—particularly from Clovis and earlier archaeological sites—demonstrating human interaction with, and harvesting of, now-extinct megafauna. Recent research on human and animal tracks preserved at playas in the American Southwest reveals remarkable environmental and archaeological archives showing that humans and megafauna coexisted for thousands of years longer than previously understood by the scientific community. These findings align more closely with longstanding Indigenous knowledge systems. For many Indigenous communities, this deep history is preserved not only through oral traditions but also through linguistic evidence, including words and narratives associated with megafauna.

Submission type

Oral

178 - Tr’ondëk Hwëch’in Relationships with Nun Dänojà' (Ancient Animals)

Tr’ondëk Hwëch’in Heritage Department[1], Nun Cho Ga Stewardship Committee[1]

[1]Tr’ondëk Hwëch’in Government

The discovery of Nun Cho Ga on National Indigenous Peoples' Day 2022 marked a powerful moment for Tr'ondëk Hwëch'in (TH), reaffirming long-standing relationships between Hän people, land, and the ancient animals that continue to emerge from the Traditional Territory. Within TH, Nun Cho Ga is understood not only as a palaeontological discovery, but as an ancestor whose arrival brings teachings, responsibilities, and opportunities for collective healing. Since Nun Cho Ga’s recovery, TH has been working to strengthen heritage governance, expand involvement in palaeontological fieldwork and policy, and develop new protocols that integrate Hän knowledge, ceremony, and language into fossil stewardship.

Central to this emerging work is the Nun Cho Ga Stewardship Committee, composed of TH Elders and a youth representative, who together provide cultural guidance and help shape how Nun Cho Ga and other ancient beings should be cared for.

Rather than contrasting cultural and scientific approaches, TH emphasizes working alongside researchers, miners, and partners in ways that honour Hän values and shared commitments to respect. Through stories, community experiences, and reflections from TH knowledge holders, this presentation offers insight into how Nun Cho Ga continues to guide a developing vision for Indigenous-led palaeontology in the Tr'ondëk Hwëch'in Traditional Territory.

Submission type

Oral

208 - Approaching deep time through Blackfoot cultural memories of megafauna

Leroy Little Bear[1], Jerry Potts[2], Kent Ayoungman[3], Gabriel Yanicki[4]

[1] University of Lethbridge,[2] Mi'kskimmii Soka' Simmi (Iron Shirt Culture & Heritage Society),[3] Siksika Nation,[4] Canadian Museum of History

Archaeology, like many Western sciences, has a preoccupation with dates. In the reckoning of the past within the worldview of the Siksikaitsitapi (Blackfoot peoples), however, there is far less concern with the chronological ordering of time. Cultural memories of distant events passed down from ancient ancestors are conceptualized within a single, compressed temporal category, and are recollected with the same freshness as having happened just two days before. And yet Siksikaitsitapi teachings do speak of profound changes, including descriptions of frozen or inundated landscapes, and of animals that correspond with archaeologically and paleontologically known megafauna. While these evocations of what is identifiable as a late Pleistocene environment attest to the enduring connection of the Siksikaitsitapi to their homeland, this reckoning of time challenges us to recognize that questions of "when" represent only a superficial understanding of the past. The teachings in oral histories embody the concept of *matsiksistapi*—as explained by late Elder Allan Pard, that cultural practices always have "a reason, and usually that reason is told through these kind of stories." This more comprehensive understanding relating to questions of how and why things are done highlights the importance of centring Indigenous historical knowledge in the interpretation of deep time.

Submission type

Oral

52 - New cranial material and DNA sequence data clarify phylogenetic relationships and biogeographic history of Haringtonhippus francisci

Zoe Landry[1, 2], Clement Bataille[1, 3], Danielle Fraser[2, 4, 5], Lorelei Chauvey[6], Joshua Miller[4, 7], Stephanie Schiavinato[6], Eric Scott[8, 9], Laure Tonasso-Caviere[6], Gaetan Tressieres[6], Grant Zazula[4, 10], Ludovic Orlando[6]

[1]University of Ottawa, [2]Canadian Museum of Nature, [3]Purdue University, [4]Smithsonian Institution, [5]Carleton University, [6]Centre d'Anthropobiologie et de Genomique de Toulouse, [7]University of Cincinnati, [8]California State University, [9]Cogstone Resource Management, [10]Government of Yukon

The reconstruction of evolutionary relationships is crucial for understanding past and present biodiversity and biogeography. The evolutionary relationships of *Haringtonhippus francisci* (a.k.a. *Equus francisci*) to other equids has been the subject of debate as it was the only stilt-legged horse described from eastern Beringia and its frequent synonymization with other species. Here, we leverage ancient DNA to identify eight skulls from the Klondike region of Yukon as *Haringtonhippus*, all of which were previously assigned to *Equus*. We also describe the morphological variation of the dentition within the genus and provide novel insights regarding their geographic origins and dispersal events. Overall tooth morphology is non-diagnostic and shares many similarities with other species of caballine and non-caballine equids. Genetic data places all specimens in a singular clade outside of *Equus*, indicating that *Haringtonhippus* represents a valid, monospecific genus of North American stilt-legged horse. We find compelling support for an eastern Beringian origin for the genus,

and evidence for multiple biogeographic exchanges occurring between Yukon and Wyoming during interstadial periods. Our study provides a meaningful contribution towards the resolution of the long-standing debate surrounding the systematics of late Pleistocene North American equids and further illuminates a previously unrecognized loss of the megafaunal extinction.

Submission type

Poster

188 - The potential for preservation of large animal kill sites in interdune peatlands

Robin Woywitka[1], Cameron Poole[2]

[1]MacEwan University, [2]University of Alberta

The use of sand dune landscapes as bison kill sites and pounds is well documented on the grasslands of the Great Plains. Hundreds of archaeological sites also occur on stabilized dunes in forested region of Canada, but little is known about the nature or timing of these occupations. Here we present a Bayesian age model of bison pound activities on the northern plains, a summary of archaeological materials in forested dune fields, and initiation dates and lateral migration rates of a forested interdune peatland near Grande Prairie, Alberta. We combine insights from these studies to provide an assessment of the potential for interdune peatlands to preserve bison or other large animal kill sites in the foothills and boreal forests of western Canada.

Submission type

Poster

2. Bridging the Gaps: Advances in Paleoseismology across Marine, Lacustrine, and Terrestrial Environments

15:30 – 17:00
Room 26, Leacock Building

Session Conveners: Brunet, M. (ISMER - Université du Québec à Rimouski); St-Onge, G. (ISMER - Université du Québec à Rimouski); Rizza, M. (Université du Québec à Montréal); Lajeunesse, P. (Université Laval, Québec)

32 - Are Quaternary surface faulting evidence being missed in eastern Canada?

M. Rizza*[1, 2], S. Baize[3], Y. Liu[4], C. Daigneault[1], Z. Sadeghi[1], M. Adibi[1], N. Kazemi[1]

[1]Université du Québec à Montréal, Canada, [2]Geotop, [3]Autorité de sûreté nucléaire et de radioprotection (ASNR), France, [4]McGill University, Canada

In Stable Continental Regions (SCRs), earthquake pattern is diffuse, with poorly expressed surface faulting. Nevertheless, many SCR earthquakes are shallow and capable of producing surface ruptures, but their occurrence remains underestimated, challenging current seismic hazard models.

Despite extremely low strain rates and sparse seismicity, eastern Canada has experienced large historical earthquakes (M>6.5), yet links between epicentres and mapped active faults remain unclear. Relying on seismicity catalog alone creates bias, as instrumental microseismicity rarely delineates fully locked faults and does not cover the long recurrence intervals characteristic of these SCR earthquakes.

Our project postulates that despite glacial erosion, dense vegetation, and landscape resetting, the morphological signal can provide relevant information on the past earthquake activity. We exploit newly released high-resolution LiDAR data from Québec and New Brunswick to systematically search for post-glacial surface-rupturing faults.

Several geomorphic lineaments consistent with recent fault activity have been identified. A compelling example follows the inherited St. Lawrence Fault, where a discontinuous scarp crosscuts glacial and fluvial deposits. Ground-penetrating radar images reveal structures cutting Quaternary sediments above crystalline bedrock. Together, these observations provide viable onshore evidence for recent surface rupture in Québec, potentially associated with historical or undocumented earthquakes.

Submission type

Oral

40 - Paleoseismology Along Active and Passive Continental Margins

G. St-Onge*[1], P. Lajeunesse[2], E. Chapron[3], N. Sultan[4], S. Garziglia[4], G. Villarosa[5], P. Francus[6], M. Mérindol[7], N. Cretton[8], L. Dominguez[5]

[1]ISMER, [2]Université Laval, [3]Université Toulouse Jean Jaurès, [4]IFREMER, [5]Instituto Andino Patagónico de Tecnologías Biológicas y Geoambientales (IPATEC), [6]INRS-ETE, [7]SHOM, [8]BRGM et Université Toulouse Jean Jaurès

The catastrophic earthquakes in Haiti (2010, M7.0), Chile (2010, M8.8), Japan (2011, M9.0), and Indonesia (2004, M9.3) highlight Earth's dynamic nature and the profound risks posed by high-magnitude seismic events. These earthquakes often trigger submarine landslides and tsunamis, resulting in significant loss of life and extensive infrastructure damage along both passive and active continental margins. Paleoseismology plays a key role in reconstructing earthquake recurrence beyond historical records, enabling more accurate seismic hazard assessments critical for designing resilient infrastructure and guiding land-use planning.

This presentation integrates geophysical, sedimentological, and geochronological data to investigate submarine mass movements from an active margin in Patagonia (fjord and lake records from Chile and Argentina) and a passive margin in eastern Canada (marine records from St. Lawrence Estuary). Geophysical and sedimentological data reveal rapidly deposited layers, including turbidites, as key markers of past seismic activity. Radiometric dating has linked several turbidites to historically documented earthquakes in both types of margins. Furthermore, the synchronism of prehistoric turbidites over distances exceeding 250 km strongly

suggests their origin from high-magnitude earthquakes. Finally, by revealing the recurrence and characteristics of high-magnitude seismic events, such studies are crucial for improving seismic hazard maps and for improving risk mitigation strategies.

Submission type

Oral

79 - Late Holocene subaqueous landslide activity within Horne Lake, Vancouver Island, British Columbia

G.R. Brooks*[1, 2], R.F. MacLeod[1, 2]

[1]Natural Resources Canada, [2]Geological Survey of Canada

Sub-bottom acoustic profiling and multibeam bathymetry surveys were undertaken at Horne Lake, Vancouver Island, British Columbia, to investigate subaqueous landslide activity. These revealed 57 late Holocene landslides within all three lake sub-basins. Three mechanisms were assessed to account for this landslide activity. A rock slide-generated tsunami was rejected because there is no evidence of a recent, major rock slide entering the lake. Two mass transport deposits within Paradise and Deadhead bays are covered with numerous submerged tree trunks and are interpreted to be drawdown failures, most likely triggered in 1964, when the greatest net drawdown happened during initial operations of the Horne Lake reservoir. To further evaluate the drawdown mechanism, an effective stress analysis of 43 other failure sites yielded factors of safety (FoS) of ≥ 1.1 for 31 sites during the 1964 drawdown. These 31 sites were probably stable, but up to nine sites with FoS < 1.0 could also be drawdown failures. Published estimates of shaking intensity (MMI ~ VII) in the Horne Lake area indicate that the M9 1700 Cascadia and/or M7.3 1946 Vancouver Island earthquakes probably triggered the majority of late Holocene landslides. Additional research is needed to determine the relative importance of each earthquake.

Submission type

Oral

114 - Pollen and non-pollen palynomorphs: potential for identifying prehistoric seismic events in Massachusetts (USA)

Aaron Alderson[1], Francine M. G. McCarthy[1], Paul Michael Pilkington[1], Katrin Monecke[2], J. Bradford Hubeny[3], Joseph I. Boyce[4], John Ebel[5]

[1]Brock University, [2]Wellesley College, [3]Salem State University, [4]McMaster University, [5]Boston College

Anomalous erosional events can be detected in the acid-resistant component (palynofacies) of lake sediments, and correlating sudden-onset disturbance events across basins can refine seismic risk assessment. Sediment cores from 3 basins in Walden Pond, near Concord MA, and from Sluice Pond, Lynn, MA, were analysed for palynomorphs as well as grainsize and other physicochemical properties to identify disturbance events. An anomalous assemblage, characterised by abundant pollen and spores from emergent aquatic plant and algal palynomorphs in relatively coarse terrigenous-rich sediments, records probable redeposition from the shoreline

into multiple basins. It is constrained by the '*Ambrosia* rise' to early colonial settlement of the area, supporting the 1638 CE M6.5 earthquake centered in New Hampshire as a trigger for resedimentation. Evidence of an earlier event found in the sediments of both Walden and Sluice Pond is tentatively attributed to a ~1400 CE earthquake in the Littleton seismic zone, where the name of Mount Nashoba is derived from an indigenous word for "the hill that shakes". An earlier influx of terrigenous elements and 'shoreline palynomorphs' in deep basin sediments from Walden Pond may record an earlier event ~1200 CE.

Submission type

Oral

141 - Lake-floor Failures and Turbidites in Comox Lake, Vancouver Island

Roger MacLeod[1, 2], Greg Brooks[1, 2]

[1]Natural Resources Canada, [2]Geological Survey of Canada

Eyewitness accounts of the June 23, 1946, M 7.3 Vancouver Island earthquake, Canada's largest onshore seismic event, describe ~9 m displacement waves and seiches on Comox Lake, followed by a month of elevated turbidity. Motivated by these observations, we acquired multibeam bathymetry and a grid pattern of 139 line-km of high-resolution, sub-bottom profiles. These data reveal a suite of 'young' mass-transport deposits (MTDs), some originating from delta-front failures. Notably, the latter includes a complex of several coalesced MTDs, covering ~3 km^2, originating from the Cruickshank River delta and overlain by a basinward-thinning turbidite bed. Whether this complex relates to 1946 or an earlier event, such as the M ~9 1700 Cascadia earthquake, needs to be determined. Conversely, several smaller failure sites correlate with 'disappearing beaches' observed in 1946 and are confirmed by pre- and post-quake aerial photographs showing shoreline loss. The observed displacement waves may have been generated at these failure sites. Additionally, stratigraphically older MTDs and turbidites are present in the sub-bottom that may record older earthquake events. Coring is planned for summer 2026 to collect datable materials to establish a chronology for the MTDs. The results of this study will contribute to improving regional seismic hazard assessments.

Submission type

Oral

211 - Using X-ray microtomography (micro-XCT) to track the sedimentary signature of the 869 CE Jōgan seismic event in the Japan Trench

Morgane Brunet[1,2], Mai-Linh Doan[3], Guillaume St-Onge[1]

[1] Institut des sciences de la mer (ISMER), Université du Québec à Rimouski, Rimouski, Canada,[2] Geo-Ocean, Univ Brest, CNRS, Ifremer, UMR6538, Plouzané, France,[3] ISTerre, CNRS, Université Grenobles Alpes, Université Savoie Mont Blanc, Grenoble, France

The Mw 9.1 2011 Tōhoku-Oki earthquake and tsunami demonstrated that historical and instrumental records alone are insufficient to constrain the recurrence of giant megathrust earthquakes along the Japan Trench. The 869 CE Jōgan earthquake and tsunami is considered one of the best pre-instrumental analogues of the 2011

event, yet the sedimentary characteristics of its offshore deposits remain poorly understood. Recent advances in submarine paleoseismology and scientific ocean drilling now provide an opportunity to investigate these deposits at unprecedented resolution.

During the International Ocean Discovery Program (IODP) Expedition 386, deep-sea sediment cores recovered along the Japan Trench documented homogenite-turbidite deposits (HmTu) associated with past earthquake and tsunami activity, including deposits potentially linked to the 869 CE Jōgan event. Here, we explore the use of X-ray microtomography (micro-XCT) as a high-resolution, non-destructive method to identify, characterize, and correlate these event deposits.

Micro-XCT imaging reveals internal structure, sedimentary fabric, grain-size organization, density contrasts, and subtle stratigraphic features preserved within HmTu sequences. These observations provide insights into depositional processes and sediment remobilization associated with large earthquake-triggered sediment gravity flows. This study highlights the potential of high-resolution imaging to improve offshore paleoseismic reconstructions and long-term assessments of megathrust earthquake recurrence along the Japan Trench.

Submission type

Oral

36 - Paleoseismic trenching confirms multiple late Quaternary surface-rupturing earthquakes on the Tintina fault, Yukon, Canada

Theron Finley[1], Nicolas Harrichhausen[2], Edwin Nissen[3], Derek Cronmiller[1], Taryn Neligan[4], Britta Jensen[5]

[1]Yukon Geological Survey; Energy, Mines and Resources; Yukon Government, [2]Department of Geological Sciences; University of Alaska, Anchorage, [3]School of Earth and Ocean Sciences; University of Victoria, [4]Department of Geography; University of Victoria, [5]Department of Earth and Atmospheric Sciences; University of Alberta

Recent work has revealed geomorphic evidence for large Quaternary earthquakes on the Tintina fault (TF) in west-central Yukon. This region was ice-free during the last glaciation and preserves one of the longest terrestrial paleoseismic records in Canada. Concerningly, despite the evidence for numerous Quaternary earthquakes, the TF appears to have not ruptured since at least 12 ka, which may indicate a large slip deficit. The TF is not included in seismic hazard models, and a key piece of missing information is its average recurrence interval. In 2025 we excavated three trenches across the TF to attempt to date individual earthquakes. The trenches exposed complex deformation indicative of transpressional rupture kinematics. At least three - possibly four - colluvial wedges are evident, and the Sheep Creek-Klondike tephra near the base constrains these events to <~80 ka. Results from additional geochronological samples are pending. Assuming all major events are represented, preliminary age constraints suggest an average recurrence interval on the order of 10^4 years, consistent with the low 0.5 mm/yr slip rate estimated from geological offsets. Future efforts to constrain the recurrence interval may include lacustrine paleoseismology, though identifying lakes with sufficiently long depositional records and suitable sedimentation rates will be challenging.

Submission type

Poster

82 - Cascading Hazards on the Talas-Fergana Fault: Comprehensive Paleoseismic Analysis along the Karasu-Sary segment

Laurianne Gariepy[1], Magali Rizza[1], Richard Walker[2], Emma Greenough[2], Christoph Gruetzner[3], Shreya Arora[4], Erkin Rahmedinov[5]

[1]Department of Earth and Atmospheric Sciences, UQAM, Montreal, Canada, [2]Department of Earth Sciences, Oxford University, Oxford, UK, [3]Institute of Geological Sciences, Friedrich Schiller University Jena, 07749 Jena, Germany, [4]Department of Earth and Climate Sciences, Bates College, Lewiston, ME, USA, [5]Kyrgyz Seismological Institute, Academy of Sciences of the Kyrgyz Republic, 720060 Bishkek, Kyrgyz Republic

Within continental interiors, long recurrence intervals on active faults often mask significant seismic risks, leaving communities and infrastructure exposed to hazards lacking a historical record. Seismic activity in alpine regions can trigger cascading hazards, where earthquake-induced landslides create dammed lakes with high risk of rupture, potentially leading to flash floods with severe socio-economic consequences.

The Talas-Fergana Fault (TFF) in Central Asia is a major strike-slip fault capable of producing Mw 8+ earthquakes and hosts multiple large landslides. However, its rupture history and landslide chronologies remain poorly constrained, particularly along the central section, where rugged high-altitude terrain has hindered trenching, and mapping. We hypothesize that the spatial alignment of three landslide-dammed lakes along the central segment of the TFF reflects strong seismic control on their emplacement and preserves evidence of undocumented earthquakes.

We apply an integrated approach combining recent advances in remote sensing and geochronology. High-resolution Digital Surface Models derived from Pléiades and UAV photogrammetry are used to map landslide sites. Geomorphic analyses are paired with cosmogenic isotopes (^{10}Be, ^{36}Cl) and luminescence dating to establish a chronology of fault ruptures and landslide-damming events. This integration will clarify whether these features result from a single event or multiple seismic or climatic episodes.

Submission type

Poster

Friday, June 5, 2026

18. Integrating Archaeology and Quaternary Sciences to Decode Human-Environment History

8:30-10:30
Room 232, Leacock Building

Session Conveners: McCaffrey, M (independent researcher), Denton, D. (independent researcher), Roy, N. (Geotop and Université du Quebec à Montréal)

83 - Marine incursion, glacio-isostatic rebound, and shoreline evolution along coastal Nunavik (Canada): Implications for early Holocene paleogeography and archaeology

Roy Martin[1, 2], Proulx Alex[2, 3], Hugo Dubé-Loubert[4], Arianne Vallée[2], Anne de Vernal[2], Natasha Roy[2], Joerg M. Schaefer[5]

[1]Université du Québec à Montréal, [2]Département des sciences de la Terre et de l'atmosphère, Centre GEOTOP, Université du Québec à Montréal, Montréal, QC, Canada, [3]Ministère des Ressources naturelles et des Forêts, Montréal, QC, Canada, [4]Ministère des Ressources naturelles et des Forêts, Saguenay, QC, Canada, [5]Lamont-Doherty Earth Observatory and Department of Earth and Environmental Sciences, Columbia University, New York, NY, USA

The coastal regions of the northern Ungava Peninsula and Ungava Bay preserve an exceptional geomorphic record of the postglacial marine incursion that followed retreat of the Laurentide Ice Sheet. Raised beaches, deltas, and terraces document progressive shoreline emergence driven by rapid glacio-isostatic adjustment. However, the configuration, timing, and spatial variability of this marine inundation remain incompletely constrained, limiting archaeological investigations, as shoreline displacement influences the distribution and preservation of coastal occupation sites across Nunavik. This study presents new results from two coastal sectors of Nunavik, integrating systematic field- and ArcticDEM-based mapping of marine landforms with cosmogenic (^{10}Be) exposure dating of strandlines along transects extending (1) from inner fjords to the outer coast near Kangiqsujuaq (north), and (2) across the Caniapiscau River valley near Kuujjuaq (south). The documented shoreline sequences reveal regional variability in the elevation of the maximum marine limit and in emergence patterns reflecting differential postglacial uplift. Cosmogenic ages constrain the onset of marine incursion and subsequent shoreline regression, providing first-order estimates of emergence rates and isostatic recovery. These data refine the spatial evolution of the postglacial marine incursion and its relationship to ice-margin retreat along coastal settings. These results improve paleogeographic reconstructions and may contribute to archaeological studies.

