NERC ARCTIC RESEARCH STATION SCIENCE SUMMARIES

ARCTIC STATION

2023 SEASON

Photo: Iain Rudkin, BAS

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Arctic Office
NATURAL ENVIRONMENT RESEARCH COUNCIL

UKRI Natural Environment Research Council

THE NERC ARCTIC RESEARCH STATION

Photo: Iain Rudkin

Established in 1991, the UK's Arctic Research Station in Svalbard is funded by the Natural Environment Research Council (NERC) as part of a broad network of research facilities in Ny-Ålesund to support excellent environmental science. It is managed and operated by the British Antarctic Survey.

The Station is available to support United Kingdom-based researchers and international collaborators across a wide range of fields, including ecology, glacial/periglacial geomorphology, atmospheric chemistry, and marine research.

Priority use of the Station is given to researchers funded by United Kingdom Research and Innovation (UKRI). The Station also welcomes those supported directly by universities and research centres or funded from other routes, such as the Leverhulme Trust, the European Union and similar sources.

The Station provides an extremely effective and safe platform for Arctic field research. Comprising 440m^2 of laboratory, office, workshop, storage, garage, sitting room and bedroom space. All users of the

Photo: BAS

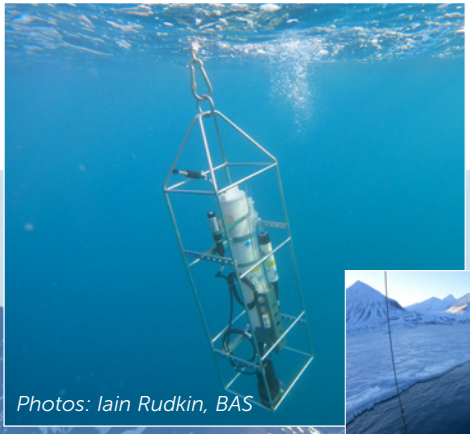
Station receive comprehensive briefings and appropriate training. Safety support is provided during their stay. There is also access to snowmobiles and a wide range of field support equipment. The Station is extremely well-connected via a fibre optic web link and telephone system. However, to prevent interference with sensitive instruments at a Geodetic Earth Observatory in Ny-Ålesund there is currently no mobile telephone network or Wi-Fi access anywhere in the community. However, as of 2024, there will be 4G mobile coverage.

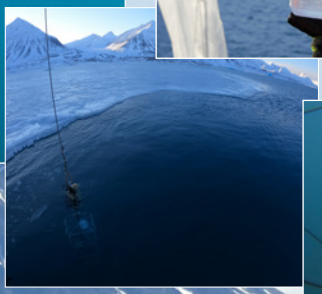
The Station is normally open to support researchers from early March through to early September, although there is potential to open the Station at other times of the year. Expressions of interest in using the Station are welcome at any time but it is best to apply as early as possible.

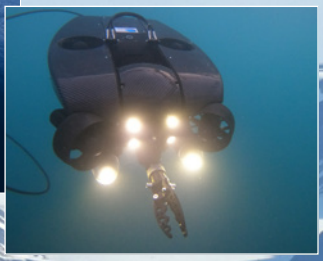
For further information about the Station, the application process and who to contact, as well as detail on Ny-Ålesund itself, please visit the NERC Arctic Office website: www.arctic.ac.uk
You can also access a virtual tour of the Station here: https://virtual.arctic.ac.uk/

Science equipment

Recent investment by UKRI-NERC has enabled the Station to include a range of cutting-edge science kit, including an ice corer and CTD, and a Polarcirkel workboat which is available for use in the nearby Kongsfjorden, extending the reach and range of activities for the next generation of Arctic scientists. There is also a comprehensive film and editing setup to allow scientists visiting the Station to document their work and prepare material for outreach and other communication purposes. From a comfort perspective, the Station is also well stocked with outdoor clothing to loan to visitors during the colder spring season as well as providing a backup in case of lost luggage. The use of any of this equipment is included in the service the facility provides and incurs no extra cost.







Photos: Iain Rudkin, BAS

Photo: Maddy Lewis

NERC Arctic Station Laboratory

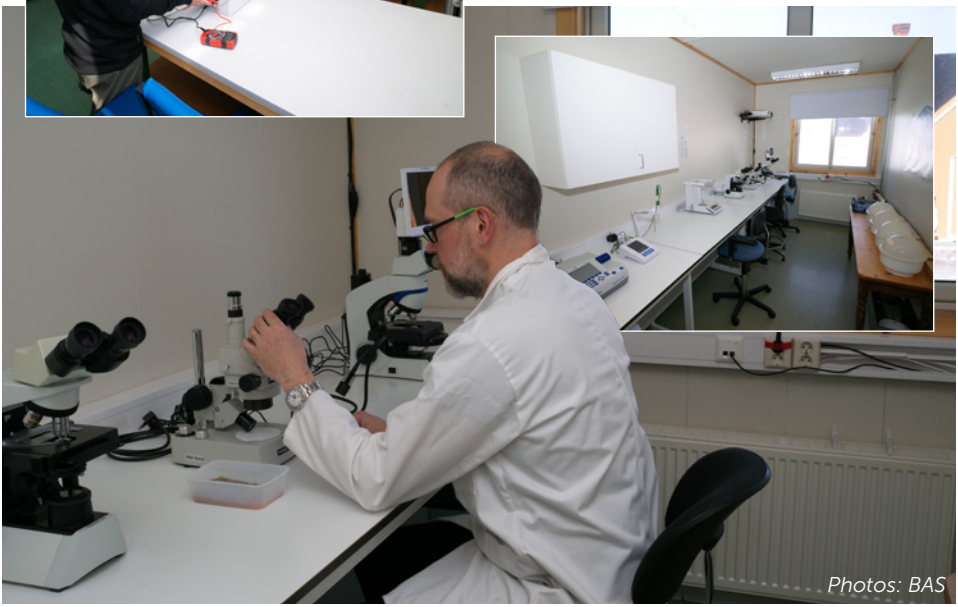
This multipurpose facility comprises four separate laboratory spaces:

- Large main laboratory with wide benching and double sink. Suitable for use as laboratory or electronics workshop
- Annex chemical laboratory with recirculating fume hood, Class II biological safety cabinet and oven
- Wet laboratory with ultra-pure water system, sink and benching
- Dry laboratory with benching, balances and microscopes
- As well as associated office space and store of general laboratory consumables

The laboratory equipment available for sample preparation, preservation and basic analysis now includes:

- Spark free laboratory fridges and chest freezers
- Balances (2 d.p. and 4 d.p.)
- Vacuum pumps
- Oven and vacuum concentrator
- Microscopes (multiple light field, including blue light)
- BioSpectrometer (200-830nm; with µCuvette)
- pH meter
- Centrifuges, heat block mixer and vortex (for 1.5ml, 15ml & 50ml tubes)
- Autoclave, steriliser, and microwave
- Web ports available in the laboratory

Further information is available from the Station pages on the Arctic Office website: www.arctic.ac.uk or contact Elaine Fitzcharles, emfi@bas.ac.uk



Photos: BAS

THE NY-ÅLESUND INTERNATIONAL RESEARCH COMMUNITY

Scientific research in Ny-Ålesund began in 1966. The Norwegian Polar Institute established a research station in 1968. The Cambridge Arctic Shelf Programme operated a busy summer field base from 1972 – 1992 overlapping with the NERC Arctic Research Station, which opened in 1991. There are now 14 research stations operated by 10 nations: Norway, United Kingdom, Germany, France, Japan, Italy, China, Netherlands, Korea and India. There is strong collaboration between the various international partners within the Ny-Ålesund research community.

There are also several other affiliated organisations including the University of Svalbard (UNIS). The Ny-Ålesund Science Managers Committee (NySMAC) includes representatives from each station. The BAS Arctic Operations Manager, Dr Iain Rudkin, is the Vice-Chair of the Committee. They discuss project details, promote international collaboration, science quality and help ensure protection of the local natural environment. The Committee also organises research seminars held in the countries represented in the community.

Photo: BAS

AN INTRODUCTION TO SVALBARD

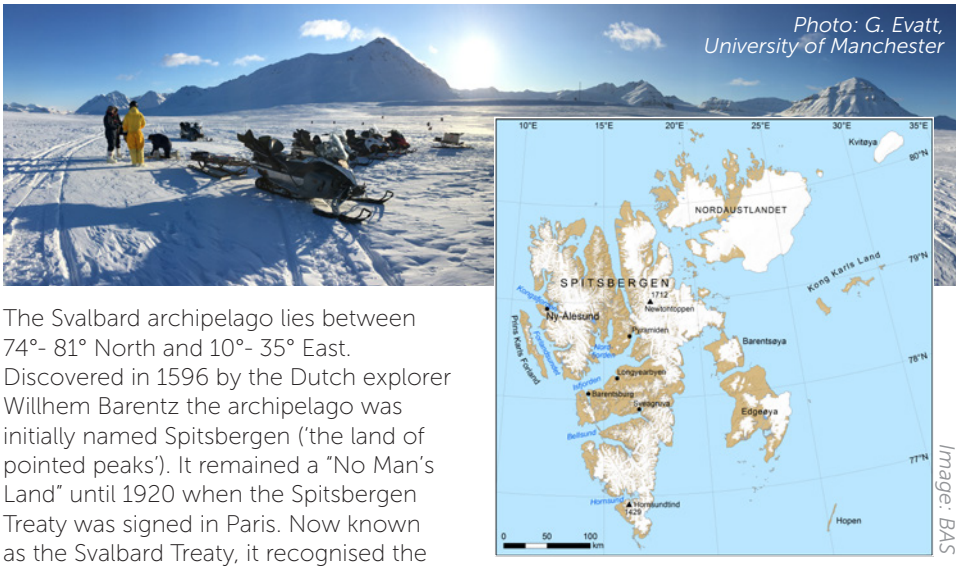


Image: BAS

The Svalbard archipelago lies between 74°- 81° North and 10°- 35° East. Discovered in 1596 by the Dutch explorer Willhem Barentz the archipelago was initially named Spitsbergen ('the land of pointed peaks'). It remained a "No Man's Land" until 1920 when the Spitsbergen Treaty was signed in Paris. Now known as the Svalbard Treaty, it recognised the islands as part of the Kingdom of Norway. There were 14 original signatory nations, including the United Kingdom; today that number has risen to 46.

