



# QANURITTUT

## Tukihinnaqtunik havaariyaumayumik uqauhiyuyun

**Qablunaatitut:** Project title: Arctic climate and atmospheric dust variations during the late glacial period from remnants of the Laurentide Ice Sheet  
Lead researcher: Dr. Gábor Újvári PhD, senior researcher  
Affiliation: Institute for Geological and Geochemical Research, Research Centre for Astronomy and Earth Sciences  
The global climate was unstable and turbulent during the last glacial period on Earth, and large and fast temperature variations (in the order of 5–16 °C) occurred in the North Atlantic region. The causes of the events are debated, but they were likely connected to sudden changes in the water circulation of the North Atlantic Ocean that took place when icy meltwater from the ice sheets entered it. As the present climate warms up, glacier meltwater entering the Atlantic Ocean could once again trigger abrupt climate changes. It is therefore of great importance to understand exactly how past rapid climate change events occurred, so as to better predict the future consequences of current global warming. One way to do this is to look for natural archives that contain a record of these events. Barnes Ice Cap (BIC) on Baffin Island is made in part of ice left behind the Laurentide Ice Sheet melted over 12,000 years ago. These ancient ice layers contain soil dust particles that were transported by winds from distant regions during the ice age. This is the only place we know of where it is possible to recover such ancient ice without drilling deep boreholes. Analyzing the dust particles trapped in ancient ice from BIC can provide clues about how the global climate adjusted during the rapid climate change events of the last ice age. This project therefore aims to recover ancient ice from BIC to help reconstruct the history of past changes in global temperatures, winds, and continental dryness, during the last ice age. We plan to collect ice samples from BIC surface across part of its northwest margin, where the oldest layers are exposed. This will be done by a 5-person team from Canada, Hungary, Austria, Sweden and Switzerland during a 14-day period between 17-31 August 2023. The only motorized equipment we will use is a portable generator and ice auger, and there are no plans to install long-term equipment at the study site. We will also bring a small battery-operated drone (quadcopter) to film our work, which will be later show in outreach presentations to communities. At the end of the field work, the field party and all equipment will be evacuated. Hence our project should have a very low impact, if any, on the local environment. The ice samples will be sent to several laboratories in Canada and Europe for scientific analyses. The analyses will likely take 1-2 years to complete and the final data will be made available to the public in databases (e.g. Pangaea repository) and scientific publications. In the meantime, we will regularly communicate our progress and findings to Nunavut communities via the Nunavut Research Institute.