Submission type

Oral

103 - Interdunal peatlands as geoarchaeological archives in northern Alberta: implications for archaeological potential

Cameron Poole[1], Robin Woywitka[2], William Wadsworth[1, 3], Diana Tirlea[4], Elora Barritt[2], Dawson Hegmann[2], Alberto Reyes[1]

[1]University of Alberta, [2]MacEwan University, [3]University of British Columbia, [4]Royal Alberta Museum

The boreal forest ecoregion of Canada contains thousands of archaeological sites that represent human presence stretching back to at least the opening of the ice-free corridor during the last glaciation. Many of these sites have been found on ridges of late-Pleistocene aeolian dunes that formed during ice sheet retreat and stabilized following the establishment of post-glacial forests. Despite sites on dune ridges being abundant, they lack stratigraphic layers and acidic boreal forest soils degrade organic materials. These two factors limit radiocarbon dating and stratigraphic analysis, restricting archaeological interpretation to lithic materials. Unlike ridge-top conditions, low-lying interdunal areas contain stratified accumulations of organic matter that are suitable for dating methods and preserve stone and organic archaeological material. This study assesses the archaeological potential of an interdunal peatland in the Smoky River dune field, Grande Prairie, Alberta. Using a combination of ground-penetrating radar (GPR), C14 dating, luminescence dating, macrofossil analysis, and sediment sampling, we present a model for peatland initiation and lateral expansion. GPR results reveal buried landscape features suitable for archaeological occupation and paleoenvironmental analyses indicate peat formation began ~6500cal BP. This research highlights the potential for well-preserved archaeological sites in these interdunal zones that have been overlooked in archaeological surveys.

Submission type

Oral

153 - the Labrador Maritime Archaic: did this really happen?

William Fitzhugh[1]

[1]Smithsonian Institution

Smithsonian research from the 1970s to mid-1980s accumulated large amounts of data on paleoenvironments and prehistory of the central and northern Labrador coast. Understanding the chronology, geographic expanse, settlement patterns, resource adaptation, ritual life, and external contacts of Labrador's earliest peoples—the Maritime Archaic (ca. 8000-3500 BP)—became the major focus and most important contribution of this research. Occurring during a period of climatic optimum before the arrival of Inuit, Innu predecessors developed a culture comparable to the complex Subarctic societies of the Northwest Coast and northern Fennoscandia. This paper documents the 4500-year development of the Labrador Maritime Archaic from a small-scale Arctic-edge society with pioneering maritime capabilities into an expansive maritime-based people with large settlements, far-reaching trade and procurement, and complex ritual, ceremony, art, and mortuary traditions. While long-distance trade in Ramah chert has been its 'flagship' profile, it is the development of supporting settlement, subsistence, transport, and procurement systems known mostly from Labrador data, suggesting an egalitarian social structure, that underpinned its achievements. Equally astonishing is the unexplained collapse of the LMA culture system when challenged by new societies from South and North at the onset of a new climatic regime.

Submission type

Oral

167 - Ancient ice and soil as archives of ecocultural landscapes

Robin Woywitka[1], Kurtis Blaikie-Birgit[2], Kaidy Cech[1], Sarrah Duiker[1]

[1]MacEwan University, [2]Independent Researcher

Buried soils and ice patches in northwestern Canada contain millennial-scale records of cultural and natural history. These archives preserve intertwined assemblages of biotic remains, biogeochemical signatures, and artifacts. As environmental and cultural proxy indicators, these materials provide information about how animals, plants, and humans related to their surroundings and each other at the time of their deposition. In this sense, they are representations of the past that can be conceptualized as ecocultural landscapes. This approach recognizes humans as part of the Earth system, not outside or above it, similar to Indigenous ways of understanding the physical world. Similar concepts have been used in archaeological research for decades but remain an emerging approach in Earth sciences. This talk reframes paleosols and ice patches in Alberta as archives of ecocultural landscapes. We use these examples to illustrate the benefits of blending insight from Quaternary science, archaeology, and Indigenous knowledge to our understanding of past, present, and future human responses to rapid environmental change.

Submission type

Oral

169 - Integrating archaeology and Quaternary science at Kaa Upiyaakaau (HdEh-1), northern Québec

Moira McCaffrey[1], David Denton[1], Magali Rizza[2], Stephen Wolfe[3], Natasha Roy[4], Anne de Vernal[4]

[1]Independent researcher, [2]Université du Québec à Montréal, [3]Geological Survey of Canada, [4]Geotop, Université du Québec à Montréal

Kaa Upiyaakaau 1 (HdEh-1) is a unique archaeological site in the interior of northern Québec, situated on an eroding terrace adjacent to a dune and characterized by fire-cracked rock features and numerous ground stone axes. Despite its significance, the age and environmental context of HdEh-1 have remained uncertain. A research project addressing these questions is being conducted in partnership with the Naskapi Nation of Kawawachikamach, for whom the site and surrounding region form an important part of Naskapi cultural heritage.

In 2024, archaeologists and a multidisciplinary Quaternary science team undertook integrated stratigraphic, chronometric, and paleoenvironmental investigations to refine the site's chronology and reconstruct landscape history. Samples were collected for optically stimulated luminescence (OSL), terrestrial cosmogenic nuclide (TCN), and radiocarbon dating, while lake and peat cores were extracted for pollen, macrofossil, and charcoal analyses to reconstruct vegetation history and regional fire dynamics.

Radiocarbon results indicate an occupation between ca. 4900-4500 BP, consistent with a likely Maritime Archaic association, while a 3200 BP date suggests possible later use of the site. We present initial results from

these ongoing analyses designed to clarify terrace formation, confirm the chronology, and refine the environmental framework of early interior occupation.

Submission type

Oral

35 - Exploring a methodology for integrating beetle (Coleoptera) subfossils in high-resolution palaeoecological reconstructions at L'Anse aux Meadows

Véronique Forbes[1], Carlos E. Salazar Guerra[1], Paul M. Ledger[1]

[1]Dept. of Archaeology, Memorial University

Studies aiming to document the ecological footprint of past human occupations sometimes include palaeoentomological datasets within the range of proxies analyzed. While these are typically examined alongside palynological data, insect subfossils rarely come from the same samples and are almost never analyzed at the same chronological resolution. Instead, beetle remains are usually extracted as c. 4 or 5cm vertically-thick blocks of sediment cut from exposed profiles to recover large (2 to 10 litres) samples that are processed through paraffin floatation. This approach has been successful at producing beetle-based reconstruction of Holocene environmental change, including those associated with woodland clearance, agriculture, and long-distance human migration. Yet, such large samples produce temporally imprecise datasets poorly suited to detect ecological changes associated with ephemeral or seasonal human activity. In our palaeoecological analysis of peat samples from L'Anse aux Meadows, a site best known for its ostensibly short Norse occupation, we developed and tested a methodology that prioritized the temporal resolution of our beetle fossil data. Here we present two highly resolved palaeoentomological datasets and explore the necessary trade-offs and misapprehensions that may arise from this effort to optimize and adapt field and laboratory methods to specific research contexts and objectives.

Submission type

Oral

126 - Palaeoenvironments, landnám and a long Viking Age at L'Anse aux Meadows

Paul Ledger[1], Véronique Forbes[1]

[1]Memorial University of Newfoundland and Labrador

In so far as is known, the Viking Age reached it western geographic frontier at L'Anse aux Meadows (LAM) in northern Newfoundland. In the 1960s, the discovery of the remains of eight turf structures at LAM illustrated to the world that the Medieval Icelandic stories of Norse voyages beyond Greenland in the eleventh century were records of real events. In 1978, UNESCO listed LAM as representing "…the earliest evidence of Europeans in North America". An integral part of the extensive archaeological excavations at this iconic site were a series of studies of the palaeoenvironmental context of human occupation. In all cases, these studies concluded that there was no evidence of environmental change coincident with Norse *landnám* (settlement). These findings are in

stark contrast to those reported elsewhere in the North Atlantic islands over the past two decades, where Norse *landnám* resulted in a repeated suite of environmental changes. The reported absence of environmental impact at LAM has, to some extent, engendered and supported a narrative of Norse activity in Newfoundland as being short-lived. Here we examine these ideas in light of a review of legacy data and renewed archaeological and palaeoenvironmental research conducted at LAM over the past eight years.

Submission type

Oral

207 - A middle to late Holocene multi-proxy study of L'Anse aux Meadows National Historic Site, Newfoundland, Canada

Charlotte Whyte[1], Jeannine St-Jacques[1], George Drummond[1], Paola Jirado[2], Matthew Peros[2]

[1]Concordia University, [2]Bishop's University

This study reconstructs the past 6,000 years of vegetation, fire, and water table history at the L'Anse aux Meadows National Historic Site, Newfoundland, Canada. A 2 m long core, collected from a fen located about 300 m east of the Norse settlement, was studied for pollen, charcoal, and testate amoebae, and has a chronology based on nine AMS radiocarbon dates. The analysis shows transitions from fen- to bog-like environments, punctuated by fire events and shifts in vegetation composition and water table depth. Early fen conditions (4055-1740 BCE) transitioned to a more bog-like environment, following a significant fire disturbance. The early fen conditions were followed by a prolonged period of low peat accumulation (1095 BCE-50 CE), potentially due to drier conditions. Fire frequency increased during the first millennium CE, and a reconstruction of water table depth suggests drier conditions preceding the onset of the Little Ice Age. A long-term decline in pollen influx aligns with regional cooling trends, driven by decreasing solar radiation and SST changes. This research helps situate L'Anse aux Meadows within a broader climatic and ecological context, and explores potential anthropogenic impacts on fire regimes and landscape changes.

Submission type

Oral

71 - Palaeoecological Insights from a Naskapi Cultural Landscape in the Mistisiipuw Nipiiy (Cambrien Lake) region, northern Québec: Preliminary Results

Natasha Roy[1], Anne de Vernal[1], Moira McCaffrey[2], David Denton[2], Magali Rizza[1], Stephen Wolfe[3]

[1]Geotop - Centre de recherche sur la dynamique du système Terre, Université du Québec à Montréal, [2]Independent researcher, [3]Natural Resources Canada, Geological Survey of Canada

The northern Québec interior remains a poorly documented region regarding late Holocene paleoecological history. Yet the Cambrien Lake (Mistisiipuw Nipiiy) sector has sustained human occupation for nearly 5000 years and today forms part of the Naskapi cultural landscape, making it a culturally and ecologically significant subarctic region. How environmental variability shaped this long-term relationship is the main research question

addressed in this project, which aims to reconstruct vegetation and climate dynamics over the past 4000 years using peatland sediment archives (pollen, plant macrofossil, charcoal).

Preliminary pollen and macrofossil data from peat indicate marked shifts in vegetation composition, suggesting ecological reorganization and environmental change. When completed, the analyses will allow us to establish the first continuous environmental baselines for this sector. By embedding millennial-scale environmental change within a well-documented Indigenous cultural landscape, this study will contribute to a better understanding of the sensitivity and resilience of subarctic ecosystems, and of long-term human-environment interactions under climatic variability. This research aims to strengthen the scientific foundation for the creation of a protected area encompassing Waskaikinis (Fort McKenzie), including Mistisiipuw Nipiiy and Nachacapau Nipiiy (Lake Nachicapau), as defined and led by the Naskapi Nation of Kawawachikamach.

Submission type

Poster

201 - Anthropogenic burning and the origin of inland heathlands in Nova Scotia: evidence from the Annapolis Valley

Elena Ponomarenko[1], Ekaterina Ershova[2], Raphael Chavardes[3], Sarah Vascotto[4], Kim Huskins[4], Hannah Machat[5]

[1]University of Ottawa and Ecosystem Archaeology Services, [2]University of Wisconsin-Madison, [3]Atlantic Forestry Centre, Canadian Forest Service, [4]Nova Scotia Department of Natural Resources, [5]Integrated Resource Planning, Nova Scotia Department of Natural Resources

Heathlands - treeless shrublands - form an unusual ecosystem within the densely forested landscape of Nova Scotia. They support ericaceous shrubs and several rare plant species with disjunct distributions whose principal ranges lie to the southwest. The persistence of these treeless sites in the region's humid climate has long been debated. Although recurrent fire has been proposed as the main driver, this hypothesis has not been tested systematically.

We reconstructed the history of inland heathlands using pollen and macrofossil analyses of oxbow sediments, complemented by the study of buried soil horizons.

For most of the Holocene, areas now occupied by heathlands were forested, predominantly by conifers. Fire episodes occur throughout the 12-ka old sediment sequence, but more than half fall within the last millennium. A marked increase in fire frequency coincided with a two-stage vegetation transition. At the first stage, forests were partially replaced by shrublands rich in *Ilex*, Polypodiaceae and Onagraceae. Around 300 yrs BP, these communities shifted to Ericaceae-dominated heathlands. Although ericaceous taxa appear intermittently in late Pleistocene and early Holocene records, their dominance emerged only in recent centuries.

The timing and magnitude of the increase in fire frequency suggest anthropogenic burning - deliberate landscape management by fire.

Submission type

Poster

134 - regime shift and loss of benthic habitat in Ginoo-gami (Ontario): assessing the impacts of the 1939 Long Lake diversion

Monica Lise Garvie[1], Calvin Sr. Taylor[2], Micheal Fisher[3], John Smol[1], Brian Cumming[1]

[1]Queen's University, [2]Ginoogaming First Nation, [3]Long Lake #58 First Nation

The Upper Kenogami Watershed (UKW) is a meaningful region of Treaty #9 Territory in northern Ontario (Canada) impacted by several resource development projects beginning in the 1930s, including Canada's first inter-basin water diversion (the Long Lake Diversion of 1939). This study uses Anishinaabe *mino-bimaadiziwin* principles coupled with paleolimnological techniques to examine the sediments of Long Lake and reconstruct baseline conditions as well as examine the responses of the lake to the Long Lake Diversion and cumulative anthropocentric stressors over the past ~150 years. Following the completion of the diversion, diatom, geochemical, and isotopic analyses showed an abrupt and long-lasting shift from oligotrophic to mesotrophic conditions and a loss of benthic taxa, with a contemporaneous rise in metal concentrations, C:N ratios, and a depletion of $\delta^{13}C$ values. The shift to a more nutrient-rich state is likely the result of the increased catchment area draining into Long Lake in conjunction with the influx of organic matter from flooding. This study highlights the permanent impacts of the diversion on Long Lake from an era when resource development and landscape alterations did not consider changes in water-quality and/or the ecological impacts on aquatic communities or human and other-than-humans in relation with the water.

Submission type

Poster

14. Constraining the Cordillera: Advances in Quaternary Landscape Evolution

8:45-10:30
Room 26, Leacock Building

Session Conveners: Norris, S. (University of Victoria); Hebda, C. (University of Victoria); Ferby, T. (BC Geological Survey); Elia, E. (BC Geological Survey); Finley, T (Yukon Geological Survey)

57 - Cordilleran Ice Sheet early deglaciation inferred from evolution of Late-Pleistocene glacial Lake Dzulh Stun in east-central British Columbia

Brendan Miller[1, 2], John Clague[3], Andree Blais-Stevens[4]

[1]University of Northern BC, [2]BC Ministry of Forests, [3]Simon Fraser University, [4]Natural Resources Canada

We documented the early decay of the Late-Pleistocene Cordilleran Ice Sheet in the central portion of the Rocky and Cariboo Mountains and the Rocky Mountain Trench in east-central British Columbia. Glacial lakes

impounded at the eastern margin of the ice sheet occupied watersheds on the west flank of the central Rocky Mountains, leaving extensive glaciolacustrine deposits and shorelines. Some of the lakes overflowed across high divides onto the westernmost Interior Plains. These lakes expanded westward and eventually coalesced to form glacial Lake Dzulh Stun, which grew to occupy ~400 km of the Rocky Mountain Trench and extended farther west into the adjacent Cariboo Mountains. Meltwater from the margin of the ice sheet located in the central Cariboo Mountains crossed the crest of the range in places and flowed into this lake. At this time, high elevations on the east side of the Cariboo Mountains were ice-free, while major cross-cutting valleys remained obstructed by ice. The lake drained to the north along the Parsnip River valley, through the Rocky Mountains and onto the Interior Plains, accompanied by an ~400-m (1213 - 808-m ASL) lowering in its level. These events occurred during perhaps a millennium within the period 13-14.5 ka before present.

Submission type

Oral

61 - Reconstructing glacial lake evolution in the central Canadian Cordillera during the last deglaciation: using an adapted GIA model

Rachel Higgins[1], Sophie Norris[1], Benjamin Stoker[2]

[1]Geomorphology and Chronology Research Lab, University of Victoria, [2]Lamont-Doherty Earth Observatory, Columbia University

During the last deglaciation, proglacial lakes were widespread throughout North America and have been implicated in the destabilization of ice sheets. One region where glacial lake evolution is particularly poorly understood is the interior region of the last Cordilleran Ice Sheet. For this region, we adopt a dual-method approach to understand these lakes. First, we developed a regional-scale database of paleo-lake extents based on previously published studies. Then, we use an adapted glacial isostatic adjustment model to create an updated glacial lake reconstruction, using the North American Deglaciation Isochrones (NADI-1). These reconstructions are then compared against our database to identify differences between the numerical model and the geomorphic record. This comparison allowed us to build an ensemble of feasible simulations. Our results show that the configuration of ice margins is the dominant control for damming proglacial lakes during the deglaciation of the Canadian Cordillera, while GIA appears to play a more minor role. Data-model mismatches within our feasible simulations could not be resolved, suggesting that the solid earth structure is not responsible for the discrepancy. Resolving these differences would require revisions to the ice margins, revisions to the model, or future fieldwork to identify lakes absent from the geomorphic record.

Submission type

Oral

75 - Revisiting pre-last glacial maximum sediments and tephrochronology of interior British Columbia

Britta Jensen[1], Serhiy Buryak[2], Sophie Norris[3], Matthew Bolton[1], Rachel Higgins[3], Crystal Huscroft[4], Stephen Kuehn[5]

[1]Department of Earth and Atmospheric Sciences, University of Alberta, [2]Department of Physical Sciences, MacEwan University, [3]Department of Geography, University of Victoria, [4]Department of Environment, Culture and Society, Thompson Rivers University, [5]Department of Physical and Environmental Sciences, Concord University

Exposures of sediments presumed to be Marine Isotope Stage 3 are scattered throughout the south-central interior of British Columbia. A complex interfingering of glacial lake sediments, outwash gravel, colluvium, debris flows and fluvial gravels, this active depositional setting has preserved numerous tephra. First described by Westgate and Fulton in the 1970s, these tephra are important chronostratigraphic markers for dating and deconvoluting this stratigraphy. However, only limited work has been carried out on many of these sites since then. Tephra only have their original ^{14}C ages, and source(s) remain speculative. As part of a project investigating glacial lake histories in the region, we are recollecting and recharacterizing key tephra. Starting with original samples in the John Westgate Tephra Collection, we are obtaining new glass geochemistry (e.g., trace element) and dates (U-series dating). Initial results support the original conclusions that most are from the same source (likely Mount St. Helens), but newer reference data adds nuance (potentially set C). New U-series ages support original radiocarbon ages: e.g., the Kamloops Lake tephra was estimated to be ~39 cal yr BP, the new U-series age is 38.82 +7.0/-7.9 ka. This gives confidence to further dating, particularly for tephra that may have infinite ^{14}C ages.

Submission type

Oral

116 - Reconstructing the glacial dynamics of the Cordilleran Ice Sheet on northern Vancouver Island, British Columbia, during the Last Glacial Maximum

Lindsay Worden*[1], Travis Ferbey[2], Christopher F.G. Hebda[3], Duncan McLaren[4], Sophie L. Norris[1]

[1]Department of Geography, University of Victoria, Victoria, BC, Canada, [2]British Columbia Geological Survey, Victoria, BC, Canada, [3]Hakai Institute, Victoria, BC, Canada, [4]Department of Anthropology, University of Victoria, BC, Canada

During the Last Glacial Maximum, the Cordilleran Ice Sheet (CIS) enveloped most of coastal British Columbia (BC) and spread across parts of the continental shelf. Understanding the dynamics of ice sheet evolution in this region is essential to determine postglacial ecosystem development to support the dispersal of early humans and biota along the Pacific Coast of North America. Recent chronological studies focus on the archaeological and paleontological history of this region, raising critical questions about deglaciation. We present newly published glacial geomorphic feature mapping of the northern Vancouver Island, BC, which is used to reconstruct local deglaciation, but more broadly to infer glacial dynamics of the western margin of the CIS. Additionally, a synthesis of regional geochronology is presented within a Bayesian statistical model, including previously published radiocarbon and newly collected cosmogenic ^{10}Be exposure ages (n = 21 erratic samples collected). Our findings provide insights into coastal CIS deglaciation, showing initial retreat along the continental shelf then subsequent ice thinning of uplands, directly impacting the viability along the coast for early human dispersal. These data suggest that initial deglaciation of the northern portion of Vancouver Island occurred by at least ~16,000 years BP, consistent with other chronologies in the region.

