NERC ARCTIC RESEARCH STATION SCIENCE SUMMARIES

ARCTIC STATION

2025 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: BAS

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 (BAS).

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 is also a part of the EU Horizon Europe project POLARIN (Polar Research and Infrastructure Network - https://eu-polarin.eu/), providing transnational access.

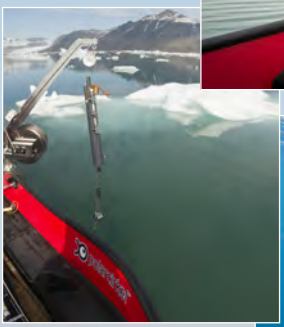
The Station provides an extremely effective and safe platform for Arctic field research. The Station comprises of 440m^2 of laboratory, office, workshop, storage, garage, sitting room and bedroom space. All users of the Station receive comprehensive briefings and appropriate training. Safety support 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 is now 4G mobile coverage.

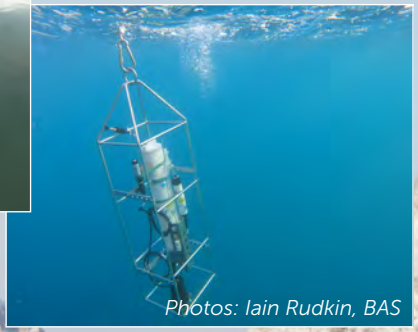
The Station is normally open to support researchers from early March through to early September, although there is potential to open the Station at other times of the year. Expressions of interest in using the Station are welcome at any time but it is best to apply as early as possible.

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 as virtual tour of the Station here: https://virtual.arctic.ac.uk/.

Science equipment

Use of the Station includes a range of cutting-edge science kit, including ice corers, ROV, water samplers 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

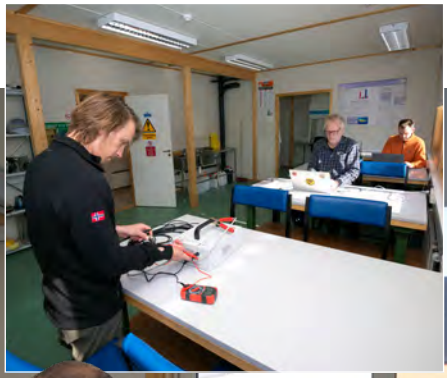
NERC Arctic Station Laboratory

This multipurpose facility comprises the following laboratory spaces:

- Large main laboratory with wide benching and double sink. Suitable for use as laboratory or electronics workshop
- 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

Users are also able to apply to use the Kings Bay Terrestrial Laboratory for any work involving chemicals and will be guided by the Station Manager when applying to access the NERC Station.

Further information about the lab space in the Station is available from the Station pages on the Arctic Office website: www.arctic.ac.uk or by contacting Guy Hillyard, Arctic Labs Manager- ghil@bas.ac.uk.



Photos: BAS

THE NY-ÅLESUND INTERNATIONAL RESEARCH COMMUNITY

Photo: Ny-Ålesund, BAS

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, Republic of 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 and will become the Chair in 2026. NySMAC 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.

AN INTRODUCTION TO SVALBARD


Photo: Iain Rudkin, BAS

The Svalbard archipelago lies between 74°- 81° North and 10°- 35° East. Discovered in 1596 by the Dutch explorer Willem 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 48.

Svalbard has a land area of 61,000 km^2, 56 per cent 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 at least 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:

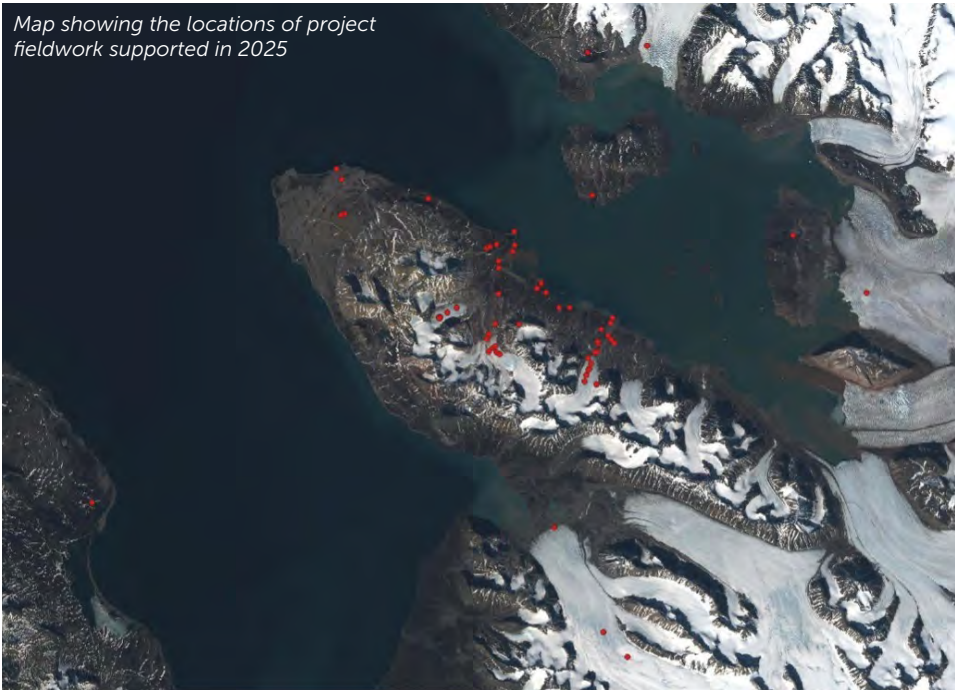
- rapidly shrinking glaciers;
- warming air and seas bringing new bird and fish species, including Mackerel;
- alterations to plant life and growth cycles; and
- increasing marine microplastic pollution.

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.

Image: BAS

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 and an ideal location for proving new technology in a hostile environment and for early career researchers to gain experience of working in a remote polar environment. 2025 was another busy season for the Station, supporting twelve science projects (fourteen visits) and one VIP visit.



Map showing the locations of project fieldwork supported in 2025

NERC Arctic Station Projects 2025

RiS #	Project PI / Leader	Institute	Project Title	Location	Funding source
12044	Dr Arwyn Edwards	Aberystwyth University	Understanding the Dynamics of Glacier Surface Ecosystems during Seasonal Transitions	Midtre Lovénbreen, Austre and Vestre Brøggerbreen, Kongsbreen, Blomstrandbreen	UK-Japan Arctic Science Bursaries Scheme 2024-2025
12304	Dr James Bradley	Mediterranean Institute of Oceanography, France/ Queen Mary University of London	The atmospheric ecosystem over the High Arctic (ARCTIC-AIR)	Midtre Lovénbreen, Austre Brøggerbreen, Vestre Brøggerbreen Zeppelin Observatory	NERC
12515	Dr Liam Kelleher	University of Birmingham	Polar Online Airborne Nano and Microplastic Sensing and Environmental Monitoring (POLARSENSE)	Voitelva, Ny-Ålesund	UK-Arctic Council Working Groups Engagement Scheme 2024-25
12573	Dr Karen Cameron	University of Glasgow	Glacial Ecology through the 21st Century (GECO-21)	Midtre Lovénbreen, Austre and Vestre Brøggerbreen, Comfortlessbreen	UK-Arctic Council Working Group Engagement Scheme 2024-25
12207	Prof Bjorn Tytgat	Ghent University, Belgium	Climate Change impacts on Arctic soil and lake microbiomes (CLIMARCTIC)	Knudsenheia, Kongsfjordneset	Belgian Science Policy Office ExPoSoils
12382	Dr Claudia Colesie	Edinburgh University	Plant phenology change as a driver of Arctic greening trends (TundraTime)	Kongsfjordneset, Aberdeen site, Geopol, Stuphallet, and Blomstrandhalvøya	NERC
12708	Dr Darren Ghent	University of Leicester	Arctic Radiometer Deployment to Validate Satellite-Derived Surface Temperatures for Climate Services	NERC Station, Ny-Ålesund	NCEO/ESA
11462	Dr Mihai Cimpoiasu	British Geological Survey	SUNSPEARS	Midtre Lovénbreen	NERC/NSF
12722	Dr Eva Doting	University of Pennsylvania	Sources and cycling of organic matter along glacial-proglacial-fjord flow paths (SCOOP)	Midtre Lovénbreen, Austre Brøggerbreen	EU Horizon Europe funded POLARIN
12719	Dr James Kempton	University of Oxford	The Genomics Basis of Environmental Adaptations in the Bryophytes and Freshwater Protists of Svalbard (EASE)	Ossian Sars, Hukboggen, Ragnahytta, Forlandet, Lilliehookfjorden	Austrian Academy of Science
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
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)

COLD SHOULDERS: Understanding the Dynamics of Glacier Surface Ecosystems during Seasonal Transitions

Research in Svalbard database number: 12044

Date of visit: February and June 2025

Principal investigator: Professor Arwyn Edwards, Aberystwyth University

Field team: Arwyn Edwards (PI), Tristram Irvine-Fynn, Alice Phillips, Aberystwyth University, Masato Ono, Chiba University and Jun Uetake, Hokkaido University