**Uiviititut:** Titre du projet: Variations du climat arctique et de la poussière atmosphérique pendant la période glaciaire tardive à partir des restes de l'inlandsis laurentidien  
Rechercheur principal: Gábor Újvári PhD, chercheur principal  
Affiliation: Institut de Recherche Géologique et Géochimique, Centre de Recherche en Astronomie et Sciences de la Terre  
Le climat mondial était instable et turbulent au cours de la dernière période glaciaire sur Terre, et des variations de température importantes et rapides (de l'ordre de 5 à 16 °C) se sont produites dans la région de l'Atlantique Nord. Les causes de ces événements sont débattues, mais elles étaient probablement liées à des changements soudains dans la circulation de l'eau de l'océan Atlantique Nord, qui ont eu lieu lorsque l'eau de fonte des calottes glaciaires a pénétré dans l'océan. Avec le réchauffement du climat actuel, l'eau de fonte des glaciers qui pénètre dans l'océan Atlantique pourrait à nouveau déclencher des changements climatiques abrupts. Il est donc très important de comprendre exactement comment les changements climatiques rapides du passé se sont produits, afin de mieux prévoir les conséquences futures du réchauffement climatique actuel. L'un des moyens d'y parvenir est de rechercher des archives naturelles qui contiennent un enregistrement de ces événements. La calotte glaciaire de Barnes (BIC), sur l'île de Baffin, est constituée en partie de glace laissée par l'inlandsis laurentidien qui a fondu il y a plus de 12 000 ans. Ces anciennes couches de glace contiennent des particules de poussière de sol qui ont été transportées par les vents depuis des régions éloignées pendant la période glaciaire. C'est le seul endroit que nous connaissons où il est possible de récupérer de la glace ancienne sans forer des trous profonds. L'analyse des particules de poussière piégées dans la glace ancienne du BIC peut fournir des indices sur la façon dont le climat mondial s'est adapté pendant les changements climatiques rapides de la dernière période glaciaire. Ce projet vise donc à récupérer de la glace ancienne du BIC pour aider à reconstruire l'histoire des changements passés des températures mondiales, des vents et de la sécheresse continentale, pendant la dernière période glaciaire. Nous prévoyons de prélever des échantillons de glace à la surface du BIC sur une partie de sa marge nord-ouest, où les couches les plus anciennes sont exposées. Cette opération sera réalisée par une équipe de cinq personnes originaires du Canada, de Hongrie, d'Autriche, de Suède et de Suisse pendant une période de 14 jours entre le 17 et le 31 août 2023. Le seul équipement motorisé que nous utiliserons est un générateur portable et une tarière à glace, et il n'est pas prévu d'installer des équipements à long terme sur le site d'étude. Nous apporterons également un petit drone (quadcopter) fonctionnant sur batterie pour filmer notre travail, qui sera ensuite montré dans des présentations de sensibilisation aux communautés. À la fin du travail sur le terrain, l'équipe de terrain et tout le matériel seront évacués. Notre projet devrait donc avoir un impact très faible, voire nul, sur l'environnement local. Les échantillons de glace seront envoyés à plusieurs laboratoires au Canada et en Europe pour des analyses

[illegible]

**Personnel**

Personnel on site: 5

Days on site: 14

Total Person days: 70

Operations Phase: from 2023-08-17 to 2023-08-31

## Hulilukaarutit

Inigiya	Hulilukaarut Qanurittuq	Nunannga Qanurittaakhaanik	Initurlinga qanuritpa	Initurlinga utuqqarnitat unaluuniit Ingilraaqnitat Uyarannguqtut akhuurninnga	Qanitqiyauyuq qanitqiamut nunallaat kitulluuniit ahiruqtaiiyainnit nuna
Twin Otter landing strip (Lewis Camp) to be used for transit to/from field camp site	Airstrip use or construction	Crown	Lewis Camp airstrip for landing (Twin Otter)	No archeological/paleontological value	Clyde River is 200 km
Planned field camp site on edge of Barnes Ice Cap (to be accessed by helicopter from landing strip)	Scientific/International Polar Year Research	Crown	This will be our camp site at the edge of the Barnes ice cap	No archeological/paleontological value	Clyde River is 200 km

### Nunaliin Ilauyun, Aviktuqhimayuniitunullu Ikayuuhiarunguyun

Nunauyuq	Atia	Timiuyuq	Upluani Uqaqatigiyaungmata
Information is not available			

# Angiuttauvaktunik

Naunaiqlugu nunanga talvani havauhikhaq ittuq:

North Baffin

## Angiuttauvaktunik

Munariniqmut Ayuittiaqtuq	Angirutinga Qanurittuq	Tadja Qanurittaakhaanik	Ublua Tuniyauyuq/Uuktuqtuq	Umikvikhaa Ublua
Nunavunmi Ihivriuqniqmut Timiqutigiyanga	We plan to submit our application to NRI within some days.	Not Yet Applied		

## Project transportation types

Transportation Type	Qanuq Atuqtauniarmangaa	Length of Use
Air	Twin Otter from Iqaluit to Lewis Camp airstrip and helicopter from Lewis Camp to camp site at the Barnes ice cap	

## Project accomodation types

Temporary Camp

# Ihuaqutivaluin Atuqtauyukhan

Hanalrutit atuqtaunahuat (ukuallu ikuutat, pampiutainnik, tingmitinik, akhaluutinik, hunaluuniit)