Svalbard has a land area of 61,000 km^2, approximately 56% of which is currently glaciated. The sun is permanently in the sky from mid-April to late August and lies below the horizon mid-October to late February, showing above the mountains near Ny-Ålesund (79°North), in early March. The west coasts of Svalbard experience the last remnants of the North Atlantic Drift. From mid-June to early September the coastline is largely snow free with areas of alluvial plain and tundra, which support plant life.

The Arctic is experiencing climatic warming three times faster than the rate of the rest of the world. Average temperatures in Svalbard have increased by 4°C in the last 50 years with the local area and its wildlife experiencing rapid changes. Some of these changes include:

- rapidly shrinking glaciers - the north side of the local glacier Kronebreen has retreated by at least 2.6km since the Station was established;
- warming air and seas bringing new bird and fish species, including Mackerel;
- alterations to plant life and growth cycles; and
- increasing marine microplastic pollution.

The Ny-Ålesund area is home to the polar bear, reindeer, arctic fox, ringed, harbour and bearded seals, walrus and whales including beluga, humpback and minke. Blue and fin whales are becoming quite common. Birds make use of the perpetual summer sunlight to nest. They include puffins, Brunnich's guillemots, phalaropes, fulmars, ivory gulls, little auks and ptarmigan. Barnacle geese return in the summer having spent the winter on the shores of the Solway Firth. Terns rear their young before returning to Antarctica in the autumn.

PROJECT SUMMARIES

The NERC Arctic Research Station has supported over 100 projects in the last 10 years, with up to 40 scientists regularly visiting each year. The location is particularly suitable for ecological research, glacial/periglacial geomorphology, hydrology and atmospheric chemistry and marine research. The Station also provides an excellent training ground for United Kingdom-based students to gain experience of working in a remote polar environment. 2023 was another busy season for the Station, supporting thirteen science projects and two VIP visits.

Photo: Iain Rudkin, BAS

NERC Arctic Station Projects 2023

RiS #	Project PI / Leader	Institute	Project Title	Location	Funding source
12175	Dr Rachel Coppock	Plymouth Marine Laboratory	Scoping use of autonomous technologies to complement observations of winter-spring dynamics in Kongsfjorden, Svalbard	Kongsfjorden	2022–2023 NERC Arctic Station Access Scheme
12132	Dorothea Moser	British Antarctic Survey	Wet Fingerprints – Constraining the Influence of (Near-) Surface Melting on Svalbard Snow Structure	Gruvebadet	Arctic Field Grant through Norwegian Research Council
12179	Prof Alistair Crame	British Antarctic Survey	An Introduction to Polar Fieldwork for Early Career Researchers	Midtre Lovénbreen & Kongsfjord	NERC Advanced Training Short Course
12207	Prof Bjorn Tytgat	University of Ghent	Climate change Impacts on Arctic soil and lake microbiomes (CLIMARCTIC)	Knudsenheia and Kongsfjordneset	Belgian Science Policy Office project ExPoSoils
6921	Dr Kevin Newsham	British Antarctic Survey	REMUS: Responses of Microbes in Upper Soil Horizons to Environmental Manipulations	Kongsfjordneset	NERC and Universities of Ghent and Edinburgh
12212	Prof Chris Williamson	University of Bristol	iDAPT: ice dependent adaptations for plant terrestrialization	Midtre Lovénbreen, Austre Broggerbreen and Feiringbreen	The Leverhulme Trust
12197	Prof Bryan Spears	UK Centre for Ecology and Hydrology	BIOPOLE (Biogeochemical processes and ecosystem function in changing polar systems have global impacts)	Ny-Ålesund	BIPOLE is a 5-year NERC National Capability Multi-centre Programme
12044	Prof A Edwards	Aberystwyth University	Temporal dynamics of glacier ecosystems (Cryo356)	Glaciers around Ny-Ålesund: Austre Broggerbreen, Vestre Broggerbreen, Vestre Lovénbreen, Midre Lovénbreen	NERC
12248	Dr James Bradley	Queen Mary University of London	QCARBON	Midtre Lovénbreen glacier forefield to Kongsfjord shoreline	NERC and DFG (German national funding agency)
11966	Dr Nicholas Cassar	Duke University, USA	Response of Nitrogen Fixation in Lichens and Mosses to a Rapidly Changing Arctic Environment (N2 Fix)	South of Ny-Ålesund	H2020 EU Funded – INTERACT III - Transnational Access Programme
11462	Dr James Bradley	Queen Mary University of London	SUNSPEARS	Midtre Lovénbreen	NERC/NSF
10785	Prof Mike Kosch Dr Mark Clilverd	Lancaster University British Antarctic Survey	Mesopheric ozone radiometer (MOSAIC)	NERC Station, Ny-Ålesund	BAS research grant (Royal Society Newton International Exchanges project)
12252	Dr Mark Clilverd	British Antarctic Survey	Antarctic-Arctic Radiation-belt Dynamic Deposition VLF Atmospheric Research Konsortia (AARDDVARK)	NERC Station, Ny-Ålesund	BAS National Capability-SS funding

Scoping use of autonomous technologies to complement observations of winter-spring dynamics in Kongsfjorden, Svalbard