Email: aye@aber.ac.uk

UK and Japanese research has revealed that glaciers are microbial ecosystems affecting the fates of glaciers in our warming world. We also know the Arctic is warming fastest in its coldest months but know little about life at these times. This project united leading UK and Japanese scientists to study the transition points between the active summer melting season and the frozen conditions typical of autumn and winter in the Arctic. We hypothesized that the meteorological conditions terminating the summer governs the wintertime distribution, activity, and composition of glacier surface microbes. Understanding these changes during the "cold shoulder season" of autumn is essential for understanding ecosystem responses to the rapidly warming winters of the Arctic. To accomplish these goals, the team conducted two deployments of a joint UK and Japanese team to Ny-Ålesund to study autumn and winter glacier-microbe interactions.

Photo: Iain Rudkin, BAS

Photo: Iain Rudkin, BAS

The project successfully completed the planned fieldwork in February and June 2025, building on the work carried out in September 2024. The team prevailed through inclement conditions in February 2025: too little snow, too much wind, and then a winter heatwave. Nevertheless, samples collected from six plots across Midtre Lovénbreen and Vestre Brøggerbreen provided measurements which detailed ice surface albedo, microbial activities, distributions and community biodiversity.

Highlights from the project include:

1. **First shoulder-season glacier sampling**
   Developed a novel field-portable ATP assay to confirm microbial activity in surface ice and debris during polar night transitions. Complementary DNA/RNA analyses are currently underway.
2. **Discovery of parasitic fungi on glaciers**
   Documented chytrid infections in glacier algae across two glaciers, revealing their potential role in carbon cycling and algal population control.
3. **Nitrogen origins and utilization**
   Using isotopic analysis (δ15N, δ18O), demonstrated that microbial activity produces nitrate on glacier surfaces in winter, supporting algal growth later in the season.
4. **UK–Japan Glacier Ecology Workshop**
   Convened 46 participants from 11 institutions in Chiba (March–April 2025), fostering collaboration and knowledge exchange.
5. **NERC Pushing the Frontiers project**
   A follow-on collaborative bid was a deliverable for Cold Shoulders. This took the form of a NERC Pushing the Frontiers project which was submitted in January 2025 with Japanese project partners. The project – EMERGE – was awarded and will commence fieldwork in Ny-Ålesund in early 2026.

The atmospheric ecosystem over the High Arctic (ARCTIC-AIR)

Research in Svalbard database number: 12304

Date of visit: February 2025

Principal investigator: Dr James Bradley, Mediterranean Institute of Oceanography, France/Queen Mary University of London

Field team: James Bradley (PI), Mediterranean Institute of Oceanography, France/Queen Mary University of London (QMUL) and Laura Molares Moncayo, QMUL

Email: jbradley.earth@gmail.com

The atmosphere is the Earth's largest potential habitat, yet the least understood. Microscopic organisms (microbes) are transported between land and water through the atmosphere in a process that shapes global biodiversity and influences disease transmission. Yet little is known about the nature and extent of the atmospheric microbiome, including the rates of airborne input, and the structure and function of resident microbial communities.

Photo: James Bradley

The overarching aim of ARCTIC-AIR is to assess whether High-Arctic atmospheric communities are structured and adapted to the atmosphere, and to investigate the relationship between airborne microbes and adjacent cryospheric habitats. We are addressing two major objectives:

1. To characterize the diversity of High Arctic atmosphere-dwelling and adjacent microbial communities using state-of-the-art molecular techniques.
2. To determine the metabolic capabilities and ecological processes influencing the structure and function of the High-Arctic atmospheric community.

In February 2025, we sampled atmospheric microbial communities across a range of environments using portable SASS 3100 dry air samplers. We deployed our samplers on nearby glaciers Midtre Lovénbreen, Austre Brøggerbreen, and Vestre Brøggerbreen, as well as the tundra, and the Zeppelin Observatory. Our samplers concentrated airborne particles and microorganisms onto filters. These filters were frozen and returned to the Natural History Museum, UK. We are analysing these filters using genomic approaches to understand the microbial community composition, physiological capabilities, and ecological controls of the High-Arctic aeromicrobiome. We also collected underlying and adjacent cryosphere (snow and ice) samples, which we will analyse to compare the microbial communities inhabiting these environments with the air. This data will be used to tackle our main hypothesis – that atmospheric microbial communities are strongly structured due to selection for metabolic traits and resistance to

atmospheric stressors. If the atmosphere is found to be ecologically structured, it would result in the discovery of the largest biosphere on Earth and could broaden how (and where) we may search for life on other planets.