Hanalrutit Qanurittuq	Qaffiuyut	Aktikkulaanga – Qanurittullu	Qanuq Atuqtauniarmangaa
Twin Otter	1	20 x 15 x 6 m	Transport of field party between Iqaluit and landing strip (Lewis Camp) near Barnes ice cap.
Helicopter Bell 206LR	1	7 x 6 x 2 m	Transport of field party between Twin Otter landing strip (Lewis Camp) and field camp site.
Cooking shelter	1	2.5 x 3 m	Large cooking tent/shelter.
Tents	6	1.5 x 1.5 m	Individual tents for field party + 1 spare.
Coolers	10	0.5 x 0.5 x 0.75 m	Insulated containers to store camp food and ice samples.
Ice auger	1	0.2 x 0.2 x 0.2 m	Portable ice auger to collect ice samples

## Qanurittuq Urhuqyuaq unalu Qayangnaqtut Hunavaluit Aturninnga

Qanurittuq urhuqyuaq hunavaluit aturninnga:	Urhuqyuaq Qanurittuq	Qaffiuyut qattaryut	Qattaryuk Aktikkulaanga	Atauttimut Qaffiuyut	Ilanga	Qanuq Atuqtauniarmangaa
Aviation fuel	fuel	4	200	800	Liters	Jet fuel (205L) to refuel Twin Otter and Helicopter when staging camp and evacuating at end of project. To be temporarily cached at Twin Otter landing site (Lewis Camp; N 70 deg 24.3'; W 74 deg 55.1'). No longer-term fuel caching planned.
Propane	fuel	3	20	60	Liters	3 x 20 L cylinders for cooking stove in field camp.
Gasoline	fuel	3	10	30	Liters	For portable 2 kW generator, to be used for powering ice auger.

## Imaqmik Aturninnga

Ubluq qanuraaluk (m3)	Aturumayain imavaluin utiqittagaani qanuq	Atulirumayain imavaluin utiqittagani humi
0	from local streams	within 10 m of our field camp

# Iqqakuq

## Ikkakunik Munakgiyauyunik

Havaulikhaq Hulilukaarut	Qanurittuq Iqqakut	Ihumagiyauyuq Qanuraaluktut Atuqtait	Qanuq Iqqakuurniarmangaa	Halummaqtirarnirutikhan piyutin
Scientific/International Polar Year Research	Qimarivyaktuq imaq	50 liter	Grey water (essentially dishwater) will be disposed of in a shallow hole away from any stream	No additional treatment planned
Scientific/International Polar Year Research	Anaagun (inuin anaaguin)	20 kg	Human waste will be collected in sterile bags for evacuation	No garbage of any sort will be burned or buries on site: Everything will be taken out for safe disposal in Iqaluit

### Avatiliriniqmut Ayurhaulingit:

Our project requires some low-level aircraft flying (Twin Otter/helicopter), limited to a few hours on two separate days. The landing site for the Twin Otter (Lewis Camp) is a natural gravel flat on the bank of the Isortoq River, so no artificial infrastructure is needed. The planned field camp site is about 10 km away, on tundra at the edge of Barnes Ice Cap. We are aware that animals (e.g., geese, caribou) may be present in this area, and therefore will pay close attention to avoid disturbing them. The PCSP aircraft pilot may opt to cache a few drums of jet fuel at the landing strip during our stay. However, these would be taken out at the end of the project. Other than aircraft fuels, our own usage will be limited to ordinary gasoline (in jerry cans) for the portable generator, and propane cylinders for the cooking stove. We will take the usual precautions to avoid fuel spills whenever we handle it. The field camp will be set up on a gravel patch at the edge of a stream. We do not plan any trenching or excavation at the camp site. Human waste will be collected in sterile bags for evacuation, and grey water (essentially dishwater) will be disposed of in a shallow hole away from any stream. Likewise, no garbage of any sort will be burned or buries on site. Hence our field camp should have a very low impact, if any, on the local environment. On Barnes Ice Cap itself, the ice samples will be collected over a distance of a few hundred meters across the oldest ice layers. These samples will be taken at depths less than 1 m, which is much less than the actual thickness of ice that melts every summer, so this will have a negligible impact on the ice cap. We will not be using any hazardous chemicals (e.g., acids, solvents) in our work. Neither do we have any plans to collect fauna, flora, or human artefacts.