Research in Svalbard database number: 12175

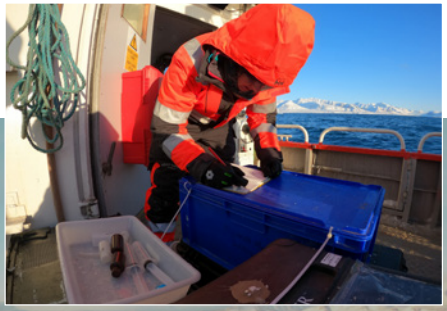
Date of visit: 6–20 March 2023

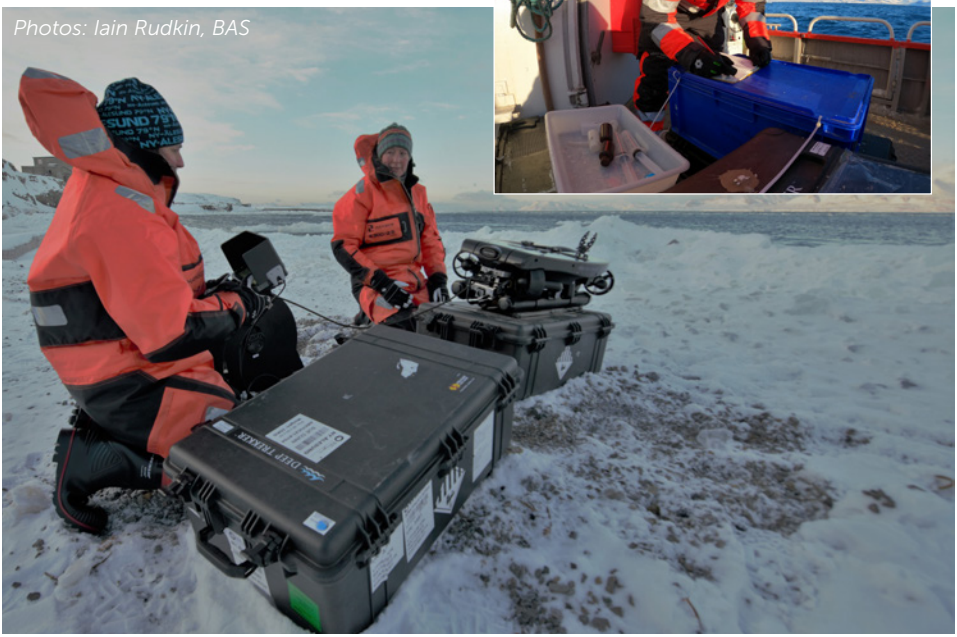
Principal investigator: Dr Rachel Coppock, Plymouth Marine Laboratory

Field team: Prof Helen Findlay, Plymouth Marine Laboratory

Email: rac@pml.ac.uk

Researchers from Plymouth Marine Laboratory and British Antarctic Survey teamed up to conduct sampling in Kongsfjorden in late winter/early spring 2023. The team went with several different aims, the first of which was to track water column properties in this high Arctic fjord, to complement our understanding of the driving mechanisms behind the initiation of spring blooms in polar regions and the resulting impact of Arctic warming on coastal Svalbard. Another aim of the visit was to assess to what extent key zooplankton species may be exposed to microplastic ingestion within the fjord. For both aims, sampling was conducted along a transect from the glacial input of the inner fjord to the Atlantic influences of the outer fjord. In tandem, we were able to trial and optimise some of the Station's new field kit to help us achieve these aims, including a CTD (a set of electronic instruments that measure conductivity, temperature and depth), plankton sampling nets to collect microplastics and zooplankton, and a state of the art ROV (remotely operated vehicle).





Photos: Iain Rudkin, BAS

Wet Fingerprints – Constraining the Influence of (Near-) Surface Melting on Svalbard Snow Structure

Research in Svalbard database number: 12132

Date of visit: 17 March – 3 April 2023

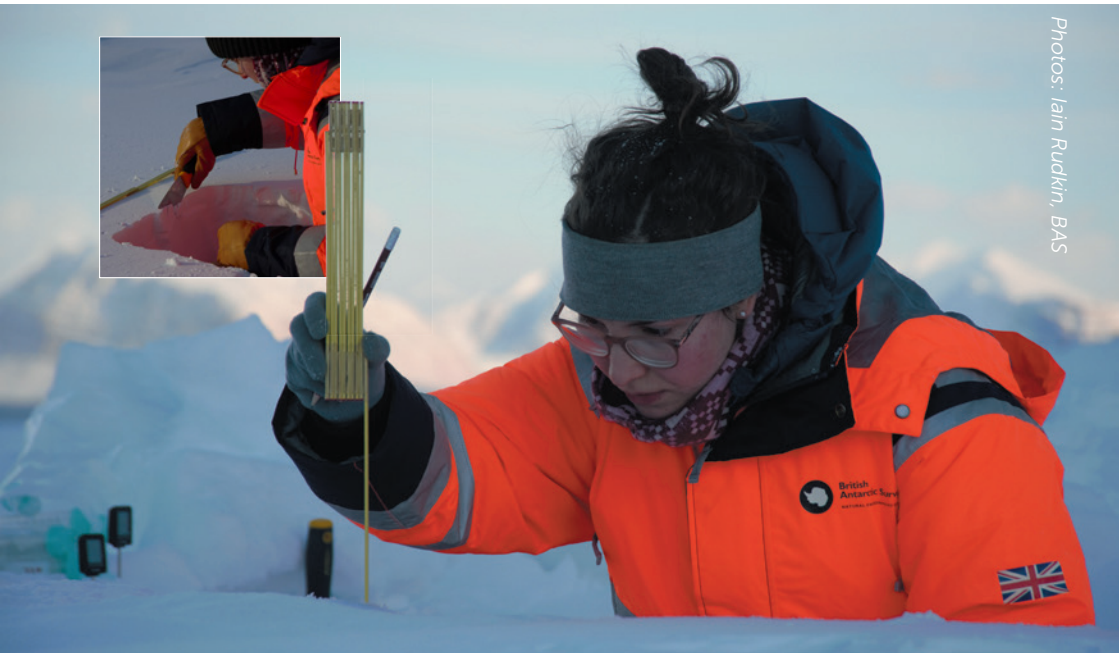
Principal investigator: Dorothea Moser, British Antarctic Survey (BAS)