While we were working in Ny-Ålesund, we encountered unusually high air temperatures for wintertime. Air temperatures above 0°C persisted for several days, resulting in rapid melting of the snowpack, meltwater covering the land, and newly exposed bare tundra thawing completely and showing signs of biological activity. We documented our observations of this winter warming event and its potential impacts on snow and soil properties, thermal insulation, microorganisms and dormancy patterns, carbon cycling and soil gas exchange, in a Comment published in Nature Communications: https://www.nature.com/articles/s41467-025-60926-8.

Photo: James Bradley

Polar Online Airborne Nano and Microplastic Sensing and Environmental Monitoring (POLARSENSE)

Research in Svalbard database number: 12515

Date of visit: February and June 2025

Principal investigator: Dr Liam Kelleher, University of Birmingham

Field team: Liam Kelleher, Steve Allen, Nicholas Lugg, University of Birmingham, Gijsbert Breedveld, UNIS, Milena Latz, UFZ

Email: l.kelleher@bham.ac.uk

This project addresses the urgent global concern of Nano and Microplastics (NMP) by enhancing understanding of their distribution and transport mechanisms in the Arctic. The project is a collaboration between the University of Birmingham, University Centre in Svalbard (UNIS), UFZ Helmholtz, and Healthy Earth, with support from the NERC Arctic Station during March and June 2025. Three primary objectives guide the research:

1. Establishing and evaluating automated monitoring stations in and around Ny-Ålesund
2. Refining methodologies (sampling station function) over a 6-month period
3. Systematically collecting and analysing nanoplastics, microplastics, and associated chemicals like polyfluoroalkyl substances (PFAS).

We have developed the first 'online' continually airborne particle collection system, making use of auto-changing sample collection units, the NanoTank, which are changed every 5-days. By extending the temporal and spatial scope of atmospheric studies, utilizing pyrolysis gas chromatography mass spectrometry (pyGCMS) and Raman spectroscopy for analysis, we will build knowledge on pollution transport across varying seasons and weather conditions. Back-trajectory and dispersion modelling will be applied to the generated dataset to allow for detailed understanding of NMP transport into the Arctic.

The findings offer critical insights into NMP pollution transport and its potential impact, contributing significantly to polar research. This research underscores the significance of addressing NMP pollution in the Arctic and highlights the importance of continued monitoring and research in this area. By the end of the project, the team expects to have generated a new technology and knowledge to share with the community.

Highlights from the field include:

1. The use and technology refinement of the first automated remote monitoring systems for airborne NMP and associated chemicals.
2. Generation of new knowledge NMP and associated chemical samples over spatial and temporal scales in the Arctic.
3. Modelling particle trajectories to understand the global flux of NMP into and out of the Arctic region.

Photo: Iain Rudkin, BAS

Glacial Ecology through the 21st Century (GECO-21)

Research in Svalbard database number: 12573

Date of visit: March/April 2025

Principal investigator:
Dr Karen Cameron,
University of Glasgow

Field team: Karen Cameron, University of Glasgow, Neil Glasser, University of Aberystwyth

Email: Karen.Cameron@glasgow.ac.uk

By the end of the century, at least 50% of our glaciers will have disappeared due to climate warming. In the wake of this ongoing environmental disaster, lies an overlooked ecological problem: How will glacial environments function when the glaciers are gone? Glaciers are rich in microorganisms that are specialised to the challenging conditions that they live in; they have crucial roles to play in local nutrient cycling, and global atmospheric and oceanic processes; but almost nothing is known about what happens to glacial microorganisms when they are flushed downstream. Through a two stepped approach, this programme of research will be the first to embark on this important area of study. Firstly, the viability, activity and nutrient cycling of supraglacial microorganisms, subjected to current and future environmental conditions akin to adjoining subglacial, soil and coastal environments, will be tested. Secondly, empirical relationships between ecological responses and 21st century climatic boundary conditions will be explored and modelled. Together, this research will help to shape our understanding of the ecological consequences of climate warming, allowing us to predict how these fragile environments will change over the coming decades, and what the wider scale implications of this may be.

The project successfully collected samples from Ny-Ålesund in June 2024 to investigate biogeochemical responses of glacial communities in downstream environments. Over 300 incubations were conducted under varying conditions (temperature, salinity, light, oxygen, pressure), with subsamples taken for gas analysis, sequencing, and metabolomics. Initial oxygen measurements suggest significant ecological changes, with full data analysis ongoing.