Submission type

Oral

143 - Constraining the evolution of postglacial river incision rates and sediment-routing systems in western Canada using luminescence

Sam Woor[1, 2], Mitch K. D'Arcy[2], Olav B. Lian[1], Maria Schaarschmidt[1], Henry Crawford[2], Justine Stoeckly[1], Sierra Colpitts[1]

[1]University of the Fraser Valley, [2]University of British Columbia

INVITED SPEAKER - Optically-stimulated luminescence dating is a powerful tool for quantifying the burial ages of sediment. Recent research has shown that luminescence signals also record valuable information about sediment routing and provenance, extending the method beyond dating. This talk will summarise our work applying luminescence to understand the postglacial evolution of the Fraser River watershed, British Columbia, with a particular focus on the Thompson River. We have quantified post-glacial river incision rates from relict terraces using luminescence dating, whilst the luminescence signals of modern sediments reveal information about sediment transfer through the system. Postglacial incision rates decrease towards the present, supporting models of how rivers respond to excess sediment following deglaciation. Incision rates doubled during a period of greater rainfall in the mid-Holocene, demonstrating the sensitivity of postglacial adjustment to climate forcing. Comparing upstream incision records with downstream depositional records shows that the response timescales of signal transmission are much quicker than predicted by numerical modelling studies. Luminescence signals from modern sediments show that inputs from glacial and paraglacial sediment stores are now limited. My talk will conclude by summarising future opportunities for quantifying sediment routing using luminescence, e.g., emission spectrometry for sediment fingerprinting, and portable luminescence readers for enabling rapid dating.

Submission type

Oral

163 - Ongoing paraglacial erosion in response to drainage reorganization along the ice-sheet marginal Northern Cordillera

Alexander Getraer[1], Marisa Palucis[1], Justin Strauss[1]

[1]Dartmouth College

Rapid thaw-induced erosion along past Laurentide ice margins in western Canada points to the lasting influence of continental glaciation on landscape evolution. Interpreting and anticipating erosion in these landscapes demands understanding the geomorphic history to which they are responding. For most of the Cenozoic, North American drainage was dominated by the Bell River system that connected headwaters in the Northern Cordillera to the Hudson Straight and Labrador Sea. Arctic drainage was limited to smaller watersheds of the paleo-Porcupine and Anderson rivers. However, Laurentide glaciations emanating from Hudson Bay disrupted these paleo-rivers during the Pleistocene, integrating modern watersheds. Foundational work by Duk-Rodkin

and Hughes (1994) hypothesizes that the Mackenzie River formed following the Last Glacial Maximum, after ice streams entrenched drainage against the Northern Cordillera ice margin. We use topographic reconstructions to infer the magnitude of this perturbation and trace postglacial landscape response from canyon incision and alluvial fan deposition to modern day permafrost disturbances. We present a conceptual model of paraglacial landscape evolution to drainage rerouting and quantify postglacial erosion rates along the northwestern margin of the Laurentide Ice Sheet. Our results link Cenozoic drainage reorganization to modern observations of permafrost erosion, providing crucial geomorphic context for ongoing landscape evolution.

Submission type

Oral

96 - Progress in resolving the age of a key unit bounding the last interglacial Muir Point Formation (MIS 5e), at Muir Point, SE Vancouver Island, British Columbia

Sierra Colpitts[1], Sam Woor[1, 2], Maria Schaarschmidt[1], Olav B. Lian[1]

[1]Department of Geoscience, University of the Fraser Valley, [2]Department of Earth, Ocean and Atmospheric Sciences, University of British Columbia,

Reconstructing past environments is essential for understanding how landscapes respond to changing climates. The holostratotype for the Muir Point Formation (MPF) at Muir Point, SE Vancouver Island, BC, has been previously interpreted from palaeoecology and luminescence age estimates to have been deposited during the climate optimum of the last interglaciation (MIS 5e). It is bounded by glacial and nonglacial units of unknown age. One of these nonglacial units, which lies directly above MPF sediments, contains pollen that suggests that climate was colder than that at present and has been interpreted to be consistent with deposition during MIS 3. Radiocarbon ages from wood collected from this unit are all interpreted to be infinite, and preliminary luminescence dating has been problematic due to poor luminescence signals from quartz and feldspar ages that are too old to be corrected for anomalous fading. In this study we will present luminescence dating data from K-feldspar that was recently acquired using the post-IR IRSL method that is designed to minimize the effect of anomalous fading. This new age information will be compared to existing data in order to help resolve the chronological challenges and more accurately constrain the timing of deposition of this key lithostratigraphic unit.

Submission type

Poster

132 - The world beneath the waves: reconstructing submarine glacial history and late Pleistocene sea level change on the west coast of Canada

Christopher F.G. Hebda[1, 2], Zhen Li[1], Sophie L. Norris[2], Cooper D. Stacey[1]

[1]Geological Survey of Canada - Pacific, Natural Resources Canada, Sidney, BC, Canada, [2]Department of Geography, University of Victoria, Victoria, BC, Canada

Understanding Quaternary environmental transformations is highly dependent on the quality and spatial coverage of available data, especially in formerly glaciated regions such as coastal British Columbia, which experienced highly variable relative sea level (RSL) during the late Pleistocene. Along the coast, RSL changes resulted from a combination of eustatic sea level drawdown, uneven ice cover, isostatic glacial loading, and forebulge effects during and following the Last Glacial Maximum. During deglaciation, the uneven distribution of ice across the coast led to the submergence and emergence of numerous landscape features. Notably, outer areas of the coast were uplifted by a peripheral forebulge, leading to lower RSL and the growth of extant archipelagoes as well as the subaerial exposure of large, flat-lying islands that are now submerged. We analyze high-quality datasets collected over decades by the Geological Survey of Canada in Queen Charlotte Sound and around northern Vancouver Island, including multibeam bathymetry, seismic reflection and sub-bottom profiles, side-scan sonar, sediment cores, and other seabed characteristics to: (i) document relict glacial landforms, (ii) reconstruct late Pleistocene palaeogeography, and (iii) identify data collection targets for upcoming field campaigns. These results will inform future research in glacial dynamics, glacio-isostatic adjustment modelling, palaeoecology, biogeography, and archaeology.

Submission type

Poster

10. Glacial geology, paleoecology and geochronology studies of the Hudson Plains

9:30-10:30
Room 219, Leacock Building

Session Conveners: Hodder, T.J. (Manitoba Geological Survey); Hathaway J. (University of Toronto); Finkelstein, S. (University of Toronto); Dalton, A.S. (Université du Québec à Montréal)

41 - Till stratigraphy and ice flows in Ontario's Ring of Fire area, Hudson Bay Lowlands

Cunhai Gao*[1], Michel Lamothe[2], Nicholas Szumylo[1]

[1]Ontario Geological Survey, [2]Université du Québec à Montréal

Till and stream-sediment sampling by the Ontario Geological Survey (OGS) along the Attawapiskat River has revealed anomalously high concentrations of detrital chromite in Ontario's mineral-rich Ring of Fire region, indicating the presence of undiscovered bedrock sources in the surrounding terrain. Interpretation of these anomalies has been hindered by limited understanding of local till stratigraphy and the complex sequence of Late Quaternary ice-flow events that governed sediment transport. To improve this framework, the OGS conducted additional surficial mapping and stratigraphic investigations along the river in 2024. Fieldwork emphasized distinguishing till units using sediment texture, structure, colour, and erosional unconformities that mark key stratigraphic boundaries. Till-clast fabrics were measured at multiple stratigraphic levels across

riverbank exposures to reconstruct ice-flow patterns. Samples from distinct till units and subtill nonglacial sediments were collected for laboratory analyses, including indicator-mineral characterization, till-matrix geochemistry, magnetic susceptibility, clast-lithology counts, and radiocarbon and optically stimulated luminescence dating. Results from this study can improve understanding of glacial processes that controlled mineral-dispersion pathways relevant to drift prospecting but also provide critical information to support land-use planning and future infrastructure development across this emerging northern district.

Submission type

Oral

146 - Comparing the glacial geology of Foxe Basin and Hudson Bay lowlands

Tommy Tremblay[1], Daniel Utting[2]

[1]Natural Resources Canada, [2]Alberta Geological Survey

Ice flow patterns and their variability under paleo-ice sheets are important to understand fluctuations in sedimentary outputs at the ice margin and under the glacier. During the last glaciation, ice flow patterns, including many ice streams, out of Foxe Basin are suspected to have been relatively steady, mostly because the basin is surrounded by significant relief, and the ice flow is generally constrained by it. The question arises how this situation compares to the important regional shifts in ice flow directions described around southern Hudson Bay, which is largely surrounded by low terrain, between two major ice domes, and affected by large glacial lakes near the ice margin. Surficial mapping based on field observations, TCN data, air photos, satellite images, ArcticDEM and multibeam bathymetric data provides updated insights into Foxe Basin glacial evolution. Glacial transport evidence indicates that ice predominantly exited the basin through major topographic depressions. Cold-based glacial landscapes occur across the uplands surrounding the basin and in some lowland areas near southern Admiralty Inlet, with possible relict terrains preserved close to the Foxe Dome. Esker systems are present in Foxe Basin, suggesting warm-based deglaciation. During deglaciation, ice flow patterns complexify, notably where local ice streams are observed.

Submission type

Oral

174 - Reconstructing the Laurentide Ice Sheet beyond the last glaciation: insights from the Hudson Bay Lowland

Tyler Hodder[1], Michelle Gauthier[2], Nick Mesich[2], Martin Ross[2], Olav Lian[3], Maria Schaarschmidt[3], April Dalton[4], Julia Hathaway[5], Sarah Finkelstein[5]

[1]Manitoba Geological Survey, [2]University of Waterloo, [3]University of the Fraser Valley, [4]Université du Québec à Montréal, [5]University of Toronto

Quaternary terrestrial stratigraphic records are key to understanding the long-term behaviour of past ice sheets beyond the most recent glaciation. The Hudson Bay Lowland (HBL) is situated near the geographic centre of

glaciated North America and contains amongst the best preserved and laterally extensive Quaternary stratigraphic successions within the limits of the LIS, including glacial sediments deposited during at least the last four major glaciations (≥MIS 10). Deciphering the complex stratigraphy is hindered by the fragmented nature of the record which requires a multi-parameter approach with an emphasis on collecting extensive ice-flow data. This presentation synthesizes recent field-based studies across the western HBL to provide insight into behaviour of the LIS beyond the most recent (Wisconsinan) glaciation. In particular, the stratigraphic record provides important constraints on the spatio-temporal evolution of LIS domes throughout earlier glaciations. This information is key to advancing reconstructions and modelling of the LIS throughout the Quaternary.

Submission type

Oral

194 - Paleoenvironments of the Hudson Bay Lowland across multiple glacial - interglacial cycles

Julia Hathaway[1], Tyler Hodder[2], April Dalton[3], Michelle Gauthier[4], Nick Mesich[5], Maria Schaarschmidt[6], Olav Lian[6], Martin Ross[5], Sarah Finkelstein[1]

[1]University of Toronto, [2]Manitoba Geological Survey, [3]Université du Québec à Montréal, [4]New Brunswick Geological Survey, [5]University of Waterloo, [6]University of the Fraser Valley

Past intervals of reduced or comparable global ice extent to present — referred to as interglaciations — are critical for isolating climate as a driver of terrestrial ecological change. In the Hudson Bay Lowland (HBL), sub-till organic bearing sediments provide some of the only empirical evidence of biome reorganization under different climate regimes. Here, we present new fossil palynological records from the HBL that reconstruct paleoenvironments from multiple glacial - interglacial cycles. Our results are integrated with published proxy-based and modelled records from the northern HBL and contextualized within regional to global scale climate reconstructions to assess the magnitude of ecological response to past interglacial conditions. In particular, we explore climate regimes suitable to support the northward migration of broadleaf forests into northern Manitoba and Ontario. These findings, such as pollen from temperate species present in subtill assemblages, contribute to a growing understanding of mid-latitude biome sensitivity under varying interglacial boundary conditions, providing critical analogues for projected future warming.

Submission type

Oral

Friday, June 5, 2026

Keynote: Dr. John (Jack) W. Williams

Studying Past Vegetation Dynamics at Continental to Global Scales Through Open Community-Curated Data Resources

Room 219, Leacock Building, McGill University

11:00 – 12:00 PM

Dr. John (Jack) Williams is Professor in the Department of Geography and Center for Climatic Research at the University of Wisconsin-Madison. He currently serves as Chair of the Executive Committee for the Neotoma Paleoecology Database and is a leader in advancing open-science efforts. Research themes include novel climates and ecosystems, the consequences of past species extinctions, abrupt ecological and climate change, and the last deglaciation as a model system for understanding 21st-century climate change. Awards include Ecological Society of America Fellow, the Phil Certain Distinguished Faculty Award, Aldo Leopold Leadership Fellow, and the PNAS Cozzarelli Prize. https://williamspaleolab.github.io/ and www.neotomadb.org

Abstract: Paleoecological data networks are the primary constraints on pre-1700 CE vegetation dynamics, land cover change, fire regimes, and vegetation-climate interactions. The gathering and compilation of these records is time-intensive. The Neotoma Paleoecology Database supports the Quaternary and global change communities by providing an expert-curated, open-access resource for paleoecological and paleoenvironmental data. Neotoma comprises three interlinked elements: the paleoecological data itself, the services that connect these data to diverse audiences, and the community of people who contribute, steward, and use Neotoma's data and services. All three are growing and together are enabling a flowering of research into past ecological dynamics at continental to global scales. For example, in North America, a new generation of REVEALS-based land-cover reconstructions suggest a continental-scale mid-Holocene peak in summergreen tree cover and strong physiognomic changes associated with the mid-Holocene hemlock collapse. Globally, late-Holocene rates of vegetation change were as fast or faster as those of the last deglaciation. Global spectral analyses of climate and vegetation variance suggest close couplings at timescales of 150 to 18,000 years-1, including a breakpoint in vegetation turnover that matches a breakpoint between stochastic ('weather') and autocorrelated ('climate') modes of variation in the atmosphere. Current activities include the rapid growth of the European community under the PalaeOpen initiative and the expansion of the Neotoma data model to support ancient environmental DNA.

4. From land to ocean : the recording of past environmental changes and their complex paleoclimate signals

13:30-17:15
Room 219, Leacock Building

Session Conveners: Peros, M. (Geotop and Bishop's University); Roy, N. (Geotop and Université du Quebec à Montréal); de Vernal, A. (Geotop and Université du Quebec à Montréal)

68 - Reconstructing Laurentide Ice Sheet Dynamics since the Last Glacial Maximum along Southeastern Baffin Island: Insights from Sedimentary Proxies and Baffin Bay Detrital Carbonate Events

Alexis P. Belko[1], Patrick Lajeunesse[1], Alexandre Normandeau[2], Audrey Limoges[3]

[1]Université Laval, Département de géographie, [2]Geological Survey of Canada (Atlantic), [3]University of New Brunswick, Department of forestry and Geology

The Laurentide Ice Sheet (LIS) was the largest ice sheet during the Last Glacial Period, and reconstructing its post-LGM dynamics is critical for understanding how marine-based ice sheets respond to climate change. The spatial variability of the LIS margin and its deglaciation history remain, however, poorly constrained along southeastern Baffin Island. This study integrates swath bathymetry, seismic-stratigraphy, sediment core analysis, and foraminiferal assemblages to reconstruct the LIS margin evolution from the LGM to the Younger Dryas across the Broughton and Merchants cross-shelf trough systems as well as Home Bay. Baffin Bay Detrital Carbonate events (BBDCs) recorded in sediment cores provide a robust stratigraphic proxy for tracking episodic ice sheet instability and meltwater discharge pulses throughout this interval. Combined with radiocarbon chronologies and the foraminiferal assemblages, BBDCs allow precise correlation between core records and constrain the timing of major dynamic shifts. Our results reveal contrasting retreat patterns between adjacent ice flow sectors, transient ice shelf development in Merchants Trough, and continuous retreat in Broughton Trough. These results allow refining LIS reconstruction models and improve our understanding of the relationship between ice sheet dynamics and sedimentary processes on glaciated continental margins.

Submission type

Oral

88 - Exploring Plant Macroremains for Quantitative Holocene Climate Reconstruction in Greenland

Jena Zumaque[1], Anne de Vernal[1], Manuel Chevalier[2]

[1]Université du Québec à Montréal, [2]University of Bonn

Arctic warming is accelerating mass loss from the Greenland Ice Sheet (GrIS), increasing freshwater discharge to the North Atlantic and potentially affecting ocean stratification, deep-water formation, and large-scale ocean-

atmosphere circulation. Understanding the GrIS response to warm conditions is therefore critical. The Holocene, characterized by natural climate variability under boundary conditions similar to today, provides a useful framework for investigating ice sheet-climate interactions.

As part of the GRATe program, which aims to improve knowledge of Greenland Ice Sheet sensitivity to Holocene climate change, we reconstructed Holocene climate variability in Greenland. Because terrestrial paleoecological archives at high latitudes are scarce, we applied the R-based tool CREST, which uses a Probability Density Function (PDF) approach to infer climate parameters from biological assemblages.

While pollen data are commonly used, their taxonomic resolution is often limited, reducing climatic precision. We therefore explored, for the first time at these latitudes, plant macroremains as an alternative proxy, as they are typically identified to species level and provide more constrained climatic signals. Macroremain-based reconstructions were compared with independent pollen and dinocyst records using the Modern Analogue Technique, establishing a multi-proxy framework and evaluating the strengths and limitations of this new approach.

Submission type

Oral

93 - Environmental changes in Hudson Strait and cultural transition in the Kangiqsujuaq region, Nunavik, Canada

Bianca Fréchette[1], Anne de Vernal[1], Natasha Roy[1], Elsa Cencig[2], Susan Lofthouse[2], André Rochon[3], Matthias Moros[4]

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A record of marine and terrestrial palynomorphs combined with geochemical and isotopic data from a sediment core collected in eastern Hudson Strait provides evidence of past environmental changes in northern Nunavik over the last 4000 years. A significant transition is recorded around 1850 yr BP. In the dinocysts assemblages, it is marked by a drastic increase of heterotrophic taxa at the expense of phototrophic taxa; in the pollen assemblages, it is marked by a change in the ratio between *Picea* and *Pinus*, with *Pinus* being more abundant than *Picea* after 1850 yr BP. The reconstructions of sea-surface conditions show a long-term cooling trend and increased seasonal sea-ice cover. The results also showed an overall increase in summer salinity, isotopic composition of organic carbon and organic carbon to total nitrogen ratio. Such changes suggest a lower proportion of terrestrial sources of sedimentary organic matter, likely induced by an overall decrease in freshwater discharges from the Hudson Bay watershed. With some temporal offset, the Middle Dorset period (2000 - 1500 yr BP) encompasses the transition towards colder conditions around 1850 yr BP. This correlates to a period of southward population movements, possibly driven by the impact of increased sea ice hindering resource access.

Submission type

Oral

111 - Multi-proxy paleoenvironmental reconstruction and human impacts in northern Cuba over the last ~1500 years

Cesar Arturo Vera Florez[1], Timem Boujellabia[1], Émilie Saulnier-Talbot[1], Roisin O'Toole[2], Yadira Chinique de Armas[3], Matthew Peros[4]

[1]Université Laval, [2]Durham University, [3]University of Winnipeg, [4]Bishop's University

The insular Caribbean is a global biodiversity hotspot increasingly threatened by climate stressors and human activities. However, there is a paucity of long-term paleoenvironmental records to assess ecosystem responses to environmental change. To address this gap, we analyzed a 115 cm-long sediment core from Laguna Rincon, located on the northern coast of Cuba. The core spans the last ~1500 years, revealing five main stages of environmental change.

1) ~1500 to 1300 cal yr BP, lagoon formation occurring under a high-energy setting, followed by mangrove colonization. 2) 1300 to 900 cal yr BP, lagoon enclosure and mangrove diversification. 3) 900 to 540 cal yr BP terrestrialization of the lagoon margins and possible prehistoric human impacts represented by increases in charcoal and disturbance vegetation. 4) ~540 to 100 cal yr BP, increases in Bromine (Br) and expansion of drought-tolerant taxa supports wetland desiccation under drier climate. 5) The last ~200 years are marked by deforestation, increases in Calcium (Ca) and changes in sediment texture, suggesting lagoon reopening or tidal overwash from storm surges. This high-resolution record provides new insights into the environmental history of this sector of the Caribbean and offers valuable context for future biodiversity research and restoration efforts.

Submission type

Oral

118 - Sedimentary ancient DNA records climate change and permafrost thaw effects on Arctic coastal ecosystems in the Mackenzie Delta, Canada

Inda Brinkmann[1, 2], Bennet Juhls[3], Julie Lattaud[4], Blanda Matzenbacher[1], Matthew O'Regan[1], Michael Fritz[3], Lisa Bröder[5], Tommaso Tesi[6], Jorien E. Vonk[7], Pier Paul Overduin[3], Peter D. Heintzman[1, 2]

[1]Department of Geological Sciences, Stockholm University, Stockholm, Sweden, [2]Centre for Palaeogenetics, Stockholm, Sweden, [3]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany, [4]Department of Environmental Sciences, Stockholm University, Stockholm, Sweden, [5]Department of Earth and Planetary Sciences, Geological Institute, ETH Zürich, Switzerland, [6]Institute of Polar Sciences, National Research Council of Italy, Venice, Italy, [7]Department of Earth Sciences, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

Unprecedented rates of warming are shaping Arctic ecosystems and landscapes. Impacts in the Canadian Arctic are closely connected to accelerated permafrost thaw, coastal erosion and increasing river discharge to the coastal zone. Significant shifts in biodiversity and environments are evident today, but long-term ecosystem

responses are crucial for discerning the effects of Holocene climate variability and accelerating rates of change in the 21st century.
Here we explore ancient DNA records from sediment records taken in Tuktoyaktuk harbor (NWT), and additional sites in front of the wider Mackenzie Delta. We applied plant and animal metabarcoding, together with shotgun metagenomics. The 4500-year harbor record reflects the region's terrestrial and marine biodiversity at multi-decadal resolution, with distinct community shifts in particular in response to sea level rise. The identification of woolly mammoth DNA in surface sediments suggests reworking of formerly buried material from mainland permafrost into coastal sediments. We hypothesize that 'modern' signals of extinct megafauna may act as a proxy for accelerated permafrost thaw in response to recent warming.
Our study offers new perspectives on Arctic ecosystem sensitivity to climate change across the land-sea interface, and a framework for the interpretation of sedimentary ancient DNA in a rapidly warming Arctic landscape.

