



NIRB Uuktuutinga Ihivriughikhamut #125681

Geological study and mapping of hydrothermal deposits and gossans at Expedition Fiord, Axel Heiberg Island, Nunavut, as analogues for Mars

Uuktuutinga Qanurittuq: New

Havaap Qanurittunia: Scientific Research

Uuktuutinga Ublua: 4/5/2022 10:42:37 AM

Period of operation: from 0001-01-01 to 0001-01-01

Piumayaat Angirutinga: from 0001-01-01 to 0001-01-01

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QANURITTUT

Tukihiannaqtunik havaariya uyumayumik uqauhiuyun

Qablunaatitut: Project Summary Geological mapping and study of hydrothermal deposits and gossans at Expedition Fiord, Axel Heiberg Island, Nunavut, as analogues for Mars Myriam Lemelin, Département de géomatique appliquée, Université de Sherbrooke Gossans are surficial deposits that form through the chemical and physical weathering of bedrock. They can be preserved for thousands of years in the permafrost. In the Expedition Fiord area of Axel Heiberg Island, Nunavut, gossans are associated with ancient hydrothermal deposits that contain minerals also found on Mars. These minerals can preserve traces of microbial life but the way they formed is still unknown. Importantly, gossans in the Expedition Fiord area could be part of a network of fractures through which hydrothermal fluids have been circulating for millions of years. It is possible that these gossans have been formed through the interaction between the metal-rich bedrock and ancient deposits formed in a hydrothermal system. If such, this would have important implication in the search for life on Mars. It is highly probable that hydrothermal systems were active on Mars billions of years ago. These systems are key places to look for signs of ancient microbial life on Mars. Our main objective is to study gossans in the Expedition Fiord area as indicators of ancient hydrothermal systems on Mars at various spatial scales in the context of current and future Mars exploration missions. The specific objectives are as follows: 1. Map the Expedition Fiord area and detect gossans using satellite imagery. 2. Investigate the spectral signature, composition, and potential biosignatures in the gossans and hydrothermal deposits. 3. Conduct detailed spectroscopic, compositional, and biological studies on the returned samples in our university laboratories. The research will be conducted from a base camp located a few kilometers north of the McGill Arctic Research Station, near Expedition Fiord, Axel Heiberg Island. Fieldwork will take place for a period of 17 days from July 8 to 24, 2022. The field crew will travel by foot traverse to local outcrops. They will use geological hammers to collect samples. They will also use portable scientific instruments to collect data directly from the outcrops. The fieldwork will not impact local wildlife in this uninhabited region of northern Nunavut. The data will be stored on portable computers. The data and results will be published in open files and journal articles.

Uiviititut: Les chapeaux de fer sont des dépôts superficiels qui se forment par l'altération chimique et physique de la roche-mère. Ils peuvent être préservés pendant des milliers d'années dans le pergélisol. Dans la région du fiord Expedition sur l'île Axel Heiberg, au Nunavut, les chapeaux de fer sont associés à d'anciens dépôts hydrothermaux qui contiennent des minéraux que l'on trouve également sur la planète Mars. Ces minéraux peuvent préserver des traces de vie microbienne mais leur origine est inconnue. Il est important de noter que les chapeaux de fer de la région du fiord Expedition pourraient faire partie d'un réseau de fractures dans lequel des fluides hydrothermaux circulent depuis des millions d'années. Il est possible que ces chapeaux de fer aient été formés suite à l'interaction entre le socle rocheux riche en métaux et d'anciens dépôts formés dans un système hydrothermal. Si tel est le cas, cela aurait une implication importante dans la recherche de la vie sur Mars. Il est très probable que les systèmes hydrothermaux étaient actifs sur Mars il y a des milliards d'années. Ces systèmes sont des endroits clés pour rechercher des signes de vie microbienne ancienne sur Mars. Notre objectif principal est d'étudier les chapeaux de fer dans la région du fiord Expedition en tant qu'indicateurs d'anciens systèmes hydrothermaux sur Mars à différentes échelles spatiales dans le contexte des missions actuelles et futures d'exploration de la planète Mars. Les objectifs spécifiques sont les suivants : 1. Cartographier la région du fiord Expedition et détecter les chapeaux de fer à l'aide d'images satellitaires. 2. Étudier la signature spectrale, la composition et les biosignatures potentielles des chapeaux de fer et des dépôts hydrothermaux. 3. Réaliser des études spectroscopiques, compositionnelles et biologiques détaillées sur les échantillons retournés dans nos laboratoires universitaires. Les recherches seront menées à partir d'un camp de base situé à quelques kilomètres au nord de la station de recherche arctique de McGill située sur la rive nord du fiord Expedition sur l'île Axel Heiberg. La mission de terrain se déroulera sur une période de 17 jours, du 8 au 24 juillet 2022. L'équipe de terrain se déplacera au moyen de traverses à pied jusqu'aux affleurements locaux. Ils utiliseront des marteaux géologiques pour collecter des échantillons. Ils utiliseront également des instruments scientifiques portables pour recueillir des données directement sur les affleurements. Les travaux de terrain n'auront pas d'impact sur la faune locale dans cette région inhabitée du nord du Nunavut. Les données seront enregistrées sur des ordinateurs portables. Les données et les résultats seront publiés dans des dossiers publics et par le biais d'articles scientifiques.