In March 2025, a second campaign on three glaciers examined gas trapping in snowpacks using chamber measurements and air sampling. Preliminary CH_4 data indicate biological winter activity, and CO_2 and CH_4 samples have been sent for ^{14}C and ^{13}C analysis to further investigate their origins. Investigations are ongoing.

It is hoped that the results of this study will provide proof of concept results to develop future larger research projects.

Photo: Iain Rudkin, BAS

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

Research in Svalbard database number: 12207

Date of visit: June 2025

Principal investigator: Prof. Dr. Elie Verleyen, University of Ghent

Field team: Bjorn Tytgat and Ruben Van Daele, University of Ghent

Email: Bjorn.tytgat@ugent.be

The ExPoSoils project (Climate change experiments in Arctic and Antarctic polar desert soils; PI Prof. Elie Verleyen, UGent) is aimed at following up and comparing the effects of climate change experiments initiated up to and over ten years ago in both the Arctic and Antarctica. In the Arctic, Open Top Chambers (OTCs) were installed in Kongsfjordneset (Ny-Ålesund) by Dr. Kevin Newsham in 2014 (British Antarctic Survey, project REMUS) to artificially warm soil and investigate its effect on plant growth, mycorrhizal fungi, and microorganisms. Snow fences were installed in 2017 during the CLIMARCTIC project (PI Elie Verleyen) in Knudsenheia (Ny-Ålesund) in order to investigate the effects of snow cover - affecting i.a. temperature, and light and water availability - on microbial communities. Similar experiments were set up in the Antarctic Sør Rondane Mountains (PI Prof. Wim Vyverman, UGent, Project Microbian).

Photo: Bjorn Tytgat, UGent

During the late summer August-September 2024 field campaign, soil samples were collected from the OTC plots at different depths. In June 2025, the same plots were resampled to now capture the early spring conditions, right after snowmelt. It is known that a surge in microbial activity and greenhouse gas emissions occurs during this period. Using both amplicon sequencing as well as a metatranscriptomics approach, we will study the responses of the microbial communities (bacteria, protists, fungi) and micro-invertebrates (nematodes, tardigrades) in both composition and functioning to these warming experiments and compare between both seasons. Gas measurements were performed to track greenhouse gas (CH_4, CO_2 and N_2O) emissions, which will be linked to the sequencing data. Lastly, data from our time-lapse cameras installed at the snow fence sites were collected. This completes a second full year of daily pictures, providing us insights in the intra and inter-annual dynamics in snow cover at the snow fence plots, and allows comparison with the associated control plots. Snow fence plots were sampled in 2024. Preliminary data show a clear distinction between treatments after 7 years.

Samples from identical experiments were taken in the 2024 and 2025 Antarctic summer in the Sør Rondane Mountains and will allow us to investigate differences and similarities in responses between both polar regions.

Plant phenology changes as a driver of Arctic greening trends (TundraTime)

Research in Svalbard database number: 12382

Date of visit: June, July and August 2025

Principal investigator:
Dr Claudia Colesie, Edinburgh University

Field team: Claudia Colesie, Lisa Pilkinton, Jiri Subrt, Karsten Knerr, Melissa Gerwin, University of Edinburgh

Email: claudia.colesie@ed.ac.uk

The NERC-funded TundraTime project investigates how climate change alters Arctic plant phenology – the timing of important events such as flowering – and how this impacts productivity, including shifting the synchrony of above- and belowground growth. In 2025, the project moved forward by installing phenology cameras in the field to capture the seasonal greening and flowering of vegetation. In conjunction with this, in-growth soil cores installed the year prior were removed during the beginning, middle and end of the growing season to analyse root proliferation within, allowing us to link the timing of the above-ground growth period captured by the cameras to below ground root growth.

Digging deeper into how plants and soils interact, our team conducted a fertilisation experiment to determine how plants that associate with different types of mycorrhizal fungi access complex forms of nitrogen in the soil. Understanding these associations has important implications for plant growth and phenology, therefore contributing to our overall understanding of how global change is impacting Arctic plant communities. These projects involved extensive time in the field and in the Harland-Cox Huset laboratory, processing and analysing soils. The upcoming field season will provide the final data needed for project completion.

Finally, thanks to extensive field support by the NERC Arctic Station, we were able to survey the cover and composition of non-vascular vegetation – lichens and mosses – across the region, with some sites only accessible by boat. Non-vascular vegetation is abundant in the Arctic, but there is currently no way to accurately assess their contribution to productivity due to a lack of knowledge of both their distribution and physiology. Our research will address these gaps by determining the conditions under which lichens and mosses are active and capturing carbon and through understanding how the cover and composition of these organisms changes with climate.