Submission type

Oral

151 - Holocene Arctic paleoenvironments

K Gajewski[1], C Tamo[1], T Lacourse[2]

[1]University of Ottawa, [2]University of Victoria

In the past 20 years, Holocene paleoenvironmental records from lake sediment cores have become available from across the North American Arctic. The availability of modern calibration datasets for several proxies enables the quantification of past climates across the Canadian Arctic Archipelago and Greenland. Pollen records provide the best and most extensive records of climate change during the Holocene from the North American Arctic. Using local (Arctic) pollen, paleoclimate reconstructions show synchronous changes across the Arctic, although the direction of change varies for any transition between regions. Analysis of long-distance transport of pollen to the Arctic from forested regions shows patterns explainable in terms migration of tree taxa as well as insolation and atmospheric circulation changes caused by the retreating ice sheet.

Submission type

Oral

157 - Holocene temperature and Labrador Current flow speed evolution on the eastern Canadian continental margin: geochemical and sedimentological perspectives

Harunur Rashid[1], Shuang Shuang Zhao[1], Zi Teng Zhao[1], David Piper[2]

[1]College of Oceanography and Ecological Science, Shanghai Ocean University, Shanghai, China, [2]Natural Resources Canada, Bedford Institute of Oceanography, Nova Scotia, Canada

The retreat of the Laurentide Ice Sheet during the early Holocene reshaped ocean circulation and sedimentation along the eastern Canadian margin, yet the response of the Labrador Current (LC) remains insufficiently

resolved. We reconstruct Holocene LC flow-speed variability and upper-ocean conditions using sedimentological and geochemical proxies from two cores positioned along the LC pathway between Hudson Strait and the Grand Banks. Core 2006040 was recovered from a mid-shelf basin in the northern Labrador Sea, whereas core 2011032 was collected from the southeastern Grand Banks.

Sortable-silt analyses reveal three phases of LC flow variability over the past ~9.2 ka that broadly correspond to LIS retreat and final collapse. Biomarker proxies, including TEX_{86}-derived subsurface temperatures and the sea-ice indicator IP_{25}, indicate a spatially heterogeneous thermal evolution. LC flow intensified from ~9.2 to 5 ka, with two meltwater discharge events exerting only minor influence. Maximum flow occurred between ~5 and 3.1 ka, followed by gradual weakening thereafter.

Mean sortable-silt trends parallel deep North Atlantic records, suggesting strong coupling between shelf circulation and basin-scale dynamics. We interpret LC variability as reflecting changes in subpolar gyre strength and its linkage to the Atlantic Meridional Overturning Circulation, offering new insight into Holocene circulation following LIS retreat.

Submission type

Oral

162 - Holocene sea ice variability and declining terrestrial inputs in the southern Chukchi Sea revealed by lipid biomarkers

Kuang Jin[1], Anne de Vernal[2], Robert S. Pickart[3], Mickey Chen[1], Gerard Otiniano[4], Trevor Porter[1]

[1]Department of Geography, Geomatics and Environment, University of Toronto Mississauga, [2]GEOTOP, Université du Québec à Montréal, [3]Woods Hole Oceanographic Institution, [4]Department of Earth Sciences, University at Buffalo, State University of New York

Arctic sea ice strongly influences global climate and marine primary production. Despite its importance, Holocene sea ice records remain sparse in the Pacific sector of the Arctic Ocean. This lack of long-term records limits our understanding of natural sea ice variability and constrains the evaluation of future sea ice projections. We present a new biomarker-based reconstruction of Holocene sea ice and environmental change using a 519 cm-long sediment core retrieved from the southern Chukchi Sea. Seventeen AMS radiocarbon measurements indicate that the core preserves a continuous record spanning the last 8.6 kyr. Sea ice biomarkers (IP_{25}, HBI III, brassicasterol, and dinosterol) indicate reduced sea ice conditions in the region around 8 kyr BP, followed by progressive expansion beginning ~2.5 kyr BP and culminating in extended sea ice cover during the last millennium. Trends in β-sitosterol and bulk organic geochemical data also indicate decreasing terrestrial influence on sedimentary organic matter during the mid-Holocene. This record expands Holocene sea ice coverage in the Western Arctic which bridges reconstructions from the Bering Sea to the central Chukchi Shelf thus improving constraints on long-term sea ice variability in a climatically sensitive region.

Submission type

Oral

166 - Southern Lomonov Ridge palynological records document late Pleistocene to Holocene paleoclimates in the eastern Arctic

Anne de Vernal[1], Claude Hillaire-Marcel[1], Matthew O'Regan[2], Jens Matthiessen[3], Tengfei Song[4], Spielhagen Robert[5], Rudiger Stein[6]

[1]Geotop-UQAM, [2]Stockholm University, [3]AWI-Bremerhaven, [4]Geotop-UQAR, [5]Geomar-Kiel, [6]MARUM-Bremen

Palynological analyses in four deep-sea cores collected from the Laptev Sea shelf edge, at 79.91°N (SWR-31) to 83.8°N (PS2757, PS87-79, PS87-70) along the Lomonosov Ridge, provide information on pelagic fluxes and sea ice cover. Dinocyst concentrations decrease northward, with low fluxes offshore, where perennial sea ice restricts biogenic inputs. Higher sedimentation rates are also recorded close to the shelf edge, with about 2.5 meters of Holocene sediments in SWR-31 vs. 30 cm in PS87-70. The 4 records reveal particularly high dinocyst content in the early- to mid-Holocene interval and a drop to near-zero over the late Holocene, due to the development of a continuous, perennial sea ice cover.

The lower part of the sequences shows sparse palynological content, especially at offshore sites, suggesting predominance of perennial sea ice during the recovered interval. Nevertheless, a marked dinocyst peak at 7-8 m in SWR-31, more tenuous and shallower at other sites, suggests episodic seasonal sea-ice opening, with decreasing pelagic fluxes and sedimentation rates from the shelf edge to the North. In core SWR-31, elevated organic content in this interval was originally interpreted as material remobilized from the permafrost active layer. An alternate hypothesis is that these deposits are from the last interglacial.

Submission type

Oral

193 - Hydroclimate change in the Great Basin (USA) over the last six glacial-interglacial cycles: the new Devils Hole record

Kathleen Wendt[1], Stacy Carolin[2], Christo Buizert[3], R. L. Edwards[4], Gina Moseley[5], Yuri Dublyansky[5], Hai Cheng[6], Christoph Spoetl[5]

[1]University of Toronto, [2]Oxford University, [3]Oregon State University, [4]University of Minnesota, [5]University of innsbruck, [6]Xi'an Jiaotong University

The Great Basin in the southwest United States experienced major hydroclimate shifts throughout the Quaternary. Here, we present an absolute-dated speleothem record of climate and environmental changes from Devils Hole 2 Cave (DH2) in southern Nevada over the last 580,000 years. Water isotope-enabled Earth System simulations suggest that DH2 $\delta^{18}O$ variability is largely controlled by temperature-dependent and atmospheric circulation processes. DH2 $\delta^{18}O$ variations are in-phase with atmospheric CO_2 (<300 years of variable phasing). DH2 $\delta^{13}C$ variations are in-phase with seasonal insolation during the warm growing season between summer solstice and fall equinox. Abrupt reversals towards higher DH2 $\delta^{13}C$ values occur at approximately 426 ±9 ka [MIS 11e], 335 ±4 ka [MIS 9e], 240.1 ±1.5 ka [MIS 7e], 125.8 ±0.4 ka [MIS 5e], and 6.2 ±0.6 ka [Holocene]. DH2 $\delta^{13}C$ reversals are interpreted as abrupt shifts towards lower vegetation density and soil productivity in the

high-elevation mountains of southern Nevada in response to warmer temperatures and decreasing water availability (<50% above modern) during each interglacial. Our study sheds new light on the relationship between temperature, moisture balance, and vegetation changes in the southern Great Basin over the last six glacial-interglacial cycles.

Submission type

Oral

204 - Mapping Disturbance History in the Canadian Maritimes

Elena Ponomarenko[1]

[1]University of Ottawa and Ecosystem Archaeology Services

We reconstructed disturbance history in the forested landscapes of the Canadian Maritimes using trace fossil analysis combined with the study of charcoal, pollen, and macrofossils.

Extreme wind events cause mass tree uprooting, producing rotational tree-uprooting structures (TUS) preserved in soils. In the Maritimes, repeated soil churning by uprooting creates stalked soil profiles that provide a chronological framework for macrofossil and pollen analyses at site and ecosystem levels. Charcoal from superposed TUS was analyzed to determine the age of fires and taxa burned, while the presence of charred roots and rubefaction of mineral soil layers within TUS was used to document coupled windstorm-fire events in 110 forest sites. The TUS asymmetry was linked to wind direction during tree fall, enabling delineation of contours affected by the same windstorms. The age distribution of radiocarbon-dated post-windstorm fires was compared with regional climatic phases, allowing correlation of peaks in coupled disturbances with climatic transitions. Finally, prolonged multi-centennial breaks in ignition of windstorm debris were interpreted as evidence of temporary regional depopulation.

Operating at site and ecosystem levels, this ecosystem archaeology approach provides a new framework for identifying, dating, and spatially mapping multiple disturbance regimes across forested landscapes.

Submission type

Oral

135 - The Frobisher Bay sediments as a record of the Anthropocene in the Canadian Arctic

Meaghan C. Bartley[1], Tommy Tremblay[2, 3], Amila O. De Silva[4], C. Michelle Kamula[1], Stephen Ciastek[1], Zou Zou Kuzik[1]

[1]University of Manitoba, [2]Natural Resources Canada, [3]Canada-Nunavut Geoscience Office, [4]ECCC

Documenting the environmental impacts of human activities is important to assess the magnitude of man-made change in the Arctic during the Anthropocene. Since 1942, the city of Iqaluit, Nunavut (then Crystal-2 followed by Frobisher Bay), situated at the head of Frobisher Bay, has faced continuous industrial and military activities alongside rapid urban growth, broadly synchronous with the Great Acceleration worldwide. In the Arctic,

historical baseline dataset of contaminants is sparse, however, marine sediment cores provide a detailed record of both local and long-range anthropogenic inputs to the marine environment. Using seven sediment cores collected across Frobisher Bay in 2017 and 2018 and dated with radioisotopes ^{210}Pb and ^{137}Cs, we examine spatial and downcore patterns of contaminants including total mercury (THg), major and trace elements, PAHs, PCBs, and PFASs, with particular emphasis on changes associated with mid-20th-century human activity. Analyses of surface sediments also document shifts in benthic fauna and the presence of technofossils on the seafloor. Given evidence of long-term legacy effects on the marine environment from both local and distant anthropogenic activities, together with accelerating regional development, contaminant studies are essential for assessing ongoing environmental impact of anthropogenic change in the Arctic.

Submission type

Oral

199 - High-Resolution Detection of Aeolian Sand Influx in Coastal Peatlands of Nova Scotia Using X-Ray Micro-Computed Tomography

Antoine Lachance[1], Matthew Peros[2], Jeannine Marie St-Jacques[1], Malin Kylander[3], Francesco Pausata[4]

[1] Concordia University,[2] Bishop's University,[3] Stockholm University,[4] UQAM

Cold-climate coastal environments are characterized by active aeolian sediment transport and dynamic beach systems. Along exposed Atlantic coasts, beaches and dunes act as major sediment sources, forming aeolian systems transporting sand inland during periods of intense wind and storms. Despite their importance, records of aeolian sediment transport in eastern Canada remain scarce.

This study evaluates coastal peatlands as potential archives of aeolian sand in southern Nova Scotia. Located landward of active beaches and dune systems on Cape Sable Island, these peatlands receive episodic mineral sediment input transported by wind from nearby coastal sand sources. To detect and quantify these deposits, we apply X-ray micro-computed tomography (μ-CT), which enables non-destructive 3D visualization and quantification of mineral particles preserved within organic matrices. This technique provides millimetre-scale measurements of sand and grain-size distributions, allowing identification of discrete sand influx events.

Preliminary analyses are presented from two coastal peatlands: Bakers Flat Bog (510-cm core; ~11,500 years) and Hawks Beach Bog (146-cm core; ~2,500 years). Variations in mineral particle abundance and grain-size distributions are evaluated as indicators of past aeolian transport linked to storm-driven sediment mobilization. These results demonstrate the potential for coastal peatlands to preserve long-term records of cold-climate aeolian processes through the Quaternary.

Submission type

Oral

95 - Biomarker evidence of temporal changes in environmental conditions: preliminary results from a boreal lake in northeastern Canada

Milena Souza Kury[1, 2], Pierre Francus[1, 2], Dermot Antoniades[3], Samrat Alam[4], Jason Ahad[4]

[1]Centre Eau, Terre, Environnement, Institut National de la Recherche Scientifique, [2]GEOTOP Research Centre, [3]Département de Géographie, Université Laval, [4]Geological Survey of Canada, Natural Resources Canada

High-latitude environments respond more critically to environmental change than lower-latitude regions. Within these ecosystems, fjord-lakes function as important archives of climate and catchment dynamics due to their specific morphology and depth, which facilitate the deposition of sedimentary sequences. While fjord systems are recognized as significant carbon sinks, their sedimentary records are also particularly valuable for reconstructing long-term shifts in terrestrial vegetation and lacustrine primary production. In northeastern Canada, understanding these multidecadal land-cover transitions is necessary for evaluating the sensitivity of sub-arctic basins to Atlantic climate forcings beyond instrumental records. This preliminary study characterized the organic fraction of sediments from a deep fjord-lake in Labrador (n-alkanes, total organic carbon, $\delta^{13}C$, and chlorophyll). These biogeochemical proxies were integrated to μ-XRF and lithofacies analyses to reconstruct centennial-scale environmental variability and to investigate any relationship with Atlantic climate shifts. Results revealed coherent multi-centennial shifts, where chlorophyll responded more rapidly to climate shifts than sedimentary n-alkanes. Initial findings suggest a link between regional records of temperature and precipitation variability and the studied organic markers. This study demonstrates the potential of the organic fraction of sediments in Grand Lake as a robust archive for extending environmental monitoring and understanding the basin's response to multidecadal climate change.

Submission type

Poster

130 - Sedimentary evidence of post-industrial changes in bottom-water conditions in the Estuary and Gulf of St. Lawrence

Tiffany Audet[1], Matthias Moros[2], Sophie Sépulcre[3], Marit-Solveig Seidenkrantz[4], Anne de Vernal[1]

[1]UQAM - Geotop, [2]IOW, [3]Université Paris-Saclay, [4]Aarhus University

Over the industrial period, hydrographic conditions in the Laurentian Channel (LC) have undergone significant changes, with instrumental observations over the last century documenting warming of deep waters and reduced ventilation in the Estuary and Gulf of St. Lawrence. This study presents a regional synthesis of 13 short sediment cores collected along the LC, from the Lower St. Lawrence Estuary to Cabot Strait. High-resolution chronology based on ^{210}Pb, ^{137}Cs, and mercury stratigraphy provides decadal-scale resolution for the last ~200 years. Benthic foraminiferal assemblages and grain size are analyzed to document spatio-temporal variations in benthic community structure. Mg/Ca analyses on foraminiferal tests are conducted to provide quantitative temperature reconstructions. Preliminary results indicate an increase in relative abundance of taxa associated with reduced sediment oxygen penetration and elevated organic matter supply, as well as by a decrease in sand content, suggesting changes in sediment dynamics and bottom-current strength. Assemblage changes are consistent with the decline in regional sea-ice cover and a progressive increase in the influence of warmer

Atlantic-derived waters within the channel system, which likely contributed to the recent deoxygenation of bottom waters. These data support a regional assessment of recent benthic ecosystem changes across the EGSL.

Submission type

Poster

184 - Sea-level modulated teleconnections between paleo northern hemisphere ice sheets

B. Parazin[1], Natalya Gomez[1], Catherine Britt[2], Rob DeConto[2], David Pollard[2, 3]

[1]McGill University, [2]University of Massachusetts Amherst, [3]Penn State University

During periods of deglaciation, relative sea level (RSL) change at the grounding line of marine ice sheets can be significantly influenced by far-field ice sheet evolution; this RSL change will affect grounding line flux and thus ice sheet mass balance through promoting or suppressing grounding line migration. Previous studies (Gomez et al 2020, Albrecht et al 2024), have identified this relationship as a necessary condition for Holocene Antarctic deglaciation, but sea-level teleconnections between northern hemisphere ice sheets remains an open question.

We present the results of a series of coupled ice sheet-sea level simulations of the last two deglacial periods in the northern hemisphere that demonstrate the importance of this teleconnection. We compare simulations where one of the northern hemisphere ice sheets is held constant to simulations that capture the full northern hemisphere ice sheet-sea level response and quantify the relative importance of these sea level teleconnections to the North American and Eurasian ice complexes. This work has implications for interpretation of quaternary RSL records, understanding the drivers of past deglaciations and constraining ice-sheet retreat in a warming world.

Submission type

Poster

186 - Decoding the history of the Eurasian Ice Sheet through an integration of numerical modelling with paleo sea-level records

Anna de Bode[1], Natalya Gomez[1], Kristian Vasskog[2, 3], Konstanze Haubner[3, 4], Kristin Richter[3, 5]

[1]Department of Earth and Planetary Sciences, McGill University, [2]Department of Geography, University of Bergen, [3]Bjerknes Centre for Climate Research, [4]Department of Earth Science, University of Bergen, [5]Climate & Environment Division, NORCE

Understanding the response of sea level to ice-sheet loss is essential in a warming world. This study offers valuable insights into past deglaciation events by examining the response of relative sea level and the solid Earth to ice mass loss. The aim is to improve constraints on the history of the Eurasian Ice Sheet (EIS) during the Last Deglaciation through an integration of numerical sea-level model simulations with near-field paleo relative sea-level (RSL) records. These records are extremely sensitive to changes in ice mass, making them a powerful tool for refining models. We construct three sea-level index points for the near-field site Bokn, located

along the Norwegian coast, utilising the isolation basin approach. Subsequently, we generate ensembles of EIS histories and Earth rheologies, and integrate these with a larger set of RSL data from the Norwegian coastline.

Preliminary model results demonstrate strong dependencies on local ice thickness histories and solid Earth rheologies for simulating RSL in the near-field, with Earth rheology parameters emerging as a dominant control. The outcomes of this study will help quantify and reduce uncertainties related to past deglaciation events, ultimately improving future sea-level projections and informing adaptation strategies under continued global warming.

Submission type

Poster

206 - Updated bomb-14C chronology for the northwest Atlantic reveals reversal in the air-sea 14C flux since 2013

Lauren Kew[1, 2], Wilder Greenman[1], Aislinn Fox[3], Liam Jasperese[3], Brett Walker[3], Owen Sherwood[1]

[1]Dalhousie University, [2]University of Alberta, [3]University of Ottawa

Nuclear bomb testing in the early 1950s- 1960s added artificial radiocarbon ("bomb-14C") to the surface ocean, which is useful for tracking ocean circulation changes. However, few bomb-14C chronologies extend into the 21st century, so proxy records of seawater 14C are needed to better constrain changing water mass influence off eastern Canada, one of the fastest warming regions globally. Gorgonian corals can be used as proxies for seawater 14C since they are long-lived, have annual growth rings. The secretion of a two-part skeleton of gorgonin and calcite encodes the 14C signature of both the marine mixed and intermediate layers. Here, we combine time-resolved 14C data from coral specimens collected at the Stone Fence and Northeast Channel to create an updated bomb-14C chronology for the northwest Atlantic that spans 1924- 2022. The record tracks the known pulse and subsequent decrease in mixed layer bomb-14C activities as well as the attenuated and diluted intermediate layer signal. Our results reveal a reversal in the oceanic 14C gradient since the year 2013, suggesting that the air-sea flux is now returning bomb-derived 14C to the atmosphere. This new record is valuable for marine age calibration and offers insight into recent changes in air-sea carbon exchange.

Submission type

Poster

6. Cold-climate eolian systems in the Quaternary

13:30-15:30
Room 232, Leacock Building

Session Conveners: Wolfe, S.A. (Natural Resources Canada); King, J. (Université de Montréal); Rizza, M. (Geotop and Université du Québec à Montréal)

37 - The dynamics of cryodesiccation on wind erosion

James King[1], Yasin Kazemi[1]

[1]Université de Montréal

Cold climate processes such as freezing/thawing cycles and freeze-drying influence the risk of wind erosion of natural soils to varying degrees. With an outlook to developing potential dust emission mitigation measures and dust production simulations, it is pertinent to explore the effects of cryodesiccation cycles on dust emission rates for soil surfaces with different water contents and different granulometry. Therefore, we have created a dust production model with an additional treatment for cryodesiccated soils and validated it against in situ measurements at a mine site in Québec, Canada. Through a combination of monthly passive trap measurements made over ten years, the spatial and temporal distribution of wind-borne particle emissions as a function of environmental variables were established. Results show that mining sites exhibit significant variations in surface properties at small spatial scales that are not well accounted in this approach, even though surface properties (and their variations) are important factors in wind erosion potential. However, specific winter dust storm case studies are shown to be characterized well by the modeling approach, indicating that a simple parameterization of cryodesiccation processes can be included in dust production models and should be considered for larger scale simulations.