Field team: Dr Iain Rudkin and Guy Hillyard, BAS

Email: dorose14@bas.ac.uk

Svalbard ice cores have provided invaluable information about past climate variability. However, in the light of global warming, the Arctic is increasingly vulnerable to surface melt and more frequent rain-on-snow events, so that snow melt conditions in Svalbard are changing rapidly. It is crucial to constrain the impact of melting on Svalbard snow signatures. During the Wet Fingerprints Arctic Field Grant project led by Dorothea Moser, in-situ rain-on-snow tracer percolation experiments have been used to (1) assess the meltwater flow and refreezing processes in the vicinity of Ny-Ålesund, and (2) compare the informational value of stable water isotope records before and after rain-on-snow induced melt events in the context of structure changes. These type of near-surface snow measurements are essential to assess the site-specific factors shaping melt-induced alterations of ice-core proxies where they occur.

The fieldwork was supported by the NERC Arctic Research Station and successfully completed in March 2023. It included 20 in-situ percolation tracer experiments in 10 snow pits near Ny-Ålesund, and the insights that the team has gained are fundamental for interpreting climate signals in melt-affected ice cores from Svalbard glaciers and beyond. First results have already been presented at the Svalbard Science Conference 2023, various collaborating research groups, and during public outreach events – and there is more to come.



Photos: Iain Rudkin, BAS

An Introduction to Polar Fieldwork for Early Career Researchers

Research in Svalbard database number: 12179

Date of visit: 17 April – 2 May 2023

Principal investigator: Prof Alistair Crame, British Antarctic Survey

Field team: Ali Teague, Robert Mulvaney, Aurelia Reichardt, Julie Baum, British Antarctic Survey

Email: jacr@bas.ac.uk

Photo: Iain Rudkin, BAS

The purpose of the course was to give PhD students and early career researchers in polar science an opportunity to experience a polar environment first hand. This year, 14 students from across the UK participated in a wide range of fieldwork including digging a snow pit, GPS plotting, radar mapping and ice core drilling for glacial observations, taking sediment and water samples from the boat for marine observations. Some of these were recorded and compared to measurements taken from previous BAS fieldwork training courses which took place in late summer. Glacier work in April in snow added new and exciting elements to the course. The students were fully engaged with all elements of the science, health and safety, communal living and thinking about future possibilities of fieldwork. Key highlights from the course included comparing glacial retreat data through time, taking ice core samples and observations of marine life in fjord water samples.

Photo: Iain Rudkin, BAS

Climate change Impacts on Arctic soil and lake microbiomes (CLIMARCTIC)

Research in Svalbard database number: 12207

Date of visit: 26 June – 6 July 2023

Principal investigator:
Dr Bjorn Tytgat, Ghent University

Field team: Lotte De Maeyer, Jill De Visscher, Ghent University

Email: bjorn.tytgat@ugent.be

The CLIMARCTIC project is aimed at studying the effects of climate change on the diversity and genetic functional attributes (nutrient and carbon cycling) of High Arctic microbiomes in soils, wetlands and lakes. It is led by Ghent University and this season, worked in collaboration with the REMUS project, led by Dr Kevin Newsham from the British Antarctic Survey.

The main objectives for the summer 2023 fieldwork were to:

- resample Biological Soil Crusts and associated subsoil microbial communities in a wet-dry transect in Knudsenheia on 14 plots;
- carry out an inventory of plants and recording of plant cover along the Knudsenheia transect
- carry out any necessary repairs of snow fences installed in Knudsenheia
- assist Dr. Kevin Newsham in repairing the Open Top Chambers at Kongsfjordneset as part of the REMUS project.

The fieldwork was successful, and all objectives were achieved, including the installation of time-lapse cameras. The installation of these cameras will allow the team to compare the onset and duration of snow cover in the snow fence plots compared to the control plots. The team were also able to carry out important vegetation and invertebrate monitoring.