Photo: Ruben Van Daele

Arctic Radiometer Deployment to Validate Satellite-Derived Surface Temperatures for Climate Services)

Research in Svalbard database number: 12708

Date of visit: June 2025

Principal investigator:
Dr Darren Ghent, University of Leicester

Field team: Darren Ghent, Jasdeep Anand and Abigail Waring, University of Leicester

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Land surface temperature (LST) is considered an essential climate variable (ECV) because it characterises key aspects of the climate system. It is measured primarily using satellite remote sensing of emitted thermal infrared radiation from the surface, quantifying the 'skin' temperature. LST influences the global energy balance and drives heat exchange between the land surface and the atmosphere, making it critically important for understanding global weather and climate processes.

To ensure confidence in satellite-derived climate datasets, validation against ground-truth measurements is required to assess accuracy, uncertainty, and long-term stability of climate data records (CDR's). In support of this, the surface temperature research group has installed the first dedicated LST radiometer at the NERC Arctic Station. The system measures both upwelling and downwelling thermal radiation over a relatively homogeneous area. Measurements are taken every second and aggregated to one-minute intervals. The in-situ station will record surface temperature throughout the year, enabling the monitoring of seasonal changes and transitions across different surface types (e.g., pulsa, bare ground, snow, and ice). The station will continue to take measurements until 2027, where the team will need to return to re-calibrate the instrument. The team were also able to spend time assessing the wider landscape in Svalbard with numerous trips to visit the fjord bays and land-terminating glaciers. This allowed for characterisation of the local area in relation to changing surface conditions, particularly during the summer. The project aligns with ongoing work led by the National Centre for Earth Observation (NCEO) and the European Space Agency's Climate Change Initiative (ESA CCI).

Given that Arctic amplification is causing the region to warm approximately four times faster than the global average, capturing detailed surface temperature changes is essential for comparison with satellite observations. This work will enable scientists to quantify and validate LST CDR's used by research, operational services, and wider end users. Validating LST measurements also enables more reliable assessment and application of the data, supporting robust analysis of global and regional temperature trends, particularly of the Arctic landscape and how it's responding to climate change.

Publications:

- NCEO blog: https://www.nceo.ac.uk/news-media/arctic-adventures-satellite-science-in-the-northernmost-town-on-earth/
- BBC Article: https://www.bbc.co.uk/news/articles/cn5165dpzwlo

Photo: Iain Rudkin, BAS

SUNSPEARS

Research in Svalbard database number: 11462

Date of visit: August 2025

Principal investigator:
Dr Mihai Cimpoiasu,
British Geological Survey

Field team: Steven Schmidt,
Ruth Quispe Pilco, Rachel Rubin,
Adam Solon, UC Boulder, USA

Email: mcim@bgs.ac.uk

The Arctic has experienced a massive reduction in glacier cover over the recent decades. This however, allowed new terrestrial habitats to develop, which are becoming more and more important for the world's carbon budget. Our understanding of year-round variability experienced by Arctic soils and its effect on geophysical and biogeochemical processes are impaired because of a lack of year-round data. The SUN-SPEARS project, which stands for "Sensors under snow – Seasonal processes in the evolution of Arctic soils", has the ambition to capture this year-round variability by installing a series of sensors on the forefield of Midtre Lovénbreen glacier, a few miles South-East of Ny-Ålesund. The sensor measurements will be complimented by a microbiological analysis of soil samples from across the forefield, which will tell us a bit more about the existent microbial species and their activity.

The objectives for SUNSPEARS 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

Sources and Cycling Of Organic matter along glacial-proglacial-fjord flow Paths (SCOOP)

Research in Svalbard database number: 12722

Date of visit: August 2025

Principal investigator: Dr Eva Doting, University of Pennsylvania/Norwegian Institute for Nature Research

Field team: Eva Doting and Anne Kellerman, Florida State University/ University of Pennsylvania

Email: eva.doting@nina.no

Glaciers are experiencing unprecedented, accelerating melting and retreat due to climate warming. This has led to an increase in glacier discharge, which supplies freshwater and bioavailable dissolved organic matter (DOM) and nitrogen (N) to vulnerable fjord ecosystems. However, the sources of bioavailable DOM in glacial runoff, and how these will be impacted by the up-glacier migration of snow lines, remain unknown. In addition, potential inputs of bioavailable DOM and N leached from proglacial soils that develop when new terrain is exposed as a result of glacier retreat have not been quantified, limiting our understanding of controls on the flux of bioavailable DOM and N from glacierized catchments. To address these knowledge gaps, we aim to constrain sources of bioavailable OM and N along glacial-proglacial-fjord flow paths and estimate changes in OM and N delivery to fjords as a result of glacier retreat.