Submission type

Oral

77 - Stabilized parabolic dune morphologies record changing late Pleistocene-early Holocene paleowinds, northeastern North America

Stephen Wolfe[1], Brian Carl[2], Etienne Brouard[1], David Franzi[3], Maria Schaarschmidt[4], Olav Lian[4], Tammy Rittenour[5, 6], Tommy Tremblay[1], Riley Mulligan[7], George Gao[7], Andrea Marich[7], James King[8], Ryan Parker[1]

[1]Natural Resources Canada, Geological Survey of Canada, [2]Department of Earth and Environmental Science, SUNY Potsdam, [3]Center for Earth and Environmental Science, SUNY Plattsburgh, [4]Department of Geosciences, University of the Fraser Valley, [5]Department of Geology, Utah State University, [6]Department of Geosciences, Utah State University, [7]Ontario Geological Survey, [8]Département de géographie, Université de Montréal

An emerging database of stabilized parabolic dunes across northeastern North America (NENA) provides evidence of extensive dune formation following deglaciation and the drainage of proglacial lakes and marine waters. These landforms record a diverse range of sediment-transporting wind regimes, expressed by the variety of dune morphologies observed today. Under predominantly unidirectional winds, parabolic dunes, transverse parabolic dunes, and merged dunes developed. In contrast, bidirectional wind regimes produced modified and compound parabolic dunes, reflecting shifts in wind direction over time. Mapping transport directions against the timing of deglaciation and water level changes reveals a complex spatial and temporal evolution in paleowinds across the region. In southern NENA, dune orientations indicate dominant westerly winds between

13 and 11 ka, aligning with late glacial atmospheric circulation near the retreating southern Laurentide Ice Sheet (LIS) margin. Within the Champlain Sea basin, dunes formed under LIS-derived easterlies from 13 to 8 ka, punctuated by opposing winds and later westerlies. On the Canadian Shield, many dunes reflect LIS-influenced bidirectional katabatic winds, except in the former glacial Lake Ojibway basin, where only westerlies are recorded. The collapse of the LIS around 8.2 ka marks a major Holocene transition, as anticyclonic LIS-driven winds gave way to modern westerlies.

Submission type

Oral

191 - High latitude eolian systems and the problem of the Younger Dryas in eastern Beringia

Duane Froese[1], Alistair Monteath[2], Alberto Reyes[1]

[1]Department of Earth and Atmospheric Sciences, University of Alberta, [2]British Antarctic Survey, Natural Environment Research Council, Cambridge, UK

INVITED SPEAKER - Eolian deposits in unglaciated Yukon and Alaska (eastern Beringia) indicate that the Younger Dryas (YD) lacked a uniform climatic signature. Proxy records show pronounced Bolling-Allerod warming by 13.5 ka, with transition to peat accumulation, and only muted response during the YD. The strongest evidence comes from stratigraphic records along the middle Yukon River, and reveal a temporally structured interval rather than simply a monolithic cold-dry event. The early YD (ca. 12.9-12.3 ka) is marked by a prominent, laterally continuous paleosol characterized by organic enrichment and spruce (*Picea*) macrofossils and pollen. This suggests a period of high effective moisture and boreal stability that persisted well into the YD chronozone. Intensified eolian activity and sandsheet aggradation only occurred during the later YD (ca. 12.4-11.7 ka). This succession suggests that the cooling was a short-lived feature of the Younger Dryas in central Alaska. The timing argues against a dominant North Atlantic forcing of YD cooling in eastern Beringia, instead pointing toward potential North Pacific-driven atmospheric teleconnections. These findings highlight the "problem" of the YD in high latitudes, where local high-resolution geomorphic and soil records reveal a complex, evolving response to deglacial climate instability rather than a simple, synchronous cooling event.

Submission type

Oral

144 - Portable luminescence characterisation of aeolian sediments in the Northern Great Plains, western Canada

Sam Woor[1, 2], Mitch K. D'Arcy[1], Steven Wolfe[3], Olav B. Lian[2]

[1]University of British Columbia, [2]University of the Fraser Valley, [3]Natural Resources Canada

Aeolian sediments are valuable archives of past climatic and environmental change when underpinned by geochronology. Portable optically-stimulated luminescence (pOSL) readers offer a new opportunity for affordable, rapid age control that is well-suited to aeolian deposits. In low-latitude dunefields, pOSL signals are

closely correlated with known depositional ages, providing calibration models that can expedite dating campaigns across large spatial scales. Less attention has been paid to how pOSL methods translate to post-glacial dunefields. Here, we test whether the pOSL signals of dune sands across the grassland, parkland, and boreal regions of the Northern Great Plains in Canada correlate with their known depositional ages. We also test the roles of luminescence sensitivity and sample composition in controlling pOSL signals. Results reveal useful pOSL-derived, age-calibration curves for samples in the Prairie grasslands, which have consistent luminescence and sedimentological properties. By contrast, luminescence sensitivity and sample composition are stronger controls on pOSL signals for dunes across the parkland and boreal regions, precluding a regional age-calibration curve. Our findings show that rapid dating using pOSL readers is possible in post-glacial dunefields, but is reliant on the inter-sample comparability of several key characteristics. Our dataset makes progress in constraining these variables.

Submission type

Oral

15. Terrestrial Environmental Reconstructions during the Common Era

15:30-16:45
Room 232, Leacock Building

Session Conveners: St-Jacques, J.-M. (Geotop and Concordia University), Boucher, E. (Geotop and Université du Québec à Montréal)

45 - A millennium of paleo-floods in the southern Ottawa River Valley

Jeannine-Marie St-Jacques[1], Thomas Cheung[1], Pierre Francus[2], Arnaud De Coninck[2], Antonin Prijac[3], Yves Gelinas[1], Xianming Zhang[1], Matthew Peros[4]

[1]Concordia University, [2]INRS, [3]UQAM, [4]Bishop's University

Severe flooding occurred in 1974, 1976, 2017 and 2019 in the Ottawa River Basin (ORB), resulting governmental costs alone of ~$1 billion. Regional flood management in the densely populated ORB could be improved by long-term flood records of the Ottawa River. Unfortunately, the regional flood instrumental records are sparse and very short. During floods that connect a river with its oxbow lake, the lake traps sediment from the floodwater suspended load. The composition of floodwater sediments differs from locally-sourced sediment deposited during non-flood conditions. Hence, by taking sediment cores from oxbow lakes, dating them, and analyzing them for past sediment changes, we can infer past floods. Our sites consist of oxbows of the mainstem Ottawa River, and the Noire, East Coulonge and Rouge Rivers. We use X-ray fluorescence (xrf), LOI, CAT scans, and carbon/nitrogen ratios of oxbow lake sediment cores to infer flood records for the past millennium. There was a quasi-century-length cycle in the mainstem Ottawa River floods over the last 800 years. We also found this quasi-centennial flood cycle in the upper Rouge River. The effects of

the clear-cutting in the ORB throughout the 1800s were enormous in the southern portion of the basin, triggering massive erosion.

Submission type

Oral

65 - Disentangling human and climatic drivers of fire activity in Témiscamingue pine forests during European settlement

Julie-Pascale Labrecque-Foy[1, 2], Marc-André Lemay[1, 2], Étienne Boucher[3], Dominique Arseneault[2, 4], Annie DesRochers[1, 2], Fabio Gennaretti[1, 2, 5], Miguel Montoro Girona[1, 2, 6]

[1]Groupe de recherche en écologie de la MRC Abitibi, Forest Research Institute, Université du Québec en Abitibi-Témiscamingue, [2]Center for Forest Research, Université du Québec à Montréal, Montréal, [3]Department of Geography, GEOTOP and Centre d'études nordiques, Université du Québec à Montréal, [4]Université du Québec à Rimouski, [5]Department of Agricultural, Food and Environmental Sciences, Università Politécnica delle Marche, [6]Grupo de Análisis y Planificación del Medio Natural, Universidad de Huelva, Huelva, Spain

Changes in fire regimes have contributed to the decline of red and white pine forests in Témiscamingue during the 19th and 20th centuries. However, the main drivers of these changes remain unclear. The mid-19th century was marked both by increased human activity linked to European settlement and by climatic shifts following the end of the Little Ice Age. Disentangling the respective effects of anthropogenic activities and climate change on fire occurrence requires high-resolution annual reconstructions of past climate and fire activity.

In this study, we analyzed submerged red and white pine logs that sank to lake bottoms during log driving in the 19th century. By dating fire scars, we reconstructed the fire regime from 1717 to 1970. Using a multiproxy approach combining tree-ring width and stable isotopes (carbon and oxygen), we reconstructed the Standardized Precipitation Evapotranspiration Index (SPEI) from 1800 to 2020.

We used Bayesian modeling to assess the effect of drought on fire occurrence across three European settlement periods: before 1840, 1840-1915, and after 1915. Drought was associated with higher fire occurrence in the pre-settlement period (before 1840), but this relationship ceased afterward. These results suggest that anthropogenic influences on fire regime can sometimes outweigh climatic effects.

Submission type

Oral

85 - Widespread ecosystem shifts and carbon stock depletion during the Little Ice Age, in the NE Canada's boreal forest

Etienne Boucher[1, 2], Dominique Arseneault[3, 4], Vermette Jeanne[1, 2, 3], David Querry[3, 4], Mathilde Pfister[3, 4]

[1]GEOTOP, [2]UQAM, [3]CEN, [4]UQAR

The fate of ecosystem services provided by Eastern Canada's taiga-tundra transition is tightly linked to complex, yet poorly understood, interactions among climate variability, fire history, and forest structure. This study investigates how present-day forest attributes and services reflect such long-term ecological trajectories over the past millennia. We combined (i) a novel, two-millennia-long tree-ring-based reconstruction of growing degree days (GDD), (ii) a large-scale semi-random forest inventory of current forest attributes (structure, composition, and carbon stocks), and (iii) radiocarbon and dendrochronological estimates of the time elapsed since the last fire. Our results suggest that most forest stands that burned after ~1450 CE, during a period when GDD values fell below 800, regenerated to more open stands following fire. Forest that burned during the last 200 years systematically shifted to treeless tundra. This led to substantial depletion of both above- and belowground carbon stocks across the region. In contrast, stands that escaped fire over the past 500 years remain carbon-rich ecosystems and serve as refugia for pyrophobic species such as balsam fir. In the absence of the Little Ice Age, forests in this region would thus likely be much denser, carbon-rich, and diverse than they are today.

Submission type

Oral

203 - Changing Disturbance Dynamics and a Mega-Drought in an 800-Year Eastern White Cedar Chronology

Alexandre Pace[1], Jeannine Marie St Jacques[1], Dominique Arseneault[2]

[1]Concordia, [2]Université de Québec à Rimouski

Lakeside eastern white cedar groves were historically prevalent across northeastern North America, yet their long-term dynamics remain under-researched. We analyzed an 807-year chronology derived from subfossil lakebed trees and living inventory in a relict grove within the Appalachian foothills of eastern Québec. Our findings indicate a steady recovery following an early-millennium fire, which was sustained by small-scale canopy gaps from interactions of beaver activity, insect epidemics and drought. A major shift occurred in the mid-17th century, characterized by declining cedar dominance and an altered disturbance regime, a transition likely catalyzed by the onset of the regional beaver trade in the 1670s. Despite the absence of clear-cutting at the site, the stand shows heightened sensitivity to budworm outbreaks since the 1800s. Additionally, the chronology confirms that the late-16th-century continental megadrought extended into eastern Québec. This research provides critical insights into the resilience and historical hydroclimate of riparian old-growth systems over the last millennium.

Submission type

Oral

205 - Ichnology of Holocene soils: Tracing mammal ranges using fossil burrows

Dmitri Ponomarenko[1]

[1]University of Saskatchewan

Conservation paleobiology has emerged as an approach that extends beyond the limited scope of direct human observation in order to understand the variety of biological responses to environmental change. Burrowing mammals are an especially promising group for conservation paleobiology, because they are closely associated with certain habitats and frequently function as ecosystem engineers that create habitat for other species.

Quaternary distributions of burrowing mammals are usually reconstructed from bone remains found in archaeological and fossil sites. Most of these remains are not preserved *in situ*, either because of transport by humans or by natural processes. Fossil burrows, preserved as natural internal casts, are a little explored source of evidence for past mammal distributions. Once formed, filled burrows (which are called krotovinas in soil science) remain in the soil until obliterated by further bioturbation. Therefore, both the presence and the absence of burrows in soils can serve as an indicator of the absence or presence of a species. The taxonomic identification is based on the architecture of the filled burrow itself, rather than skeletal remains inside. The trace fossil record complements the zooarcheological record in reconstructing the ranges of burrowing mammals, thereby providing a historical baseline for biodiversity conservation and restoration.

Submission type

Oral

97 - Cryptotephra: ultra-distal volcanic ash deposits in the peat bogs of the St. Lawrence Valley

Élodie Roussel[1], Britta Jensen[2], Julie Talbot[1]

[1]Université de Montréal, [2]University of Alberta

Cryptotephra are microscopic volcanic ash particles (largely glass shards) carried for thousands of kilometers following volcanic eruptions. Cryptotephra are often well-preserved in ombrotrophic peat bogs due to the anoxic conditions. These bogs, characterized by the dominance of atmospheric inputs, are key paleoenvironmental archives frequently used to reconstruct regional environmental histories. However, a robust chronology of the peat is essential for reliable interpretation. Cryptotephra are particularly useful in providing precise dates crucial for paleoenvironmental studies. Each eruption produces tephra with a unique geochemical signature, which makes it possible to correlate cryptotephra to specific events of known age. Nevertheless, there are no cryptotephra records from ombrotropic peat bogs in Quebec or Ontario. This project fills this gap by identifying cryptotephra in three bogs along the St. Lawrence Valley, improving the chronology of peatland records and adding to the tephra framework for east-central North America. Preliminary results reveal multiple known cryptotephra (White River Ash east, Newberry Pumice and Mount St. Helens Yn), and a focus on the 20th century suggests younger eruptions such as the 1980 eruption of Mount St. Helens may also be present.

Submission type

Poster

20. General session

8:30-10:30
Room 219, Leacock Building

Session Conveners: Douglas, P. (Geotop and McGill University); de Vernal, A. (Geotop and Université du Québec à Montréal)

59 - Submarine glacial landforms and their link to glacier front processes in Croker Bay, Devon Island

Kerstin Brembach[1], Patrick Lajeunesse[1], Alexandre Normandeau[2], Jean-Carlos Montero-Serrano[3], Luke Copland[4]

[1]Département de géographie, Université Laval, [2]Geological Survey of Canada (Atlantic), [3]Institut des sciences de la mer (ISMER), Université du Québec à Rimouski, [4]Department of Environment and Geomatics, University of Ottawa

This study investigates the relationship between the frontal dynamics of two tidewater glaciers in Croker Bay, Devon Island, and the formation of submarine glacial landforms over recent decades. Optical satellite imagery (1973-2023) and high-resolution multibeam echosounder data were used to map seasonal glacier-front positions and submarine glacial landforms. Both glaciers retreated by up to 1.5 km, punctuated by seasonal to annual re-advances. Their dynamic behaviour produced various moraine types distinguished by their morphology. Analysis of digitised glacier fronts preceding individual moraines shows that overall glacier retreat was marked by repeated stillstands and re-advances onto existing landforms. Moraine formation thus reflects a combination of processes rather than single depositional events. During re-advances, sediment is bulldozed and reworked at the glacier margin, while meltwater continues to deliver further sediment, also during stillstands. These interacting processes generate distinct moraine morphologies. Furthermore, a meltwater plume was observed almost annually at a consistent position relative to the Croker North glacier front, indicating a stable subglacial conduit. This persistent sediment source contributes to rapid submarine glacial fan deposition. Overall, the results provide crucial insights into the formation of submarine glacial landforms and improve interpretation of these landform assemblages as records of past glacier behaviour.

Submission type

Oral

63 - Small mammals with big insights: a rodent's view of Pleistocene Beringia

Scott Cocker[1, 2], Tyler Murchie[3], Stephanie Dolenz[1], Jonas Oppenheimer[4], Sina Baleka[5], Danielle Grant[3], McIntyre Barrera[3], Libby Natola[3], Britta Jensen[2], Love Dalén[4], Hendrik Poinar[5], Duane Froese[2], Peter Heintzman[1]

[1]Department of Geological Sciences and Centre for Palaeogenetics, Stockholm University, [2]Department of Earth and Atmospheric Sciences, University of Alberta, [3]Hakai Institute, [4]Department of Zoology and Centre for Palaeogenetics, Stockholm University, [5]McMaster Ancient DNA Centre, Departments of Biochemistry and Anthropology, McMaster University

Rodents offer unique insights into the evolution of Pleistocene ecosystems in Beringia, as both ecosystem participants and preservers of environmental information. We integrated genomic data from rodent palaeofaeces, permafrost sediments, and skeletal remains to reconstruct Pleistocene ecosystems and evolutionary relationships through time. The excellent preservation conditions in permafrost enabled us to recover high-coverage mitochondrial genomes, including a 700,000-year-old ground squirrel (*Urocitellus* sp.). By using both shotgun and targeted sequencing we also recover diverse plant, invertebrate, and vertebrate taxa, many of which are absent from the fossil record. Our integrated palaeogenomic approach demonstrates the value of combining skeletal remains with ancient environmental DNA to reconstruct Pleistocene ecosystems, highlighting the rodent perspective as a powerful lens for understanding deep-time biodiversity, evolution, and ecological interactions.

Submission type

Oral

64 - Tills and glacitectonites - why process sedimentology matters

David Evans[1]

[1]Durham University

Till is the geologic-climatic unit representative of glaciation in geological record, but the specificity of the term "till" is often viewed differently by Quaternary geologists based upon the remit of their level of enquiry. On maps, it is common practise to classify a range of diamictic materials as till because they occur in association with subglacial landforms and moraines. Although practicable for classifying surface materials over large areas, this has less utility when assessing glacial process-form regimes. In stratigraphy, a similarly rudimentary level of specificity can be employed in interpretations of diamictons, with process sedimentology being under-utilized or even overlooked. This risks mis-classification and mis-interpretation of a complex family of deposits, even though we have created an enormously complex nomenclature for tills in attempts to find order in the perceived chaos. A simplified nomenclature is presented that is compatible with known subglacial processes. It considers tills and glacitectonites as hybrids created by a range of subglacial traction zone processes. Modern analogues are used to identify diagnostic criteria for diamictons and mélanges in both glacial and non-glacial settings and case studies are presented from a range of glacierized terrains to illustrate the implications of under-estimating process sedimentology when reconstructing palaeoglaciology.

Submission type

Oral

99 - Old glacial landscapes preserved far from ice sheet divides

Michelle Gauthier[1, 2], Tyler Hodder[3], Olav Lian[4], Maria Schaarschmidt[4]

[1]New Brunswick Geological Survey, [2]University of Waterloo, [3]Manitoba Geological Survey, [4]University of the Fraser Valley

Patches of older preserved landscapes continue to be identified in the regions formerly covered by the Laurentide Ice Sheet. These 'patches' are accepted to occur near ice sheet divides, due to the presence of cold ice or dewatered spots. Importantly, we document similar patches of older glacial and interglacial landscapes in an area ~1300 km from the Keewatin centre of the Laurentide Ice Sheet. In southern Manitoba, sediment deposited in MIS 3 Lake Vita are preserved just 0.6-2.0 m from the surface. To the north, till (~0-5 m thick) covers up to 30 m of gravel that is underlain by ~ 2 m of organic-rich silty sand. The gravels contain steppe bison, mammoth, musk ox and giant beaver fossils, as well as macrofossil evidence for a spruce-dominated forest. Six new radiocarbon ages on bones are >41.3 ka. Supporting this, we have two optical ages consistent with MIS 5 within 0.6-3.0 m of the surface as well - one from sand within the gravels and one from sand within a drumlin. Further north on the Precambrian shield, 2.5+ m of proglacial sediment under 0.8 m of till also has an MIS 3 optical age.

Submission type

Oral

112 - Plateau icefield glaciation of the Canadian Prairies: reconstruction and Younger Dryas palaeoclimatic significance

T.*, Neligan,[1], N., Atkinson,[2], D. J. A., Evans,[3], S. S. R., Jamieson,[3], N., Mesich,[2], E., Nissen,[4], S. L. Norris,[1]

[1]Department of Geography, University of Victoria, Victoria, B.C., Canada., [2]Alberta Geological Survey, Edmonton, Alberta, Canada., [3]Department of Geography, Durham University, Durham, U.K., [4]School of Earth and Ocean Sciences, University of Victoria, Victoria, B.C., Canada.

High-resolution lidar data have allowed closer examination of glacial landforms across five northern Alberta plateaus: the Caribou Mountains, Birch Mountains, Buffalo Head Hills, Clear Hills, and Swan Hills. Using these data, we update pre-existing maps by adding ~30,000 newly identified glacial landforms. The mapping reveals previously unrecognized radial ice flow patterns emanating from upland centres which overprint deglacial landforms associated with Laurentide Ice Sheet retreat. This landform signature indicates that localized ice caps persisted on plateaus after regional deglaciation. In other parts of the world, the survival of plateau ice caps beyond the retreating margins of continental ice sheets has been documented during the abrupt cooling of the Younger Drays (YD; 12.9-11.7 ka). However, to date, their potential existence in interior North America has not been explored despite suitable topographic and climatic conditions. We test the hypothesis that plateau icefields existed on northern Alberta uplands during the YD by comparing geomorphic reconstructions

with simulations from time-dependant 2D ice-flow modelling forced using YD temperature anomalies (derived from GRIP ice core data) and modern topography. Preliminary results indicate that cooling of the magnitude recorded during the YD was sufficient to expand plateau ice caps consistent with mapped limits.