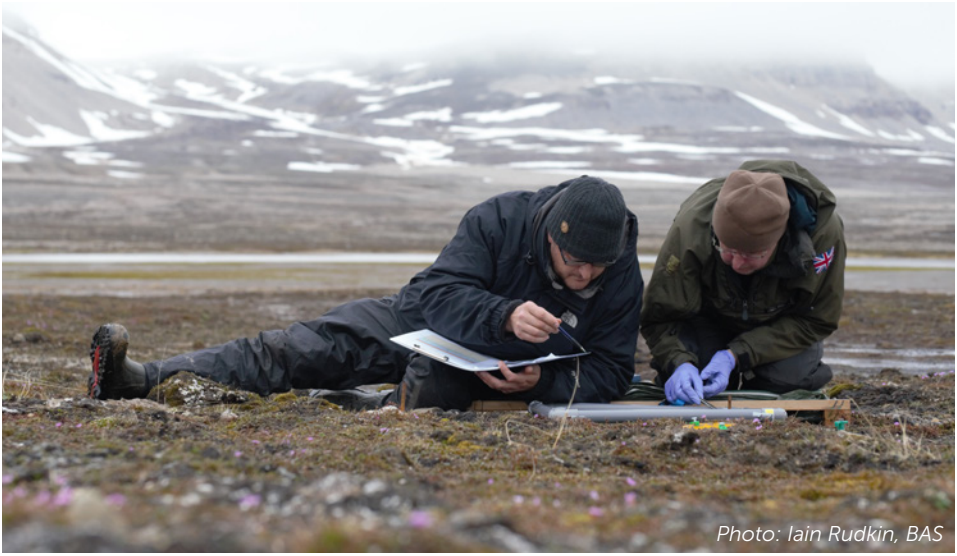


Photo: Iain Rudkin, BAS

REMUS: Responses of Microbes in Upper Soil Horizons to Environmental Manipulations

Research in Svalbard database number: 6921

Date of visit: 26 June – 6 July and 28 August – 7 September 2023

Principal investigator: Dr Kevin Newsham, British Antarctic Survey

Field team: Bjorn Tytgat, Lotte De Maeyer, Jill De Visscher, Ghent University and Jiri Subrt, University of Edinburgh

Email: kne@bas.ac.uk

In September 2014, REMUS, a long-term soil warming experiment, was set up at Kongsfjordneset on the Brøggerhalvøya Peninsula. Forty-eight plots in three blocks were established over frost boils. The boils were colonised by *Salix polaris, Bistorta vivipara* and *Saxifraga oppositifolia*, and by microbial soil crusts. Twenty-four ITEX chambers (1.2 m basal diameter, 0.75 m aperture diameter, 400 mm height, each held down with ropes) were deployed over frost boils to increase mean annual soil surface temperatures by c. 1 degrees Celsius. The REMUS team visit the site every year. In 2023, the main objective of the fieldwork was to sample roots and leaves of Salix polaris and Bistorta vivipara, along with soil, from the warming experiment at Kongsfjordneset. The REMUS experiment was properly maintained in June-July and sampled in August-September. The BAS led experiment will come to an end in 2024.

Photo: Iain Rudkin, BAS

iDAPT: ice dependent adaptations for plant terrestrialization

Research in Svalbard database number: 12212

Date of visit: 3–31 July 20233

Principal investigator: Prof Christopher Williamson, University of Bristol

Field team: Jaz Millar, Emily Broadwell, Madeleine Lewis, Tom Harvey, University of Bristol

Email: c.williamson@bristol.ac.uk

On the surfaces of glaciers and ice sheets, specialized species of Streptophyte 'glacier algae' establish wide-spread algal blooms during summer melt seasons. To achieve this, glacier algae must balance their requirements for growth and survival against extremes in temperature, desiccation, visible and UV radiation; key stressors important in the transition of ancestral Streptophytes from aquatic to terrestrial environments. In this respect, surface ice environments may represent an important intermediate between freshwater and terrestrial systems, driving evolution of key biological traits critical to the colonisation of land.

By studying the mechanisms that allow living Streptophyte glacier algae to thrive in supraglacial environments, iDAPT is delineating the role of surface ice environments in processes of land plant terrestrialization.

The main focus for the fieldwork on Svalbard was to quantify glacier algal adaptations to life in ice across multiple Svalbard glaciers. To achieve this, the team addressed the following objectives:

i) deployment of the Photosynthetron to measure glacier algal responses to dominant environmental stressors across multiple Svalbard glaciers.

ii) to twin Photosynthetron measurements with fine-scale environmental monitoring within the supraglacial weathering crust, including micro-scale measurements of temperature, dissolved oxygen, pH and EC within surface ice colonized by glacier algae.

iii) to undertake complementary sampling of supraglacial ice for subsequent quantification of bulk-scale geochemistry including inorganic nutrients, major ions and dissolved organics back at the University of Bristol.

The team managed to successfully sample glacier algae from three contrasting glaciers and take in situ measurements of their activity for the first time. Highlights included capturing the early bloom season on glacier algae, using novel sampling methods, and taking in-situ measurements.

Further information about iDAPT can be found here: https://microlabbristol.org/research/115-2/

Photos: Iain Rudkin, BAS

BIOPOLE (Biogeochemical processes and ecosystem function in changing polar systems and their global impacts)

Research in Svalbard database number: 12197

Date of visit: 6 July – 3 August 2023

Principal investigators: Prof Bryan Spears, UK Centre for Ecology and Hydrology and Prof Kate Hendry, British Antarctic Survey

Field team: Nathan Callaghan, Alanna Grant, Chris Evans, UK Centre for Ecology and Hydrology

Email: spear@ceh.ac.uk

BIOPOLE is an interdisciplinary programme examining biogeochemical processes and ecosystem function in polar ecosystems. It will address a fundamental aspect of the Earth System – how nutrients in polar waters drive the global carbon cycle and primary productivity. Over the next 5 years, BIOPOLE scientists will conduct their research in both the Arctic and Antarctic.