# **Additional Information**

**SECTION A1: Project Info**

**SECTION A2: Allweather Road**

**SECTION A3: Winter Road**

**SECTION B1: Project Info**

**SECTION B2: Exploration Activity**

**SECTION B3: Geosciences**

**SECTION B4: Drilling**

**SECTION B5: Stripping**

**SECTION B6: Underground Activity**

**SECTION B7: Waste Rock**

**SECTION B8: Stockpiles**

**SECTION B9: Mine Development**

**SECTION B10: Geology**

**SECTION B11: Mine**

**SECTION B12: Mill**

**SECTION C1: Pits**

**SECTION D1: Facility**

**SECTION D2: Facility Construction**

**SECTION D3: Facility Operation**

**SECTION D4: Vessel Use**

**SECTION E1: Offshore Survey**

**SECTION E2: Nearshore Survey**

**SECTION E3: Vessel Use**

## **SECTION F1: Site Cleanup**

## **SECTION G1: Well Authorization**

## **SECTION G2: Onland Exploration**

## **SECTION G3: Offshore Exploration**

## **SECTION G4: Rig**

## **SECTION H1: Vessel Use**

## **SECTION H2: Disposal At Sea**

## **SECTION I1: Municipal Development**

### **Qanurittuq Ittunik Avatinga: Avatingalluanga**

The landing site for the Twin Otter (Lewis Camp) is a natural gravel flat on the bank of the Isortoq River (headwaters of the northern branch), so no artificial infrastructure is needed. The planned field camp site is about 10 km away, on tundra at the edge of Barnes Ice Cap. The field camp will likely be set up on a gravel patch at the edge of a stream where there is little vegetation. We do not plan any trenching, excavation or any such disturbances at the camp site.

### **Qanurittuq Ittunik Avatinga: Inuuhimayunut Avatinga**

This is a tundra environment. We are aware that animals (e.g., geese, caribou) may be present in this area, and therefore will pay close attention to avoid disturbing them when ferrying people and equipment between the landing strip and the field camp.

### **Qanurittuq Ittunik Avatinga: Inungit-maniliurutingit Avatinga**

The field site is located far from all hamlets, the nearest being Clyde River, which is over 200 km distant.

## **Miscellaneous Project Information**

### **Naunaiyainiq ukuninnga Ayurhautingit unalu Piumayaat Ikikliyuumiutinahuarutit**

Human waste will be collected in sterile bags for evacuation, and grey water (essentially dishwater) will be disposed of in a shallow hole away from any stream. Likewise, no garbage of any sort will be burned or buried on site: Everything will be taken out for safe disposal in Iqaluit or Resolute. Hence our field camp should have a very low impact, if any, on the local environment. On Barnes Ice Cap itself, the ice samples will be collected at regular intervals over a distance of a few hundred meters across the oldest ice layers. These samples will be taken at depths less than 1 m, which is much less than the actual thickness of ice that melts every summer at the edge of Barnes Ice Cap, so this will have a negligible impact on the ice cap. We will not be using any hazardous chemicals (e.g., acids, solvents) in our work. Neither do we have any plans to collect fauna, flora, or human artefacts.

### **Tamatkiumayunik Ihuikgutivaktunik**

In our opinion, the effects of this project are negligible, if any, on the physical, biological and socioeconomic environment and do not interact in any way with the impacts of other relevant past, present and reasonably foreseeable projects in the region.