Submission type

Oral

133 - Proto-Eurasian Ice Sheets from ~2.4 million years ago

Kaleb Wagner[1, 2], Lotta Ylä-Mella[1, 2], Martin Margold[2], Ruben Bertels[2], Mads Faurschou Knudsen[3], John D. Jansen[1]

[1]GFÚ Institute of Geophysics, Czech Academy of Sciences, Prague, Czechia, [2]Department of Physical Geography and Geoecology, Charles University, Prague Czechia, [3]Department of Geoscience, Aarhus University, Aarhus, Denmark

Northern Hemisphere ice sheet reconstructions are key to resolving Quaternary sea level and climate. Yet, terrestrial records of the earliest glaciations are fragmentary and difficult to reconcile with continuous offshore archives. Here we present cosmogenic ^{26}Al-^{10}Be burial chronologies and detrital zircon U-Pb provenance constraints from glacial successions across northwest and central Europe that challenge prevailing models for the timing and extent of the first Eurasian Ice Sheets (EIS). Our results indicate that extensive EIS configurations were established by ~2.41 Ma and recurred throughout the Early and Middle Pleistocene, well before the canonical onset of lowland glaciation during Marine Isotope Stages (MIS) 12-16 (~425-675 ka). Ice flow through the Baltic corridor was active by ~1.8 Ma, sustaining large ice sheets that advanced across the North European Plain and eroded the headwaters of the Baltic River System, leading to its collapse by ~1.6 Ma. Enhanced freshwater delivery to the North Atlantic during these intervals may have influenced overturning circulation and promoted climate variability on orbital and millennial timescales. Our revised chronology places the first trans-Baltic EIS within uncertainty of the Laurentide Ice Sheet maximum, suggesting a potential threshold response to Early Pleistocene temperature and CO_2 forcing.

Submission type

Oral

181 - Increasing human influence in geological time: Anthroposphere, Holocene, and Anthropocene

M.J. Head[1], J.A. Zalasiewicz[2], C.N. Waters[2], M. Williams[2], S. Turner[3], A. Cearetta[4], R. Leinfelder[5], McCarthy F.M.G.[1], N.L. Rose[3], M. Wagreich[6]

[1]Brock University, [2]University of Leicester, U.K., [3]University College London, U.K., [4]Universidad del País Vasco UPV/EHU, Spain, [5]Freie Universität Berlin, Germany, [6]University of Vienna, Austria

The term *holocènes*, meaning “entirely recent”, was introduced by zoologist/ paleontologist Paul Gervais in 1850 for deposits representing historical time and prospectively also the Pleistocene, effectively replacing Charles Lyell’s “Recent”. It was officially defined in 2008 as an epoch/series to represent the past 11,700 years, characterized by relatively stable interglacial conditions that allowed settled hierarchical societies to emerge and become dominant. The Anthropocene was introduced by Paul Crutzen in 2000 as a new epoch, reflecting the transformative and still-growing impacts of industrialized human societies on the Earth System. Its inception aligns with that of the mid-20th century Great Acceleration, when human impacts on the Earth System rapidly became overwhelming. However, the Anthropocene has since been applied to other human-related concepts across various timescales, creating inevitable confusion. The anthroposphere, introduced in 1902 by D.N. Anuchin for “the stages and forms of culture of [Earth’s] most perfected organic product: humankind”, has since come to mean the sum total of all human lives, actions and products having capacity to affect the Earth System state. Hence, we propose using the term anthroposphere broadly to embrace all concepts that denote significant anthropogenic impact, including the Anthropocene epoch, but freeing that term for its original purpose.

Submission type

Oral

48 - Humans in the Americas during and before Last Glacial Maximum: personal and paradigmatic transitions from a decade of successful research in Mexico to a complicated panorama in Ontario

Ciprian F. Ardelean[1, 2]

[1]Archaeological Services Inc., Toronto, [2]Trent University, ON

In 2010-2020 I conducted extensive research on hunter-gatherers in the northern mountains of the Mexican state of Zacatecas, right on the Tropic of Cancer, at over 1700 meters of altitude, while a university professor there. Currently a desert, the region had vast shallow lakes within endhorreic basins and narrow mountain ranges covered in lush forests during the Pleistocene, then gradually reduced to desert throughout the Early and Middle Holocene. Years of surveys and excavations focused the search on two cave sites that eventually yielded hard evidence of human presence in deposits strongly dated to between the Younger Dryas and the onset of the LGM: Chiquihuite Cave and Sima de las Golondrinas. Chiquihuite revealed a complex lithic industry manufactured from locally-available hardened limestones behaving like cherts. Golondrinas, formerly a flooded chasm, yielded no lithics but multiple modified bones. After 25 years in Mexico, I moved to Toronto in 2023, at a major CRM firm, in the hope of resuming my investigations on human presence older than 18k BP in Canada. However, the institutional and regulatory environments in Ontario archaeology make it hard or almost impossible, even though the potential is there, but largely ignored. This presentation analyses that transition and prospects.

Submission type

Oral

47 - Sedimentology and stratigraphy associated with the Late Devensian Welsh Ice Cap and Irish Sea Ice Stream: Glanllynnau, Llŷn Peninsula, Northwest Wales.

Molly Gath[1], David John Alexander Evans[1], Emrys Phillips[2]

[1]Durham University, [2]British Geological Survey

A combined sedimentological and stratigraphic approach has been employed to revise the succession at Glanllynnau, Llŷn Peninsula, Northwest Wales. New data provide insights concerning ice-flow dynamics close to the suture zone of the terrestrial Welsh Ice Cap and marine-based Irish Sea Ice Stream. The multiple till sequence, separated by glacifluvial sands and gravels, records the advance, subsequent unzipping, retreat, and readvance of Welsh ice during the Late Devensian. A subglacial traction till, containing evidence of locally plucked bedrock, was deposited by east-west ice flow over the site as part of the Cricceith Advance. Lithofacies thicken to the west where the surface is drumlinised, and the upper zone was stained brown due to percolation via close contact with finer-grained deposits above. Initial phases of retreat are conducive to asymmetric ice-marginal conditions, with development of the Rhoslan Sandur that drained southwest from Irish Sea ice towards Glanllynnau. A sandy subglacial till that caps the sequence is attributed to deposition by Welsh ice readvancing onshore. Here, the trajectory of the Arfon Readvance is more SE-NW than previously reconstructed. Glacitectonic deformation, such as polygonal burst-out structures, folds and thrusts identified throughout the succession, provides further evidence for more than one phase of ice-flow.

Submission type

Poster

78 - Multi scale mapping of surficial sediments and assessment of permafrost conditions to support baseline studies for a dam on a glaciolacustrine moraine within the continuous permafrost zone

Tommy Tremblay[1], Kaya Sokukawa[2], Michel Allard[3], L'Hérault Emmanuel[3], Frappell Anders[2], Greg Oldenborger[1], Julie Kostecki[2], Wade Lowell[2], Alexandre Jego[2]

[1]Natural Resources Canada, [2]Tetra Tech Canada, [3]Centre d'études nordiques

Infrastructure planning in cold regions must be supported by comprehensive geotechnical studies relying on accurate geological mapping, stratigraphic information, and reliable subsurface data. A hydroelectric project is planned at the confluence of the McKeand River and the Frobisher Bay Moraine, requiring baseline information about the nature and extent of surficial sediments, the depth to bedrock, the permafrost conditions, and the occurrence of buried glacial ice. In this study, maps and geological cross-sections delineating the main surficial geology features were produced using surface observations, riverbank sections, remote sensing, electrical resistivity surveys, and shallow permafrost drilling. Accurate remote sensing data helped refine the previous surficial sediment maps at a relevant scale for the project. Results suggest that during the last deglaciation, around 8.8-8.0 ka, a standstill of the ice margin resulted in the deposition of moraine ridges composed of distinct sediment types when deposited in a proglacial lake or on land. The retreating glacier dammed the McKeand River (Kuugaluk) watershed, forming a long proglacial lake (McKeand proglacial lake). Multi-scale mapping of surficial sediments conducted in this study, together with assessment of permafrost conditions, provides critical baseline information that will contribute to the safe planning and design of the proposed dam.

Submission type

Poster

84 - Glacial landsystems of former mountain icefield outlet glaciers, South Island, New Zealand

David Evans[1], Jenna Sutherland[2], Jonathan Carrivick[3]

[1]Durham University, [2]Leeds Beckett University, [3]University of Leeds

Glacial landform assemblages enable identification of distinct glacial landsystems that are diagnostic of palaeo-glaciological conditions, facilitating the mapping of spatial and temporal variability of sediment-landform associations. High-resolution topography generated from airborne LiDAR reveals a spectacular landform record that has hitherto remained undetected beneath dense forest canopies and throughout mountainous terrain across South Island. Detailed geomorphological mapping from 1 m DEMs characterises the nature and behaviour of former outlet glaciers of the Southern Alps ice sheet. We here showcase the exceptionally well-preserved evidence of extensive and repeated glaciations on the NZ west coast throughout the Quaternary, documenting a variety of ice-marginal, subglacial, supraglacial and glaciofluvial landform assemblages. Spectacular latero-frontal moraine loops and associated breach lobe moraines have been developed in this area as glacier lobes have partially overridden ice-contact fans and ramps. Active recession from major latero-frontal moraines is documented by complex sequences of partially overridden minor recessional push moraines. Exposures through this landform assemblage provide a stratigraphic signature of the progradation and superimposition of ice-contact fans/ramps and supraglacial debris loads, including recognisable Waiho Loop type moraine construction associated with slugs of rock slope failure material transported from the Southern Alps mountain front over time.

Submission type

Poster

92 - Communicating palaeoenvironmental data through digital art

Benjamin Gwinneth[1]

[1]Université de Montréal

The ancient Maya civilisation of Mesoamerica responded to various socio-political and environmental challenges throughout their history. Yet, the environmental history of these societies, including response to drought, is poorly constrained, with gaps in understanding how landscapes were transformed over millennia by both natural forces and human activities. By combining organic geochemical and archaeological data from an interdisciplinary palaeoenvironmental study of the lowland Maya site of Itzan, located present-day Guatemala, "Itzan" communicates the insights of a multi-proxy study through visualising in video format the changing environmental conditions that shaped the site over the last 6,000 years. Central to the Itzan project is its emphasis on communicating palaeoenvironmental science to a broad audience, including scholars, students, and the general public. By presenting complex environmental data in accessible, interactive visual formats, the project aims to foster a deeper understanding of the long-term relationships between the lowland Maya and their

environment. It has been shown at over 20 festivals and galleries internationally, including the Festival del Cinema di Cefalù and Sardinia Film Festival (Italy), the 28th International Symposium on Electronic Art (France), the Athens Digital Art Festival and Balkan Can Kino (Greece), and the Global Science Film Festival (Switzerland).

Submission type

Poster

94 - The morphosedimentary evolution of the Évettes Glacier landsystem (Western Alps, France) since the Little Ice Age

Myriam Thériault[1], Patrick Lajeunesse[1], Jean-François Bernier[1], Pierre-Olivier Couette[1, 2], Sydney W. Meury[1], Jean-François Ghienne[2]

[1]Département de Géographie, Université Laval, Québec, Canada, [2]Institut Terre et Environnement de Strasbourg, UMR7063, CNRS-Université de Strasbourg, Strasbourg, France

The Little Ice Age (LIA) was a period of climatic cooling between 13th-19th centuries and favored the expansion of glaciers. Its end resulted in a non-linear glacial retreat trend characterized by phases of re-advance or stillstand, leaving various morphosedimentary records in alpine environments. However, developments in UAV and LiDAR technology have enabled the acquisition of high-resolution topographic data and imagery in these environments, facilitating the identification and mapping of overlooked sediment-landform assemblages. The unprecedented level of detail provided by these techniques improves reconstruction of past glaciological and geomorphological processes influenced by climatic and topographic forcings.

This study focuses on the dynamics of the Évettes Glacier (Haute-Maurienne, French Alps) since the LIA. The approach adopted combines geomorphological mapping and geohistorical analysis, including high-resolution geospatial, geochronological, and iconographic datasets. Results reveal distinct morainic systems and succession of landforms and deposits displaying a landsystem with characteristics of rapid ice flow, mimicking a surge-type glacier. Identified features include moraines, boulders, bedrock lineations, flutes, kames, and outwash deposits reflecting a dynamic depositional environment. The complex morphosedimentary assemblages deposited since the LIA provide insights into glacier-climate interactions and topographic controls on past glacial dynamics, while informing projections of alpine landscape responses to future climate change.

Submission type

Poster

98 - New machines, new methods, new maps, new models: Updating the Ontario Geological Survey's practices and product delivery in a digital age

Riley Mulligan[1], Abigail Burt[1], George Gao[1], Grant Hagedorn[1], Andrea Marich[1], Kei Yeung[1]

[1]Ontario Geological Survey

The shift to fully-digital has created both challenges and opportunities.

Seamless 16-20 cm digital air photo compilations and 0.5-m lidar terrain models:
- Make landform identification easier and faster;
- Facilitate new landform discovery;
- Allow for pre-field identification of high-quality sections, with enhanced regional context;
- Enhance delineation of sediment-landform assemblages;
- Result in features too numerous to include on a traditional PDF map;
- Highlight inaccuracies of older published maps

Three-dimensional models need to be digestible and functional:
- New interactive cross-section viewers allow manual delineation of annotated vertical cross-sections through published model domains;
- New raster math highlights regional trends in aquifer-aquitard relationships that weren't readily apparent in discrete raster layers for model layers

Product delivery:
- Seamless geological maps for southern Ontario are becoming outdated, with no simple way to issue updates;
- GeologyOntario and ArcGIS Online provide a new platform to store large mapping products and deliver spatial geoscience data to the public;
- Digital compilations of surficial data (maps, till geochemistry and indicator mineral data, paleo-ice flow indicators, relict shorelines and landslides) are in review and inventories of other glacial landforms are underway

Submission type

Oral

100 - Introducing the detailed Surficial Data Model (dSDM) for Quaternary Geology mapping

Michelle Gauthier[1, 2], Austin Martin[3], Tyler Hodder[3], Steinke Jessi[4], Serge Allard[1]

[1]New Brunswick Geological Survey, [2]University of Waterloo, [3]Manitoba Geological Survey, [4]Saskatchewan Geological Survey

At its core, surficial-geology mapping involves classifying the landscape based on genesis (origin), landforms (morphology), sediment properties and stratigraphy. As part of the Pan-Canadian Geoscience Strategy, several surveys are adopting a new standardized detailed surficial geology data model (dSDM). The Geological Survey of Canada has been developing standardization for the last 12 years, primarily a genetic model allowing users to quickly identify the origin of sediment at the surface. The dSDM expands on this model, incorporating data for client-oriented (derivative) maps in a single database. Specifically, derivative maps require clear definitions and additional information on stratigraphy, grain size, and process modifiers.

Increasingly, digital 2D and 3D maps are required for quantitative modelling, maintenance, exploration and sustainability of resources. The dSDM enables surficial maps at a range of scales, acknowledging that digital products allow for inclusion of more information that can be displayed on static maps. The goal is to create a standardized geodatabase schema that enables comprehensive attribution, efficient querying, and routine

updates. Rather than infilling, data gaps are intentionally maintained to highlight areas where additional mapping is required. The first major step is adoption of a cross-border, standardized surficial geology classification method with clear and complete definitions.

Submission type

Poster

101 - Reconstructing Late Pleistocene glacial dynamics in the south-central region of the Laurentide Ice Sheet

Tyler Hodder[1], Olav Lian[2], Maria Schaarschmidt[2], Michelle Gauthier[3]

[1]Manitoba Geological Survey, [2]University of the Fraser Valley, [3]New Brunswick Geological Survey

Southeastern Manitoba contains an extensive record of past glacial and nonglacial events that provides important insight into Late Pleistocene glacial dynamics of the Laurentide Ice Sheet (LIS). Recent studies have confirmed that the LIS retreated from the region during the Marine Isotope Stage (MIS) 3 interstadial and that a proglacial lake (Lake Vita) formed, but the behaviour of the LIS surrounding this interstadial is less certain. Here, we focus on an area east of Lake Winnipeg, on the Canadian Shield, and reconstruct the paleo-ice-flow history using the erosional record. This paleo-ice-flow record is then compared with the depositional record at rare road-cut exposures of Quaternary sediments. The stratigraphic record contains sub-till sorted sediments that are interpreted have been deposited in lacustrine to glaciolacustrine environment(s), possibly linked to the MIS 3 Lake Vita. Within the erosional record, six distinct ice-flow phases are recognized. Three of the ice-flow phases are interpreted to have occurred after the recognized ice-free period in the stratigraphic record, while three ice-flow phases preceded the ice-free period. This ice-flow reconstruction and stratigraphic record provide important constraints for the LIS along the south-central portion of this ice sheet during the Late Pleistocene.

Submission type

Poster

107 - A first step toward a fully coupled ice sheet-sediment-sea level modeling framework

Kai Hu[1], Natalya Gomez[1], Vivi Pedersen[2], Robert DeConto[3]

[1]McGill University, [2]Aarhus University, [3]University of Massachusetts Amherst

Recent advances in coupled ice sheet-GIA modeling have highlighted the importance of accounting for interactions between solid Earth deformation and changes in the sea surface equipotential, as described by gravitationally self-consistent sea-level theory, when evaluating marine ice sheet stability. When ice sheets flow across continent, they not only load and deform the solid Earth, but also erode the bedrock through subglacial erosion and redistribute the sediment toward marginal basins. Glacial erosion and sediment redistribution reshape the subglacial bed topography and alter surface loading, thereby influencing the evolution of coupled ice dynamics, solid Earth deformation, and sea level.

Here, we present progress toward coupling the PSU ice sheet model with a GIA model that accounts for sediment loading. We simulated the evolution of the Antarctic Ice Sheet, bedrock topography, and sediment distribution from approximately 1 Ma to the present. Preliminary results indicate that glacial erosion and sediment deposition substantially modify bed and continental shelf topography over million-year timescales. The total sea level change caused by sediment redistribution can reach > 1000 m, underscoring the importance of accounting for these processes in GIA modeling when interpreting long-term sea-level and ice sheet history and using past warm periods as analogues for the future.

Submission type

Poster

122 - Wind, loess, and migration: the contribution of aeolian dynamism to human occupation strategies during the Late Pleistocene in Europe

Manon Beauvillier[1], James King[2], Francesco Pausata[3]

[1]Phd candidate, University of Montréal, [2]Professor, University of Montréal, [3]Professor, University of Québec in Montréal

Human populations' adaptation to the Late Pleistocene (MIS 3-2) is visible through migrations and settlement strategies. This period was characterized by major climatic fluctuations, including cold and "warm" oscillations, a drastic sea-level fall, and an expansion of northern ice sheets. These glacial conditions favoured high winds, driving long-term sediment transport and deposition across Europe, forming the Northern European Loess Belt (NELB), a major aeolian sedimentary archive. Despite considerable research, uncertainties remain regarding the transport pathways and the provenance of the sediment. Atmospheric circulation patterns provide insight into the emission, transport and deposition processes shaping the NELB and help to identify the natural habitats of hunter-gatherers.

This interdisciplinary research uses climatic simulations to reconstruct past environments and refine our understanding of wind erosion in northern Europe during the MIS 3-2. Wind fields simulated with the Model for Prediction Across Scales (MPAS), coupled with the Lagrangian model Flexpart, are used to analyse emission, transport, and deposition processes. Multi-proxy sedimentary data will be compared with these simulations. The results will be integrated into a Habitat Suitability Model to better interpret archaeological settlement in western Europe. This approach offers new perspectives on paleoenvironmental reconstruction and on human adaptive strategies and ecological resilience under climatic instability.

Submission type

Poster

125 - Postglacial history of the northernmost population of pitch pine (Pinus rigida) in North America

Isabelle Galipeau[1], Martin Lavoie[2], Julie Talbot[1]

[1]Université de Montréal, [2]Université Laval

Pitch pine (*Pinus rigida* Mill.) has a wide distribution area in the eastern United States, ranging from Georgia to Maine. The northernmost population of pitch pine is found in southwestern Quebec, where it is an endangered tree species. It is a small population far removed from the continuous range. Little is known about the postglacial history of pitch pine in Quebec. One reason for this lack of information is the difficulty of distinguishing its pollen grains from those of other pine species, such as red pine (*Pinus resinosa* Ait.) and jack pine (*Pinus banksiana* Lamb.). The objective of our study is to reconstruct the history of this isolated population of pitch pine. We aim to answer the following questions: when was this population first established? Was this species more abundant in the past? What are the long-term relationships between pitch pine and fire? To answer these questions, both pollen and macro-charcoal analyses were done on a peat core dating back more than 10,000 years. We then developed a method based on quantitative measurements to try to differentiate the pollen grains of pitch pine. Finally, the long-term history of the species was compared to the fire history.

Submission type

Poster

136 - Reconstruction of glacial lake extents and postglacial marine inundation in the central Keewatin sector of the Laurentide Ice Sheet

Hugo Chareton[1], Martin Roy[1], Pierre-Marc Godbout[2], Étienne Brouard[2], Joerg Michael Schaefer[3]

[1]Université du Québec à Montréal, [2]Geological Survey of Canada, [3]Lamont-Doherty Earth Observatory

The central Keewatin sector of the Laurentide Ice Sheet (LIS) preserves an exceptional geomorphic record of extensive glacial lakes and postglacial marine inundation. Raised beaches, trimlines, deltas, and marginal channels provide key evidence for reconstructing ice-front positions and waterplane evolution during deglaciation. Despite its proximity to the former center of the Keewatin Dome, this region remains poorly studied, and existing deglaciation models are weakly constrained both spatially and chronologically.