In August 2025, we collected supraglacial, proglacial and fjord samples on and in front of Midtre Lovénbreen and Austre Brøggerbreen, with support of the NERC Arctic Research Station. We set up incubations with proglacial river water and leachates from proglacial soil samples to determine the bioavailability of DOM and N to the recipient fjord microbial community. We will employ bulk and molecular level analyses to quantify the concentration of dissolved and particulate total and organic carbon and nitrogen, the concentrations of nitrate and ammonium, the composition of DOM, and the composition of particulate matter. Resulting data will advance our understanding of how the supply of bioavailable DOM and N in glacier runoff will change in response to the up-glacier migration of snowlines and continued glacier retreat in a warming climate.

Photo: Iain Rudkin, BAS

The Genomics Basis of Environmental Adaptations in the Bryophytes and Freshwater Protists of Svalbard (EASE)

Research in Svalbard database number: 12719

Date of visit: August/September 2025

Principal investigator: Dr Hadleigh Frost

Field team: James Kempton, Oxford University, Hadleigh Frost, IAS (Princeton)

Email: j.kempton@kew.org

Identifying the genetic changes that underly environmental adaptation is fundamental for interpreting the deep evolutionary history of life and for both predicting and mediating the consequences of climate change. To characterize the genomic mechanisms that enable environmental adaptations, we will use the Arctic climate of Svalbard as a model to investigate how organisms, such as bryophytes and protists, overcome physical barriers such as geographical isolation, osmotic variation, and temperature change. EASE will aim to:

- determine the natural history of fresh-salt adaptation among eukaryotic microorganisms in Svalbard lakes.
- determine patterns of global freshwater protist dispersal across all eukaryotic taxa using 18S metabarcoding and analysis techniques developed in an earlier project (Frost & Irwin).
- determine the genomic basis of and characterise the diversity of cold adaptation among bryophytes and freshwater protists (principally single-celled algal species) in Svalbard.
- infer which of these genetic adaptations relate to horizontal gene transfer events from bacteria.

Photo: Matthew Phillips

A number of scientific articles and talks will stem from the results of this Svalbard fieldwork, which will add significantly to the results from a similar project that was successfully carried out by our team in the South Pacific in 2023. This South Pacific fieldwork led to the discovery of hundreds of new freshwater species. We expect that coordinating these data with data from the Svalbard fieldwork will lead to impactful scientific results both for understanding microbial dispersal and freshwater adaptation, and for understanding the impact of the fresh-salt water barrier on the diversity of Eukaryota.

Photo: Matthew Phillips

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

Field team: Neil Cobbett,
British Antarctic Survey

Email: macl@bas.ac.uk

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/.

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.

POLAR MEDAL FOR DR IAIN RUDKIN, ARCTIC OPERATIONS MANAGER

Many congratulations to Dr Iain Rudkin, who in the 2025 New Year's Honours List, was awarded the Polar Medal for services to the Arctic and Antarctic. Iain first started at BAS as a Field Guide in 2009, overwintering three times at Rothera and spending numerous summers supporting BAS projects from the Polar plateau northwards to the sub-Antarctic Islands. His highlights include his first season, spent on the Rutford Ice Stream, Marie Byrd land, and at Signy Research Station, but also include his dedication and support of BAS in the Russian Arctic, Greenland, and Svalbard. Following a five-year hiatus as a mountaineering guide and safety manager in the tourism side of Antarctica, Iain returned to BAS to support Nick Cox in the running of the NERC Arctic Research Station in Ny-Ålesund, Svalbard. His current role as Arctic Operations Manager began in autumn 2023 and helps support all those in BAS and UK science who work in the Arctic, particularly in Ny-Ålesund.

FOREIGN MINISTERS VISIT NY-ÅLESUND FOR FIRST-HAND LOOK AT ARCTIC CLIMATE SCIENCE

In May 2025, Ny-Ålesund played host to a high-profile visit from the Rt Hon David Lammy, and his Norwegian counterpart, Espen Barth Eide, as part of a wider tour of the Arctic region. The visit offered a unique, informal setting for the Foreign Ministers to dive into the realities of climate change in the Arctic—and the environmental, social, and political shifts it's driving.

The trip, hosted by the Norwegians, included a packed itinerary. The Foreign Ministers were joined by senior officials from the UK. Norwegian Polar Institute Director Camilla Brekke was also on hand to guide discussions and share insights.