In the summer of 2023, a team carried out an Arctic field campaign to sample glacial nutrient inputs accessible from the Ny-Ålesund Research Station. The team worked to assess nutrient sources and pathways at the periphery of the Fram Strait (i.e., sea and land terminating glaciers, sea ice).

During the 4 weeks that the team were in Ny-Ålesund, they were able to collect a range of samples of natural waters, particulates and sediments to study the flux of key nutrients across the land-ocean continuum. This included samples from glacial and non-glacial rivers (spot samples and samples across a salinity gradient), process-based experimental sites, and CTD casts/Niskin samples from inner to outer fjord. The CTD data were processed at the station and were of good quality. The samples were mostly shipped or hand-carried back to the UK for analysis. The team also used drone technology to determine river water fluxes.

Further information about the wider BIOPOLE programme can be found here: https://biopole.ac.uk/

Photo: Iain Rudkin, BAS

Temporal dynamics of glacier ecosystems (Cryo356)

Research in Svalbard database number: 12044

Date of visit: 31 July – 10 August 2023

Principal investigator: Professor Arwyn Edwards, Aberystwyth University

Field team: Neil Glasser and Tina Rai, Aberystwyth University

Email: aye@aber.ac.uk

Glaciers host microbial ecosystems which exhibit surprising levels of biodiversity and activity despite the seemingly austere conditions for life on ice. In the light of the rapid climate change affecting the High Arctic there is an urgent need to understand the spatial and temporal constraints on these ecosystems, as well as their metabolic processes. The project's key goals relate to the stated aims and objectives of NERC Standard Grant NE/V012991/1 and help the delivery of the project by accessing a diverse range of glacier surfaces to collect samples of microbiota associated with debris on bare ice surfaces. This will enable a comparative approach to be taken for constraining the spatial and temporal variability in supraglacial microbiota and cognate metabolic processes.

The CRYO356 project's overall hypothesis is that glacier surfaces host light-independent microbial metabolic activities, thus allowing microbial activities in unexpected conditions with neglected contributions to nutrient cycles and greenhouse gas production. The team are using the High Arctic glaciers of Svalbard in every season to compare their microbial communities in the depths of polar night, the cold of the winter, the spring thaw and the height of summer. At each glacier the team hope to collect samples for molecular analyses and measure microbial activities. They will conduct experiments to reveal how the microbes survive in these conditions, and how they interact with the carbon and nutrient cycles of the glaciers. The team will also combine their fieldwork with carefully-controlled incubation experiments in cold labs in the UK, US and Norway. By doing this, they will have a clear picture for the first time of how life survives all seasons on Arctic glaciers and what this means for the ecology of Arctic glaciers as they face an uncertain future in the warming Arctic.

The field campaign in 2023 was successful, and the team were able to collect samples from the glaciers where they had planned to during the summer of 2023. Samples are cryoconite and associated debris mounds from the glacier surface as well as descriptions of glacier surface structures. Having now completed the summer-season sampling, the team hope to re-visit on a future occasion to collect winter and spring samples.

Photo: Iain Rudkin, BAS

QCARBON

Research in Svalbard database number: 12248

Date of visit: 3–14 August 2023

Principal investigator:
Dr James Bradley, Queen Mary University of London

Field team: William Orsi, Juan Carlos Trejos Espeleta, Ian Stevens, Eva Doting, Ludwig Maximilian University of Munich, Arhus University, University of Pennsylvania

Email: jbradley.earth@gmail.com

The overarching research aim of the proposed work for QCARBON is to quantify the role of Fungi in the marine carbon cycle, in a rapidly changing Arctic environment. The team will address this knowledge gap by optimizing and implementing a state-of-the-art new method, qSIP, to quantify for the first time the carbon assimilation of specific fungal taxa in the marine environment. The team's preliminary data from Svalbard show that Fungi are ubiquitous and actively assimilating and cycling organic carbon and nitrogen along a transect spanning the Midtre Lovénbreen glacier forefield to Kongsfjord shoreline. During the fieldwork campaign in 2023, the team extended this transect by sampling beach sediments and shallow marine sediments, and measured organic carbon and nitrogen assimilation processes, as well as remineralization rates, among taxonomically and functionally diverse Fungi that are delivered via glacial meltwater to the fjord. Sample analyses are currently underway and the team plan to visit Ny-Ålesund once again in 2024 to explore further ideas developed while on site in 2023.

Photo: Iain Rudkin, BAS

Response of Nitrogen Fixation in Lichens and Mosses to a Rapidly Changing Arctic Environment (N2 Fix)

Research in Svalbard database number: 11966

Date of visit: 24 August – 7 September 2023

Principal investigator:
Dr Nicholas Cassar, Duke University

Field team: Perrin Hagge, Duke University

Email: Nicolas.Cassar@duke.edu

Funded through the EU INTERACT Transnational Access Scheme, the N2 Fix project aims to address the response of nitrogen fixation in lichens and mosses (cryptogams) to a rapidly changing Arctic environment. The team visited the station in 2022 and were funded again to revisit in 2023. The team's objective was to measure the biological nitrogen fixation (BNF) ability of cryptogams using ARACAS method either *in situ* or in the laboratory. During their visit to the Station, the team were able to successfully collect samples each morning from the field and measured if they were fixing nitrogen in the lab during the late morning through early evening.