This study aims to reconstruct the late stages of deglaciation in the central Kivalliq region, west of Baker Lake (Nunavut), through an integrated geomorphic and geochronological approach. Systematic mapping of strandlines, marginal channels, and deltas was carried out using high-resolution satellite imagery and the 2-m ArcticDEM, complemented by targeted sampling of glacially transported boulders and wave-washed bedrock for in situ cosmogenic nuclide (^{10}Be) dating.

Analysis of strandline elevations along latitudinal and meridional transects reveals pronounced lateral and vertical variability, indicating significant changes in lake levels and basin geometry in response to ice-margin retreat, followed by a transition to postglacial marine inundation. Together with forthcoming ^{10}Be ages, these results will refine palaeogeographic reconstructions, improve deglaciation chronologies, and provide new constraints on glacio-isostatic adjustment models for this key sector of the LIS.

Submission type

Poster

137 - Proglacial lake succession during ice retreat from the Adirondack foothills, northern New York, USA

Oliver Riegle[1], Brian S. Carl[2], David A. Franzi[3]

[1]Department of Geology, St. Lawrence University, [2]Department of Earth and Environmental Science, SUNY Potsdam, [3]Center for Earth and Environmental Science, SUNY Plattsburgh

This study investigates the timing and sequence of ice-margin retreat in the north-draining valleys of northeastern New York, USA. Guided by geomorphologic features observed in texture and hillshade models derived from 1 meter DEM data, we identified ice-marginal deposits, ice-marginal channels, shoreline features, and deltas connected to proglacial lakes that formed within north-draining valleys. Using a model-driven approach, we anchored lake levels to elevations at saddle “spill points" on the western edge of each lake connected to a westward-flowing channel. We projected south-dipping surfaces assuming a gradient of 0.9m/km to account for isostatic rebound. The intersection of modelled surfaces and topography determines the approximate limits of proglacial lake extent. We identify with high confidence the shorelines of at least four short-lived proglacial lakes in the modern Chateaugay, Little Trout, Big Trout, and Salmon River drainages. Additionally, we present a map of ice-marginal features across the region including relict channels (namely the Chateaugay Channel system), deltas, eskers, and washboard moraines. Based on the model, we interpret these lakes to fill and drain in west-southwest succession. The modelled lake levels dropped over 100m across 60km, ultimately discharging into glacial Lake Iroquois in the western St. Lawrence Lowland.

Submission type

Poster

138 - Sediment records associated with environmental changes in glacier-influenced fjord environments in the Canadian High Arctic

Kerstin Brembach[1], Alexandre Normandeau[2], Audrey Limoges[3], Patrick Lajeunesse[1]

[1]Département de géographie, Université Laval, [2]Geological Survey of Canada (Atlantic), [3]University of New Brunswick

Sediment records in ice-proximal environments can be used to reconstruct environmental changes, enhancing our understanding of how glaciers respond to these changes and helping predict future glacier development. We present preliminary results from the analysis of five marine sediment cores collected from such environments within two fjord systems on Ellesmere Island. Three sediment cores were collected in Makinson Inlet: one in front of Palisade Glacier, one in front of an unnamed terrestrial glacier, and one at the inlet's mouth in front of another tidewater glacier. The other core was taken from Dobbin Fjord, close to Eugenie Glacier and an unnamed tidewater glacier. Initial analysis, particularly of grain size, reveals distinct sedimentation events showing evidence of turbidity currents. The frequency and magnitude of these events differ across sediment cores, demonstrating that different sedimentation processes can occur within a single fjord. The event beds were potentially produced by the sudden release of sediment linked to glacier outburst floods. However,

morphological evidence from the Eugenie Glacier indicates that slope failures at its grounding line may have triggered turbidity currents at this site. Our initial findings indicate changes in sedimentation processes throughout each sequence, demonstrating environmental shifts over the late Holocene in all locations.

Submission type

Poster

140 - Revisiting Montreal's Quaternary Geology in the age of Big Geospatial Data

Olivier J. Caron[1], Eric Chartier[2], Brigitte Gagné[3], Karolane-Gemma Tremblay-Chacon[1], François Plourde[1], Nicolas Proteau[1]

[1]Université du Québec à Montréal, [2]Ville de Montréal, [3]Société de transport de Montréal

The Island of Montreal occupies a key position in the St. Lawrence Lowlands and has long served as a reference area for reconstructing the glacial and postglacial history of southern Quebec. However, despite its importance and the intense urban development that has occurred over the past decades, no comprehensive revision of the Quaternary surficial geology of the island has been undertaken since the regional mapping programs carried out during the 1960s and 1970s. As a result, much of the current geological framework still relies on legacy maps that predate modern geospatial technologies and the large volume of subsurface information generated by urban development. Within the framework of the PACES-CMM groundwater knowledge acquisition program, a new initiative aims to update and refine the Quaternary geological framework of the Greater Montreal region. The project is based on an unprecedented compilation of geological and geotechnical information, including high-resolution LiDAR data, historical aerial photographs, archaeological reports, and thousands of geotechnical and hydrogeological borehole records collected across the metropolitan area. These datasets are integrated within a geospatial environment to produce an updated surficial geological map, sediment thickness models, and a three-dimensional hydrofacies model, providing a foundation for groundwater recharge assessment and regional hydrogeological analyses.

Submission type

Poster

154 - Nova Scotia's coastal erosion monitoring program: sediment transport dynamics and anthropogenic influence at Caribou-Munroes Island Provincial Park

Mitch Maracle[1], Anna Ryan[1]

[1]Nova Scotia Department of Natural Resources Geological Survey

Nova Scotia's dynamic coastline is continually shaped by a complex interplay of natural processes and the province's diverse geology. To quantify these morphological changes, the Nova Scotia Geological Survey's Coastal Erosion Monitoring Program (CEMP) maintains a network of 130 sites, encompassing over 105 km of the provincial shoreline. This research focuses on a case study at Caribou-Munroes Island Provincial Park, a longshore drift-aligned barrier beach system situated on the Northumberland Strait. Central to this study is an

investigation into the depth of closure within the littoral cell and the subsequent impact of anthropogenic activity, specifically, the disposal of dredged material from the adjacent Caribou Ferry Route. By analyzing the depth of the offshore disposal site to the barrier system, we evaluated sediment budget and it's transportation mechanisms allowing it to bypass or re-enter the littoral system impacting the foreshore nourishment regime. The current disposal site was found to lay outside of the barrier beach cell and movement of the site could encourage nourishment of the barrier system. Understanding these transport conditions is essential for balancing the maintenance of the Trans-Canada Highway's ferry navigation route and developing sustainable nourishment strategies for the park's recreational beaches.

Submission type

Poster

156 - IRSL dating of polymineral and K-feldspar samples from raised beaches at Admiralty Bay, South Shetland Islands, Antarctica

M. Schaarschmidt[1], A. Kauppi[1], T. James[2], O. B. Lian[1]

[1]University of the Fraser Valley, [2]Natural Resources Canada

The Antarctic ice sheet is the largest ice sheet on Earth and losing its mass at an accelerating rate. This has implications for global sea level and climate change, affecting coastal communities around the world. Antarctica and the Southern Ocean are key players in the regulation of global climate and ocean systems.

In early 2025, the Canadian Antarctic Research Expedition (CARE 2025) set out for the first all-Canadian research voyage to Antarctica to investigate the retreating glaciers and ice caps of the South Shetland Islands and Antarctic Peninsula. During the expedition, four samples for luminescence dating were taken from palaeo-shorelines (raised beaches) in Admiralty Bay located at King George Island off the coast of mainland Antarctica. The single aliquot regeneration protocol was applied to polymineral and potassium-rich sand-sized samples using infrared stimulated luminescence to ascertain when the paleo-shorelines were last active.

This poster will present preliminary results of the luminescence analysis, including estimated deposition times for the palaeo-shorelines, and discuss implications for global climate and sea level.

Submission type

Poster

164 - Can Pollutant Lead Concentrations Be Used to Date Saltmarsh Soils of Eastern Canada?

Arunabha Day[1], Kaiyuan Wang[1], Kathryn Nicol[1], Zoë Bouma[1], Marlow Pellatt[2], Gail Chmura[1]

[1]McGill University, Department of Geography, [2]Ecosystem Science Laboratory, Parks Canada Agency

The1990 ban of leaded gasoline resulted in a decrease in lead emitted to the environment. Measurements of lead concentrations in soils of a saltmarsh on the Hudson River estuary, New York revealed an abrupt decrease in soil deposits post-dating 1990. As lead concentrations can be measured non-destructively through X-ray

fluorescence scanning, detecting this decline in saltmarsh soils would provide an inexpensive addition or alternative to more conventional dating methods utilizing radioisotopes or pollen marker horizons. However, Eastern Canada's coastal regions are largely rural thus the signal of decreased lead levels may be difficult to detect there. The signal could vary regionally depending upon degrees of urbanization but also proximity to fishing harbours. (Fishing vessels were allowed to continue to use leaded fuel, potentially masking any decline due to elimination from automobile emissions.) We have taken advantage of archived soil cores previously dated with lead-210 or cesium-137 to determine if and under what conditions the 1990 decrease in lead emissions is detectable in saltmarsh soils of Eastern Canada. Where it can be detected, this decrease will provide more refined analyses of rates of soil carbon storage in saltmarshes and their resilience to increased rates of sea-level rise.

Submission type

Poster

182 - Sedimentary ancient DNA from buried lake sediments record postglacial faunal recolonisation in southern Sweden

Scott Cocker[1], Carl Regnéll[2, 3], Inda Brinkmann[1], Peter Heintzman[1]

[1]Department of Geological Sciences and Centre for Palaeogenetics, Stockholm University, [2]Department of Geological Sciences, Stockholm University, [3]Department of Environmental Science, Kristianstad University

Following the retreat of the Fennoscandian Ice Sheet after the Last Glacial Maximum (~20 ka), newly deglaciated landscapes across southern Scandinavia became available for biological recolonisation. Although the timing of plant migration into these regions is relatively well documented, the early postglacial history of animal communities remains poorly constrained due to a lack of fossils. Evidence that does exist is largely limited to occasional remains of large mammals, providing little insight into the arrival and diversity of smaller vertebrates such as rodents, birds, and amphibians.

To improve upon this sparse fossil record, this study investigates early postglacial faunal recolonisation in southern Sweden using sedimentary ancient DNA (sedaDNA) recovered from lake sediments preserved under two bogs, Ageröd and Ebbjörnarp. This method can provide a comprehensive assessment of biodiversity, including detection of rare or rarely preserved taxa. We combine sedaDNA data with sedimentological analyses and radiocarbon chronologies to reconstruct temporal changes in vertebrate communities and their response to rapid climatic shifts during the deglaciation of Fennoscandia. Complementary work by colleagues at a site on the Kullen Peninsula in southern Sweden will provide additional regional context. Together, these data may help improve our understanding of postglacial recolonisation patterns in southern Scandinavia.

Submission type

Poster

3. Limnogeology : how lacustrine archives unravel Quaternary changes

9:00-10:30
Room 26, Leacock Building

Session Conveners: Chassiot, L. (Université du Québec à Trois-Rivières); Scott, J.J. (Mount Royal University); Godbout, P.-M. (Geological Survey of Canada); Francus, P. (INRS-ETE - GEOTOP)

60 - A fully micro-CT-based workflow for annual mass accumulation rate reconstruction from varved sediments: methodological advances for high-resolution paleoclimate studies.

Marie-Eugénie M. P. Jamba[1, 2], Pierre Francus[1, 2], Guillaume St-Onge[2, 3, 4]

[1]Institut National de la Recherche Scientifique, [2]Membre du Geotop, [3]Institut des sciences de la mer (ISMER), [4]Université du Québec à Rimouski (UQAR)

Varved sediments are exceptional archives for high-resolution paleoclimate reconstruction, yet their quantitative use remains methodologically limited. Traditional approaches rely on continuous thin-section preparation for counting and measuring varve thickness, combined with discrete density measurements that rarely match the annual resolution of the lamination record. This mismatch hampers accurate reconstruction of sediment fluxes and mass accumulation rates (MAR).

We present a fully integrated, non-destructive micro-computed tomography (micro-CT) workflow that enables annual-scale MAR reconstruction directly from sediment cores. The approach is based on three sequential steps. First, micro-CT imaging is used to identify, count, and continuously measure individual varve thicknesses along the core, eliminating the need for continuous thin sections and providing a rapid, reproducible annual stratigraphy. Second, a high-resolution calibration procedure converts micro-CT attenuation values into quantitative wet bulk density profiles at 45 µm resolution, fully aligned with the varve record. Third, a varve-scale calibration integrates the density signal over the exact depth interval of each counted varve to obtain annual dry bulk density.

By combining annual varve thickness with varve-specific dry bulk density, we derive annual MAR entirely within a micro-CT framework, providing a consistent, high-resolution reconstruction of sediment flux variability in Quaternary paleoclimate archives.

Submission type

Oral

113 - Sedimentary Signatures of Lacustrine Tsunamis: A New Approach for Reconstructing Magnitude and Frequency

Katie Hughes[1], Eva Kwoll[1], Marten Geertsema[2]

[1]Department of Geography, University of Victoria, [2]British Columbia Ministry of Forests, Lands and Natural Resource Operations

Large landslides on slopes adjacent to or beneath lakes can generate destructive tsunamis that pose a hazard to shoreline communities. Reconstructing past events is crucial for understanding the frequency and drivers of this hazard. Current approaches rely on the preservation of landslide deposits, which are often obscured over time, limiting our ability to develop long event records.

In this study, we investigate whether lake tsunamis leave diagnostic sedimentary imprints in the stratigraphic record that can be reliably used to develop long records of tsunami magnitude and frequency. Using multi-proxy sediment core analysis, high-resolution hydroacoustic data, and numerical modelling, we characterised and compared the sedimentary signatures of the 2007 aseismic lacustrine tsunami in Chehalis Lake (BC) with two palaeo-coseismic lacustrine tsunamis in New Zealand's South Island. Our findings illustrate that lacustrine tsunamis, irrespective of landslide failure type or trigger mechanism, lead to the formation of megaturbidite deposits with distinct sub-units that preserve evidence of high-velocity bottom currents, prolonged water-column motion, and tsunami backwash. Overall, our results demonstrate that lacustrine tsunami deposits consistently display diagnostic sedimentary signatures that are distinct from seismic turbidites and mass-transport deposits, enabling the reconstruction of millennial-scale records of lacustrine tsunamis that are critical for advancing hazard assessments.

Submission type

Oral

150 - A bacterial biomarker-based reconstruction of Holocene summer temperatures in central Yukon, northwestern Canada

Danielle Martin[1], Trevor Porter[1], Mickey Chen[1], Albert Tomchyshyn[1], Michael Phillips[1]

[1]University of Toronto

Over the last 4 decades, Holocene paleoenvironmental studies in northwestern North America (NWNA) have focused predominately on fossil pollen and midges from lake sediments. However, a NWNA regional analysis of pollen and midge records has demonstrated similar temperatures from present until ~7 ka BP, where a major discrepancy occurs during early Holocene summer temperature estimates. Thus, additional lines of evidence are needed to resolve this temperature estimate discrepancy. This research applies the bacterial lipid paleoclimate proxy of branched glycerol dialkyl glycerol tetraethers (brGDGTs) to obtain quantitative summer temperature estimates from Honeymoon Pond (central Yukon). Local pollen, midge, and precipitation-isotope-based reconstructions will be compared to this project's brGDGT reconstruction. Organic geochemistry was used to extract brGDGTs from a lake sediment core at a ~100-year sampling resolution. The brGDGT extracts are awaiting analysis via ultra-high-performance liquid chromatography-mass spectrometry. The forthcoming brGDGT results will be used to constrain the temperature-sensitive methylation of branched tetraethers (MBT'_{5Me}) index and estimate the Holocene temperature history using a regionally appropriate transfer function. This reconstruction along with the other local proxies will be included in a multi-proxy analysis to refine our understanding of early Holocene conditions in central Yukon, including timing and magnitude of the Holocene thermal maximum.

Submission type

Oral

175 - Multi-proxy records of Holocene environmental change and lake response at a proposed Golden Spike location

Paul Hamilton[1], Francine McCarthy[2], Joshua Moraal[2], Joseph Boyce[3], Aaron Alderson[2], Peter Leavitt[4], Cale Gushulak[5]

[1]Canadian Museum of Nature, [2]Brock University, [3]McMaster University, [4]University of Regina, [5]University of Manitoba

Distinct phase changes in the physical and ecological state of Crawford Lake (Ontario) occurred through the Holocene. Declining marl and diatom abundance with sparse benthic desmid-dominated assemblages accumulated rapidly during the warm, wet Middle Holocene (7500-4500 yBP) as *Chara* wetlands in the karstic basin were transgressed. Siliceous microfossils were absent in marl sediments during a siliciclastic influx between ca. 7000 - 4500 years ago, as estimated by ITRAX. The absence of dinoflagellate cysts in hemlock-rich samples suggests hyper-oligotrophic conditions common to marl lakes, which persisted until a mid-Holocene drought as marked by a hemlock minimum. Diatom assemblages mainly of planktic *Lindavia intermedia*, *Pantocsekiana michiganiana* and *Pantocsekiana comensis* recur above the barren marl and joined by diverse primary producers including *Botryococcus*, and *Tetraedron*. Anthropogenic impact since the 13th century is recorded by a dramatic increase in cyanobacteria, siliceous microfossils, ciliates, and rotifers. The meso-eutrophic *Asterionella formosa* appears in the late 20th century, while cellulosic dinoflagellate thecae record a short-lived period of deep-water anoxia near the turn of the last century, and abundant synurid chrysophyte scales and acid-resistant lorica of the colonial chrysophyte *Dinobryon* in elm pollen-poor sediments mark regional industry and global changes associated with the proposed mid-20th century Anthropocene GSSP.

Submission type

Oral

73 - A unique Anthropocene biosphere recorded in varved sediments of Crawford Lake

Francine McCarthy[1], Paul Hamilton[2], Paul Michael Pilkington[1], Aaron Alderson[1], Olena Volik[3], Nicholas Riddick[4]

[1]Brock University, [2]Canadian Museum of Nature, [3]Severn Sound Environmental Associaiton, [4]York University

Anthropogenic alteration of the Earth System has produced the Anthropocene, according to any definition. Has a unique Anthropocene biosphere developed in response to global changes initiated with the Industrial Revolution and sharply increasing in the mid-20th century? We contend that the rapid spread of pathogens in response to rapid globalization as well as atmospheric and hydrological changes associated with the Great Acceleration altered the ecosystem of Crawford Lake, supporting a proposed GSSP in its varved sediments. The

sharp increase in chrysophytes cysts and scales and green algal palynomorphs identified at the tops of cores from a variety of lakes suggest that unprecedented concentrations of atmospheric CO_2 since the Neogene produced changes at the base of lacustrine food chain record. Close analogues during the Eocene provide insights into near-future conditions in freshwater ecosystems.

Submission type

Oral

46 - A high-resolution multi-proxy fire history reconstruction for the Parc National de la Gaspésie

Kelly kyle*[1], Jeannine St-Jacques[1, 2], Nicole Sanderson[2, 3]

[1]concordia university, [2]Geotop, [3]UQAM

Wildfire activity in Canada is projected to increase throughout the 21st century, with boreal forests such as those found in the Parc national de la Gaspésie (PNG) expected to experience increased fire severity and frequency beyond the current range of natural variability. The unpredictability of future fire activity presents major challenges for PNG's forest management and conservation, particularly for the persistence of its old-growth stands, which serve as critical habitats for the endangered Gaspésie caribou.

Despite PNG's ecological importance, no long-term fire history from the park exists, leaving a significant gap in understanding its past fire regimes and ecosystem dynamics. To fill this gap, I am conducting a full Holocene (~ 11000 yrs. BP) high-resolution fire history reconstruction in partnership with the PNG, using charcoal and pollen archived in lake sediments. Charcoal particles, a widely used proxy for historical fire activity, will be analyzed at ~10-year sampling intervals to provide high-resolution estimates of fire return intervals. A complementary, lower-resolution pollen analysis on the same lake core will evaluate relationships between fire activity and forest composition. These results will provide insight into long-term disturbance dynamics in this region, informing sustainable forest management and caribou conservation in the face of climate change.

Submission type

Poster

86 - High-resolution fire history reconstruction from L'Ascension, Québec: insights from the past ~3000 years

Megan Tremblay[1], Jeannine Marie St-Jacques[1]

[1]Concordia University

This poster will summarize the preliminary findings from my Master's thesis. For this project, we cored Lac Leclair in the area of L'Ascension, Québec located in the central Laurentians, in the Rivière Rouge watershed. Using a combination of charcoal, pollen and loss-on-ignition (LOI) as proxy data, we will reconstruct the local fire record, over the course of the Holocene. This study will fill a gap in providing the first known high-resolution fire reconstructions in the Laurentians region. The results will then be compared to other climate reconstructions to better understand the relationships between vegetation, climate and human activities as

drivers of wildfire in the area. The results from the uppermost part of the sedimentary core representing, approximately, the past 3000 years will be presented in the poster. This time frame represents a period of rapid change in terms of land management. The area is the traditional territory of two Indigenous peoples: the Algonquin Anishinabe and the Atikamekw and was colonized in the mid-19th century subsequently heavily logged. As fire frequency is expected to increase with ongoing anthropogenic climate change, understanding the interconnected Earth processes driving wildfire is essential to preparation and management, which includes a better understanding of past fires.