[illegible]

Operations Phase: from 2022-07-08 to 2022-07-24

Hulilukaarutit

Inigiya	Hulilukaarut Qanurittuq	Nunangga Qanurittaakhaanik	Initurlinga qanuritpa	Initurlinga utuqqarnitat unaluuniit Ingilraaqnitat Uyarannguqtut akhuurninnga	Qanitqiyauyuq qanitqiamut nunallaat kitulluuniit ahiruqtaliyainnit nuna
TMARS Base Camp 2022	Scientific/International Polar Year Research	Crown	The site is located approximately 4 kilometers north of the McGill Arctic Research Station.	N/A	N/A

Nunaliin Ilauyun, Aviktuqhimayuniitunullu Ikayuuhiarunguyun

Nunauyuq	Atia	Timiuyuq	Upluani Uqaqatigiyaungmata
Iqaluit	Nunatta Campus	Arctic College	2022-05-30
Ausuittuq	Dan Smith	Uminmak School	2022-05-30
Qausuittuq	Robert Filipkowski	Qarmartalik School	2022-05-30
Ikpiaryuk	Joan Bower	Inuujaq School	2022-05-30

Angiuttauvaktunik

Naunaiqlugu nunanga talvani havauhikhaq ittuq:

North Baffin

Angiuttauvaktunik

Munariniqmut Ayuittiaqtuq	Angirutinga Qanurittuq	Tadja Qanurittaakhaanik	Ublua Tuniyauyuq/Uuktuqtuq	Umikvikhaa Ublua
Nunavunmi Ihivriuqniqmut Timiqutigiyanga	Application for scientific research license to carry out fieldwork in Nunavut	Applied, Decision Pending		

Project transportation types

Transportation Type	Qanuq Atuqtauniarmangaa	Length of Use
Air	Helicopter for transportation of field crew to and from the TMARS base camp	
Water	Water will be retrieved with buckets from local streams near camp	
Land	Foot traverses	

Project accomodation types

Temporary Camp

Ihuaqutivaluin Atuqtauyukhan

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

Hanalrutit Qanurittuq	Qaffiuyut	Aktikkulaanga – Qanurittullu	Qanuq Atuqtauniarmangaa
Information is not available			

Qanurittuq Urhuqyuaq unalu Qayangnaqtut Hunavaluit Aturninnga

Qanurittuq urhuqyuaq hunavaluit aturninnga:	Urhuqyuaq Qanurittuq	Qaffiuyut qattaryut	Qattaryuk Aktikkulaanga	Atauttimut Qaffiuyut	Ilanga	Qanuq Atuqtauniarmangaa
Information is not available						

Imaqmik Aturninnga

Ubluq qanuraaluk (m3)	Aturumayain imavaluin utiqtittagaani qanuq	Atulirumayain imavaluin utiqtittagani humi
0	bucket transported manually	Local stream

Iqqakuq

Ikkakunik Munakgiyauyunik

Havauhikhaq Hulilukaarut	Qanurittuq Iqqakut	Ihumagiyauyuq Qanuraaluktut Atuqtait	Qanuq Iqqakuurniarmangaa	Halummaqtitarnirutikhan piyutin
Scientific/International Polar Year Research	Qimarivyaktuq imaq	less than 0.01 cubic metre a day	Greywater waste will be disposed of at least 50 m away from base camp and from streams.	N/A
Scientific/International Polar Year Research	Anaagun (inuin anaaguin)	less than 0.005 cubic metres a day	Sewage will be collected in sealed containers that will be transported by helicopter to the McGill Arctic Research Station for incineration.	N/A

Avatiliriniqmut Ayurhautingit:

There are no projected environmental impacts that would result from the proposed fieldwork on Axel Heiberg Island. The site will be cleaned up and left exactly as found once the scientific project has been completed.