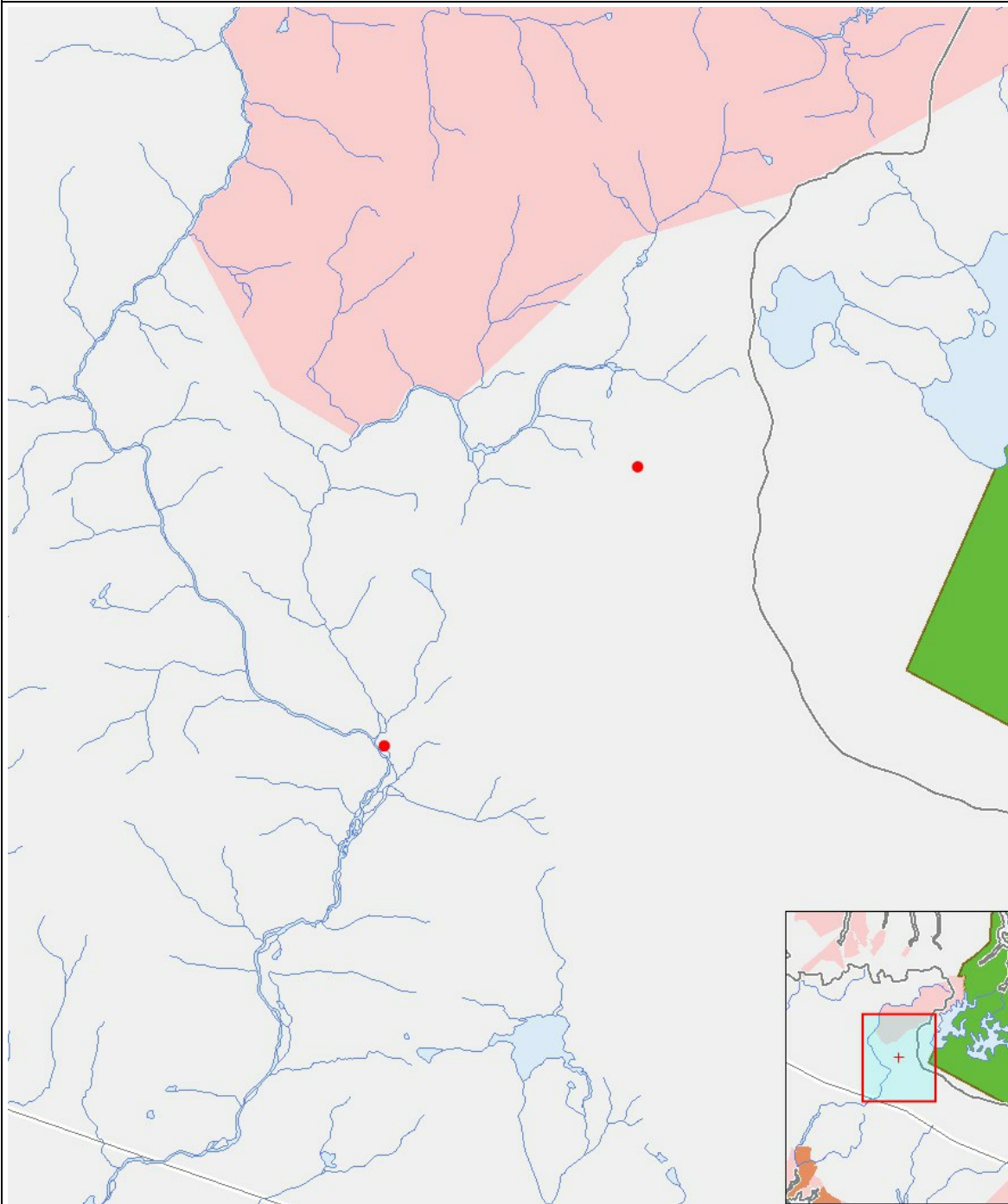
Impacts

Ilitariyauniq Avatiliriniqmut Ayurhautingit

		PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Havakvinga																										
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Aulapkaininnga																										
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Piiqtauniq																										
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(P = Nakuuyuq, N = Nakuungittut unalu mikhilimaittuq, M = Nakuungittut unalu mikhittaaqtuq, U = Naluyauyuq)

## Havaariyauyukhamut Nayugaa



### List of Project Geometries

- 1 point Planned field camp site on edge of Barnes Ice Cap (to be accessed by helicopter from landing strip)
- 2 point Twin Otter landing strip (Lewis Camp) to be used for transit to/from field camp site