Submission type

Poster

120 - Understanding Changes in Carbon Sink-Source Behavior Using a Combined Geophysical, Lithological and Palaeoecological Approach in Lakes and Wetlands

Allen Gontz[1, 2], Gareth Chalmers[2], Catherine Yule[2], Adrian McCallum[2], Meredith Holgerson[3], Stephen Langdon[4], John Tibby[5], Jonathan Marshall[6], Brian Carl[7], Curt Stager[8], James Shulmeister[9], David Chittleborough[2], Gladys Pantoja[1], Emily Philippov[2], Zeinab Ghasemzadeh[5]

[1]Clarkson University, [2]University of the Sunshine Coast, [3]Cornell University, [4]Boreal Consulting, LLC, [5]Adelaide University, [6]Queensland Department of the Environment, Tourism, Science and Innovation, [7]SUNY Potsdam, [8]Paul Smiths College, [9]University of Canterbury

Lakes and palustrine wetlands host vast sediment archives that reflect changes in climate, flora, fauna, carbon sequestration and landscape processes. Unravelling these sediment archives involves a multitude of techniques, including geochemical proxies, sedimentological analyses, changes to faunal morphology, pollen and other micro and macrofossil abundance. Generally, sediment cores are collected from the deepest basin locations as they are typically expected to contain the longest and most complete sedimentary record.

Geophysical surveying using ground penetrating radar (GPR) can complement sediment core data by mapping sediment characteristics across the entire basin. Specifically, collecting transects of GPR with intersecting lines allow for the correlation of surfaces and calculation of volumes and thicknesses. The addition of geophysical data allows for basin analysis using sequence stratigraphy and interpretation of water level changes, to which sediment cores are typically blind. If used prior to coring, GPR can inform sediment core site selection to be most representative of the site or to target locations with the longest and/or highest resolution records.

This presentation showcases records from sediment cores and GPR in wetlands and shallow lakes from New York, USA and Queensland, Australia.

Submission type

Poster

185 - A Multi-Proxy Paleoclimate Analysis of Half Moon Lake, Québec

Thomas Cheung[1], Jeannine-Marie St-Jacques[1]

[1]concordia university

In order to better understand the hydrological and climatological conditions of the Ottawa River Basin as well as better prepare for the increase in extreme events due to climate change, multiple cores were retrieved from oxbow lakes along the main stem Ottawa River, and the Noire, East Coulonge and Rouge Rivers. This project presents the multi-proxy analysis conducted on one of the sediment cores retrieved from Half-Moon Oxbow Lake. Three proxy analyses were conducted; a fire reconstruction using microscopic charcoal, Loss on Ignition, as well as X-Ray Fluorescence. An age depth model was created using a combination of carbon and lead dating. The core dated to about 1380-2024, with a high sedimentation rate. The fire reconstruction revealed 15 individual fire events with a fire return interval of 47 years. Fire events occurred in a cyclical pattern up until the arrival of the Europeans. XRF revealed the meander cut off occurred around 1450 and clear cutting in the mid 1800s had a major effect on sediment composition. Loss on ignition at 550 degrees confirmed the relationship between inc/coh and organic matter, while LOI at 950 degrees showed carbonate materiel varied with organics indicating an algal source of carbonate.

Submission type

Poster

19. Cascading Natural Hazards in a Changing Climate

9:00-10:30
Room 26, Leacock Building

Session Conveners: Barzegar, R. (Groundwater Research Group (GRES), Research Institute on Mines and Environment (RIME), Université du Québec en Abitibi-Témiscamingue); Gachon, P. (Department of Geography, University of Québec at Montréal); Rosa, E. (Groundwater Research Group (GRES), Research Institute on Mines and Environment (RIME), Université du Québec en Abitibi-Témiscamingue); Adamowski, J. (Department of Bioresource Engineering, McGill University); Finley, T. (Yukon Geological Survey); Lipovsky, P. (Yukon Geological Survey); Neligan, T. (University of Victoria)

31 - The Texas Creek landslide, southwestern British Columbia: new ages and implications for the culture history and geomorphology of the mid-Fraser River region

Pierre Friele[1], Andrée Blais-Stevens[2], John C Gosse[3]

[1]Cordilleran Geoscience, [2]Natural Resources Canada, [3]Dalhousie University

The Texas Creek rock avalanche is a prehistoric mass-movement event in the Fraser River Canyon, approximately 17 km south of Lillooet in southwestern British Columbia. The size and extent of the deposit indicate that the Fraser River was temporarily dammed, with consequences for salmon migration. Early mapping interpreted two distinct landslide events: a larger ~45 Mm³ failure emplaced after deposition of the Mazama tephra but before ~2 ka, and a smaller ~7.2 Mm³ event dated to approximately 1.1 ka. To test this

interpretation and better constrain the timing of emplacement, we obtained six ^{10}Be cosmogenic exposure ages from large boulders on the deposit, with three samples collected from each surface previously interpreted as representing the older and younger events. All samples yielded statistically indistinguishable exposure ages, indicating that the deposit formed during a single landslide event at 2.28 ± 0.19 ka. The younger of the originally proposed landslide events had been correlated with a decline in local First Nations populations and interpreted as a potential trigger for cultural collapse through disruption of salmon runs. Our revised chronology demonstrates that the Texas Creek rock avalanche played no role in the collapse of the Classic Lillooet culture after ~1ka BP.

Submission type

Oral

66 - The impact of river channel adjustments on flood mapping in eastern Canada

Duane Noel[1], Guénolé Choné[1], Iulia Mazgareanu[1], Pascale Biron[1], Thomas Buffin-Bélanger[2], Jeannine-Marie St-Jacques[1]

[1]Concordia University, [2]Université du Québec à Rimouski

In flood management, bathymetric surveys are used in hydraulic models to simulate floods. However, flood maps often assume a constant bathymetry over time due to costly field surveys, a problematic assumption for dynamic rivers. Here, we examined the effects of river bathymetric changes on flood maps for the Du Gouffre River (Charlevoix, Québec) and the Sainte-Anne River (Gaspésie, Québec) using regional-scale flood modelling for 20-year, 100-year and 350-year return periods. Channel bathymetry is assessed using an inverse hydraulic model and GIS from LiDAR data for pre- and post-major morphological events on the two rivers. Flood depths were simulated using the 1D/2D hydraulic model LISFLOOD-FP, with results indicating that bathymetric changes caused a 4% increase (Du Gouffre) and a 9% increase (Sainte-Anne) in total flooded areas. Then, we compared bathymetric changes on flood maps to anticipated climate change using the Representative Concentration Pathyway (RCP) 8.5 scenario for the 2071-2100 horizon and found that projected floods included all flooded areas in the Du Gouffre, and 95% of the Sainte-Anne's flooded areas. Hence, these results show that river channel adjustments must be incorporated into hydraulic models after major floods due to their impact on flood mapping.

Submission type

Oral

81 - a community-scale landscape hazard susceptibility model for Haines Junction, Yukon

Panya Lipovsky[1]

[1]Yukon Geological Survey

A composite landscape hazard susceptibility model was developed for the greater Haines Junction area, a region shaped by complex and dynamic geomorphic processes. The model builds on recent community-scale surficial

geology mapping informed by remote sensing and field-based investigations, including LiDAR analysis, foot traverses, borehole drilling, and geophysical surveys.

The model was generated by integrating individual qualitative susceptibility models for hillslope, permafrost, and hydrological hazards. Hillslope hazards in the map area encompass both rapid and slow-moving landslides, gullying, and solifluction. Permafrost hazards are related to ground subsidence and terrain disturbance resulting from the thaw of ground ice. Hydrological hazards include fluvial activity, surface seepage, slopewash, beaver dam activity, thermokarst ponding and seasonal water table fluctuations.

Areas of highest overall hazard susceptibility correspond to steep mountain slopes, previously failed terrain, ice-rich permafrost zones, and active floodplains and fans. Low-susceptibility zones are typically flat to gently sloping surfaces underlain by well-drained, ice-poor sediments. This model provides a decision-support tool to guide land-use planning, infrastructure development, and targeted mitigation strategies within the community.

Submission type

Oral

109 - The December 6, 2025 Mw 7.0 earthquake in Yukon, Canada: Implications for regional tectonics, seismic hazard and ground failure

Theron Finley[1], Jeremy Gosselin[2], Katherine Biegel[3], Panya Lipovsky[1], Derek Cronmiller[1], Andrew Schaeffer[2], Jan Dettmer[1]

[1]Yukon Geological Survey; Energy, Mines and Resources; Government of Yukon, [2]Geological Survey of Canada - Pacific; Natural Resources Canada; Government of Canada, [3]Earth and Planetary Sciences, University of California, David

The December 6, 2025 M_w 7.0 earthquake in southwestern Yukon was the largest onshore earthquake in Canada in over 75 years and offers insight into the complex active tectonics of the St. Elias orogen. The earthquake also caused widespread landslide and avalanche activity, providing an opportunity to study relationships between ground shaking and mass wasting. We use double-difference relocation to refine the location of the mainshock and 3280 ensuing aftershocks. Slip initiated with strike-slip motion, rupturing northwestward, and may have activated a conjugate reverse fault toward the northwest segment of the rupture. We infer that the rupture occurred on the southernmost section of the hypothesized Totschunda-Fairweather Connector fault, which is notably included in the US National Seismic Hazard model, but not in the Canadian model. Based on satellite imagery and a reconnaissance flight to the epicentral area, we compile a preliminary inventory of over 200 landslides and other surface effects caused by the event. No evidence of a fault surface rupture was observed during the flight. The areal extent of landslide occurrences was considerably smaller than expected based on empirical data from past earthquakes, possibly due to the cold temperatures and presence of permafrost.

Submission type

Oral

124 - Assessing Long Term Changes in Fire Frequency on Freshwater Ecosystems in the Experimental Lakes Area

Kristen Beck[1], Harriet Barlow[2], Michael Paterson[3], Scott Higgins[3], Pauline Gulliver[4], Vannia dos Santos Durndell[5], Luca Mao[2]

[1]Nipissing University, [2]University of Lincoln, [3]IISD Experimental Lakes Area, [4]NEIF Radiocarbon Laboratory, [5]University of Plymouth

Wildfires are increasing with anthropogenic climate change, yet little is known about the effects on freshwater ecosystems. Fires create pulses of ash, nutrients, contaminants, and organic matter to lakes, and longer-term shifts in vegetation, soils, and erosion which alter light penetration, nutrient dynamics, pH, and aquatic productivity. These fire-freshwater interactions are complex and difficult to document; thus, extended records are needed to capture long-term responses to changes in fire regimes. Here we couple the >50-year monitoring data from burnt catchments of the Experimental Lakes Area in Ontario with palaeoecological data to reconstruct past fire frequency and freshwater ecosystem change over short and long temporal scales. A multiproxy palaeoecological approach of charcoal, pollen, geochemistry, carbon/nitrogen, and diatoms at Lake 383 was used to reveal changes in fire regime, catchment processes, and aquatic response. Preliminary results indicate elevated fire activity between 1600 and 1800 CE, followed by vegetation shifts toward a more mixed forest after ~1800 CE. The diatoms suggest climate-driven changes during the Little Ice Age with later increases in nutrient availability and productivity associated with rising fire frequency. These findings suggest that increasing wildfire activity can enhance nutrient enrichment and reshape freshwater ecosystem dynamics through catchment-scale pathways.

Submission type

Oral

155 - Wildfire-induced physical and biological change assessments, supporting restoration efforts, Deadman River, British Columbia

Brendan Miller[1, 2], Axel Grist[1], Kristen Kieta[2], Philip Owens[2], Sheena Spencer[1], Brian Heise[3]

[1]British Columbia Ministry of Forests, [2]Department of Geography, Earth and Environmental Science, University of Northern British Columbia, [3]Department of Natural Resource Sciences, Thompson Rivers University

Contact: brendan.miller@gov.bc.ca

The 2021 Sparks Lake Fire burned nearly 90,000 ha, or 51% of the Deadman River watershed, in the Skeetchestn Indian Band (SIB) ancestral territory, near Kamloops, BC. Approximately 36% of the area had moderate or high vegetation burn severity. The watershed supports multiple species of Pacific salmon, including Coho, Chinook, and Steelhead. Following the wildfire, SIB began a restoration effort: Tsecmenúlecwem-kt - Deadman Recovery & Resiliency Initiative, which uses scientific research to characterize the watershed and provide data to inform restoration activities.

For sediment sources, we used multi-temporal lidar and field work to quantify hillslope erosion and delivery. We used InSAR and multi-temporal lidar to quantify landslide activity. Additionally, hydrometric stations collected turbidity and stage data, and daily water samples were used to determine suspended particulate matter (SPM) concentrations. Benthic invertebrate population assessments were also conducted. Slope gradient and burn severity were found to be important factors for erosion. Roads, benches, and the floodplain are sites of deposition. Our hydrometric and SPM results showed that during low flows, the Deadman River has higher concentrations of SPM, but during high flows, Criss Creek (a major tributary) had higher concentrations, possibly due to the higher burn severity in that basin.

Submission type

Oral

58 - Late Holocene evolution of landslides in raised marine deposits of the Little Whale River area, southeastern Hudson Bay

Ariane Ampleman-Duchesne[1], Pierre-Olivier Couette[1], Patrick Lajeunesse[1]

[1]Département de géographie, Université Laval

In the context of ongoing climate change, where rising temperatures and precipitation rates are likely to increase the frequency of landslides, the issue of mass movements in glacio-isostatically raised sensitive marine clay is becoming a concern for the communities in Nunavik. Since 2021, four large retrogressive landslides have occurred on the east coast of the Hudson Bay, a region known for its high rate of modern glacio-isostatic rebound, reaching ~1.3 m per century. Three of these landslides developed along the river Mishchaakushtikw, a tributary of Little Whale River, located approximately 100 km north-west of the community of Whapmagoostui-Kuujjuarapik. The morphosedimentary context in which these landslides developed and their links with regional base level fall remain poorly documented in this region.

This project aims at reconstructing the postglacial landscape evolution and dynamics of terrestrial mass movements in the Little Whale River sector by: (1) documenting the spatial and temporal evolution of mass movements, (2) assessing the influence of the stratigraphy on mass movements, (3) and refining the regional glacio-isostatic rebound and relative sea-level emergence history. The expected results are to provide a map of the surficial deposits and landslide scars, schematic stratigraphic profiles, and a relative sea level curve since deglaciation.

Submission type

Poster

131 - Development of a provincial wildfire fuel grid for Newfoundland and Labrador

S Quinn[1], B Misiuk[1], L Brehaut[2], C Brown[1]

[1]Memorial University of Newfoundland and Labrador, [2]Natural Resources Canada

Access to accurate data on wildfire fuels is one of the greatest challenges to planning and preparedness in NL. Fuel refers to biomass available for combustion, modified by characteristics such as moisture, spatial continuity, and horizontal structure. A fuel grid is a spatial data product coding fuel into digital form that can be analyzed for wildfire management. Currently, NL relies on the national fuel grid, which is locally inaccurate due to inadequate field observations and misrepresentation of local vegetation types. For example balsam fir forests or barrens - two prominent landcover types in NL which burned during the 2025 wildfire season - are not accounted for. My primary objectives are to develop a tailor-made provincial fuel grid product to support wildfire response and management; and to use this product to develop a series of burn probability simulations across the province to identify high-risk regions. I aim for an easily reproducible, novel data fusion approach to fuel grid design using multisource remote sensing data. This product will fill a critical knowledge gap, support wildfire management in the province, and directly improve the safety and security of residents, while development of methods will contribute to the science of wildfire prediction and management.

Submission type

Poster

160 - Modeling Logging Road Landslide Hazards Under Changing Environmental Conditions

Sebastian Yerex[1], Eva Kwoll[1], Marten Geertsema[2], Sasha Ward[2]

[1]University of Victoria, [2]Ministry of Forests, British Columbia

Landslides pose substantial risk to people, infrastructure, and ecosystems. Changes to seasonal and short-duration rainfall patterns as well as wildfire activity are expected to increase landslide frequency due to climate change. In British Columbia, over a century of industrial logging has left thousands of kilometers of access roads that disrupt natural drainage and destabilize slopes.

This research examines how logging roads impact landslide hazards under current and potential future conditions. We present a probabilistic, physics-based susceptibility model that relies only on high-resolution remote sensing data. Using topographic inpainting, we propose a framework to reconstruct pre-logging-road conditions and adjust soil hydrology to compare road-induced changes.

The model was validated against an inventory including newly and previously mapped shallow landslides, demonstrating good overall performance. By integrating intensity-duration-frequency curves, seasonal rainfall projections, and burn severity data, used to adjust soil hydrology and root reinforcement, we examine multiple hazard scenarios for two watersheds in coastal and interior BC affected by historical logging. Our findings provide a scalable approach to assessing road-related hazards under changing environmental conditions. This framework provides a tool for land managers to prioritize restoration and mitigation in high-risk terrain, bridging the gap between legacy land use and climate resilience.

Submission type

Poster

Saturday, June 6, 2026

Keynote: Dr. Rob DeConto

Dynamic Ice Sheets: Past, Present and Future

Room 219, Leacock Building, McGill University

11:00 – 12:00 PM

Rob DeConto is a Provost Professor of Climate Science and Director of the School of Earth & Sustainability at the University of Massachusetts-Amherst. Rob studies the dynamic behavior of polar ice sheets, their role in sea level rise, and related impacts on coastlines and people. His research has been featured on the cover of Nature and the front page of the New York Times. He is a fellow of the American Geophysical Union, a recipient of the Tinker-Muse Prize for Science and Policy in Antarctica and a selected lead author for the Intergovernmental Panel on Climate Change (IPCC).

Abstract: In recent years, direct and indirect geological records of Quaternary ice sheet change have inspired a generational shift in our understanding of ice sheet dynamics and their sensitivity to modest levels of warming. We will review several of these discoveries from the geological record and how they have advanced mechanistic understanding of ice sheet behaviour, including interactions across the coupled ice-atmosphere-ocean-solid Earth system. We will also consider how these insights inform projections of future sea-level rise.

Despite these advances, fundamental uncertainties remain, limiting the translation of geological evidence into predictive skill for near-term societal risk. We'll highlight a few unknowns that, if resolved, could reduce uncertainty in future sea-level projections and improve communication of sea-level science, including the pace and irreversibility of sea-level rise on societal timescales and thresholds associated with potential tipping elements among others.

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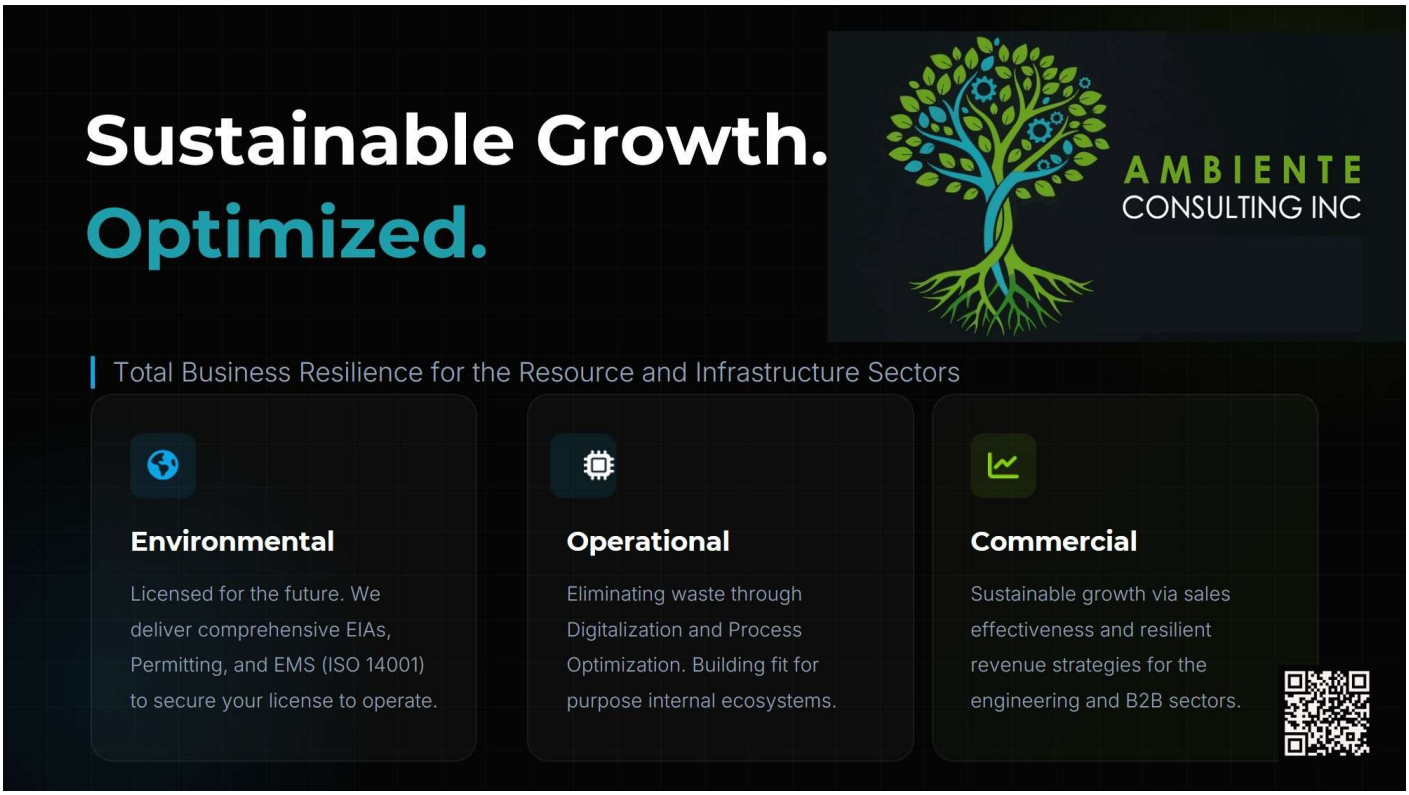

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