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

Qanurittuq Ittunik Avatinga: Inuuhimayunut Avatinga

Qanurittuq Ittunik Avatinga: Inungit-maniliurutingit Avatinga

Miscellaneous Project Information

Naunaiyainiq ukuninnga Ayurhautingit unalu Piumayaat Ikikliyuumiutinahuarutit

Tamatkiumayunik Ihuikgutivaktunik

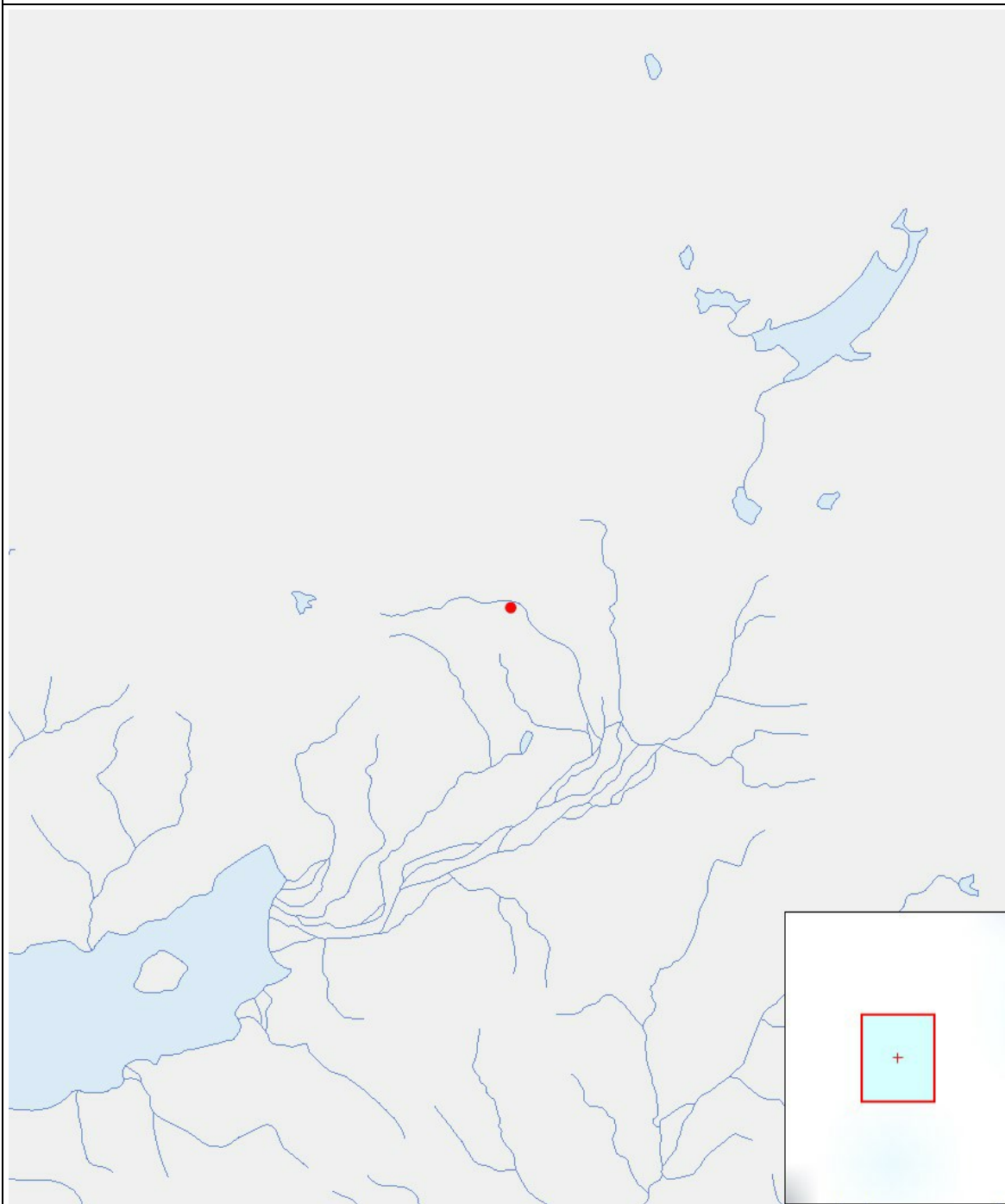
Impacts

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)

Havaariyaayukhamut Nayugaa



List of Project Geometries

1	point	TMARS Base Camp 2022
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