Photo: Claudia Colesie, Edinburgh University

Photo: Iain Rudkin, BAS

Photo: Paul Samways, BAS

SUNSPEARS

Research in Svalbard database number: 11462

Date of visit: 14–30 August 2023

Principal investigator: Dr James Bradley, Queen Mary University of London

Field team: Zhou Lyu, Queen Mary University of London, Steve Schmidt, University of Colorado Boulder, Pacifica Summers, University of Colorado Boulder, Mihai Cimpoiasu, British Geological Survey, Harry Harrison, British Geological Society, Trevor Irons, Montana Tech, Carlos Oroza, University of Utah, Dane Liljestrand, University of Utah

Email: jbradley.earth@gmail.com

The main objective of this permafrost project is to understand how seasonal processes contribute to the longer-term development of Arctic soils. The objectives include sampling and analyses for biological and chemical characteristics of the soil at various times of year and establishing continuous monitoring of the physical properties of the soils via geophysical instrumentation. Maintenance of sensors, data collection, and sampling is still ongoing, and the project is expected to be completed in 2025.

Photo: Iain Rudkin, BAS

Mesopheric ozone radiometer (MOSAIC)

Research in Svalbard database number: 10785

Date of visit: 2017–2028

Principal investigators: Prof Michael Kosch, Lancaster University and Dr Mark Clilverd, British Antarctic Survey

Email: macl@bas.ac.uk

The Mesopheric Ozone Spectral Analysis Instrument Chain (MOSAIC) is a chain of spectrometers running from pole to pole at about the longitude of Europe/Africa. The chain is a collaboration between the Massachusetts Institute of Technology, Lancaster University, the South African National Space Agency, and the British Antarctic Survey. The instrument is a passive, low-cost spectrometer for detecting ozone at altitudes of ~100 km (about the same height as the aurora). The instrument uses a satellite TV dish and a low noise block converter (LNB) to monitor the line radiation at 11.072 GHz generated by ozone in the mesosphere.

This experiment will map the concentration of high-altitude ozone from pole to pole, and identify the changes caused by space weather. Ultimately, it will lead to greater understanding of the role of space weather within the Earth's climate system, and in our ability to forecast seasonal weather patterns more reliably in the future.

Antarctic-Arctic Radiation-belt Dynamic Deposition VLF Atmospheric Research Konsortia (AARDDVARK)

Research in Svalbard database number: 12252

Date of visit: 2005–2030

Principal investigator: Dr Mark Clilverd, British Antarctic Survey

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The Antarctic-Arctic Radiation-belt (Dynamic) Deposition - VLF Atmospheric Research Konsortium (AARDDVARK) provides continuous long-range observations of the lower-ionosphere. The Konsortia sensors detect changes in ionisation levels from ~30-85 km altitude, with the goal of increasing the understanding of energy coupling between the Earth's atmosphere, Sun, and Space. The team use the upper atmosphere as a gigantic energetic particle detector to observe and understand changing energy flows; this Science area impacts our knowledge of global change, communications, and navigation. The joint NZ-UK Antarctic-Arctic Radiation-belt (Dynamic) Deposition - VLF Atmospheric Research Konsortia (AARDDVARK) is a new extension of a well-establish experimental technique, allowing long-range probing of ionisation changes at comparatively low altitudes.

This long-term project started in 2005 and currently set to run until 2030. It is one of two remotely run projects supported by the Station. Further information is available here: https://space.physics.otago.ac.nz/aarddvark/

PARLIAMENTARY VISIT

Photo: Iain Rudkin, BAS

It was a pleasure to host an official visit from the UK Parliament's Environmental Audit Committee at the end of March. The group of seven MPs and two Parliamentary clerks visited as part of their Inquiry into the relationship between the UK and the Arctic Environment. They met science teams working from the Station and saw research in action, including enthusiastically participating in fieldwork experiments. Over their stay the team had the opportunity to see how the Station runs on a day to day basis and how it fits in to the wider research support system in Ny-Ålesund. The Committee's Inquiry findings were published in the autumn and the full Report, together with the Government's response, is available online via the Parliament website.

POET LAUREATE VISIT TO THE STATION

Later in the summer the Station had one of its first 'By Royal Appointment' guests, when the Poet Laureate Simon Armitage came to visit. Simon has made the changing climate and environment, and the human response to it, a central part of his ten-year Laureate-ship. He was visiting with the BBC Radio 'Contains Strong Language' team to produce a series of programmes reflecting on the Arctic, wildlife and environmental change. The poems that Simon wrote whilst visiting Ny-Ålesund and other locations in Norway, and which he read during the broadcasts, are an evocative and powerful reminder that this part of the Arctic is at the leading edge of our changing climate. The 'Poet Laureate in the Arctic' episodes are available via the BBC website: https://www.bbc.co.uk/programmes/m001rgvf.

Thank you to Simon and Sue Roberts (BBC) for being such enthusiastic and thoughtful guests.

Photos: Jane Francis, BAS

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