The visit began with a briefing at the Norwegian Polar Institute Station, where conversations focused on UK-Norway scientific collaboration and future opportunities. The group then headed out on a boat trip to the Blomstrandbreen glacier where they got a close-up look at glacial retreat and were told about the wider impacts on ecosystems and global climate patterns.

Photo: David Thompson, FCDO


Photo: Henry Burgess

Back in the village, the delegation toured the NERC Arctic Research Station, hosted by Henry Burgess, Head of the NERC Arctic Office, along with Professor Rob Mulvaney from the British Antarctic Survey, where they explored labs, looked at maps showing dramatic changes in the fjord, and got hands-on with ice-core drilling gear. They also learned about the Early Career Researchers (ECR) polar field skills course that has been supported by the Station in recent years, examined fjord algae and copepods under microscopes, and even encountered dried polar bear eggshell vomit—an unusual but telling sign of changing Arctic diets.

The visit concluded with a short film showcasing the Station's wide-ranging work, followed by a lively discussion on international cooperation, the upcoming International Polar Year 2032–33, the Antarctic Treaty System, Artifical Intelligence (AI) in science, and more.

STATION ON THE MOVE!

Due to increasing damage to the permafrost; a direct consequence of a warming Arctic, the foundations on which the NERC Arctic Research Station sat had weakened and the building was at risk of subsidence. The original structure was built in 1992 and like many of the buildings of that vintage here in Ny-Ålesund, and indeed Svalbard, it rested on wooden piles driven 3m into the permafrost. However, seasonal melting and increased heat radiating from the building has damaged the permafrost locally so there is an expansive program to strengthen the foundations of many of the buildings here in town.

Kings Bay (our landlord) has devised an innovative engineering solution. The entire building was sequentially raised up on jacks across its footprint, and all the major joists were replaced by steel beams. Following this, temporary steel tracks were laid underneath. The building was then lowered onto these before being rolled off its original site, using pulleys, by hand! The 48 old piles are now replaced with new reinforced concrete ones drilled directly into the bedrock at a depth of 9m. All the work was completed during spring 2025 with no major interruption to the spring science programme.

A short video, produced by Iain Rudkin showing the move can be found on the Arctic Office website.

Photos: Iain Rudkin, BAS

MEET THE NERC ARCTIC STATION TEAM FOR 2025

Iain Rudkin

Iain began working for BAS in 2009 overwintering as a Field Guide at Rothera three times and taking part in numerous summer projects from the polar plateau north to the sub-Antarctic islands. After a period guiding in the tourism sector, Iain returned to BAS in 2021 as the Deputy Arctic Station Manager. In 2023 he became the Arctic Operations Manager, and a large part of his remit is overseeing the running of the station in Ny-Ålesund.

Matthew Phillips

Matthew spent four years working as the Senior Boating Officer for BAS on South Georgia before becoming the Winter Station Leader at Rothera Research Station. His tally of overwintering six times on BAS research stations has only been surpassed by three other people, since records began in 1944.

He was also part of 'Team Rat', the team that carried out the highly ambitious rodent eradication program on South Georgia. Changing poles, Matthew also spent significant time in east Greenland, Svalbard and the Canadian Arctic leading various expeditions.

Matthew lives in Fort William, which allows him to make the most the of the Scottish outdoors in his down-time.

Guy Hillyard

Guy has worked for BAS since 2005 starting in the biology labs at Cambridge HQ moving to a lab management role as Biology lab manager in 2015 with oversite of the Arctic Station.

He has been working from the Arctic Station in a science/Station support role most seasons since 2008.

Henry Burgess

Henry is the Head of the United Kingdom's Natural Environment Research Council Arctic Office. The Office is hosted by the British Antarctic Survey in Cambridge. It supports researchers based in the UK in the High North; provides advice to policy makers; and develops international scientific cooperation across all aspects of Arctic research. The Office also helps deliver the operation and planning for the NERC Arctic Station in Svalbard. Henry is also the President of the International Arctic Science Committee (IASC) from 2022–26.

Nicola Munro

Nicola is the NERC Arctic Office Manager and is based at BAS in Cambridge. Her remit includes management of Arctic research projects and programmes such as the Canada – Inuit Nunangat – United Kingdom Arctic Research Programme and management of BAS's involvement as a partner in the EU funded Polar Research and Infrastructure Network (POLARIN) transnational access project. She also provides support to users of the Station, working closely with the Arctic Station Manager.

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British Antarctic Survey
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Natural Environment Research Council