Antarctica New Zealand

Science Programme 2026/27

Aotearoa New Zealand's Antartica Science Programme is driven by the Government's science strategy for Antarctica and the Southern Ocean. Events for this season are grouped into key strategic themes.

Ecosystem dynamics and responses to change

K020A — Tracking virus dispersal risk

Viruses are small, easily transported long distances, and of increasing importance in a world where invading microbes may fundamentally change natural and agricultural ecosystem functioning. To date, no analysis has been conducted to identify global mechanisms of atmospheric transport.

In this project, the team will undertake the first comprehensive global biogeographic survey of viral distribution in the environment to identify probable processes of atmospheric transport between Antarctica and other continents.

The team will conduct aerosol sampling at ground level and at altitude, permafrost sampling and surface soil sampling.

K022A — A Long Sweltering Night: Unravelling winter survival startegies of Mt Erebus Cyanobacteria

Cyanobacteria form the base of Antarctica's food web but must survive four months of winter darkness each year. Most endure this polar night by becoming dormant, helped by low soil temperatures. However, those living in the geothermally heated soils of Mt Erebus cannot rely on the same cooling effect.

This study is testing whether these cyanobacteria use new, alternative survival strategies or die annually and recolonise the area.

This team will be conducting another winter darkness simulation experiment by installing shades on the cyanobacterial mats in October and removing them in mid-January. They will then sample the mats to test if the cyanobacteria survived the shading, as well as to explore how the rest of the microbial community responded.

K026A — Mapping terrestrial ecosystem change from ground, air and space

This project centres on the unique nature and increasing vulnerability of Antarctica's ice-free terrestrial ecosystems, which are home to endemic biota with distinct physiology and evolutionary history.

This research team will be conducting biological sampling for molecular analyses, using handheld spectrometers, and using hyperspectral imagers onboard UAVs (Unmanned Aircraft Systems).

By taking a multi-pronged approach, the team hopes to construct and cross-validate comprehensive spectral libraries for key photosynthetic taxa in the Ross Sea region. This research fits into a wider project that is developing technology to improve interpretation of satellite imagery.

K082A — Antarctic seafloor seeps

Large reservoirs of methane and ancient groundwater lie hidden beneath the Antarctic continent. As Antarctica's climate changes, groundwater pathways may shift, altering how greenhouse gases, dissolved carbon, nutrients and microbes are transported from the continent to the coastal ocean, with potential implications for coastal ecosystems and global climate.

Using remotely operated vehicles, diver surveys, geophysical measurements and biogeochemical sampling, the team will investigate groundwater discharge, methane seepage and subglacial water flow. They will recover long-term seafloor observatories to understand how these systems change over time, test new flow-measurement technologies, and deploy novel instrumentation to map groundwater discharge and methane concentrations across Antarctic coastal environments.

Through this work, the team hopes to reveal how these hidden pathways connect the Antarctic continent to the ocean — and how those connections may change in the future.

K881B — Using Automatic Weather Stations to monitor the Ross Sea Region ecosystem

This research team is using data from a network of Automatic Weather Stations to develop regional and local climate models. These models will improve understanding of how climate-driven changes in the physical environment affect land-based ecosystems.

This season the team is focused on supraglacial meltwater and the impact of climate change on terrestrial biology in Victoria Land. They will maintain, service and repair Automatic Weather Stations, soil stations, and other remote monitoring equipment.

K884A — Functional attributes of Antarctic Sponges

The objective of this study is to make a first qualitative and quantitative assessment of high Antarctic glass sponge feeding, using minimally invasive SCUBA diving methods.

In their third and final year, this team will be mapping the glass sponge population structure down to 100m depth using Remotely Operated Vehicles. Divers will complete in-situ diet, feeding rates and metabolism experiments, as well as revisiting individuals from previous seasons for photogrammetry and growth monitoring.

The team will sample physical ocean properties at four sites, and recover and redeploy a mooring that was installed to assess environmental conditions near sponge communities.

K893A — Supersites: Meltwater production change in an 'extreme' environment

This research team aims to find out:

1) How will the rates of meltwater production change in an 'extreme' climate?
2) What are the consequences for terrestrial ice, hydrology and ecosystems?

By answering these questions, they can improve the representation of ice shelf mechanics and behaviour in Antarctic ice sheet models – making them more accurate and helpful for forecasting future conditions.

This season the team will be focused on installing hydrological and glaciological monitoring equipment, along with taking baseline measurements.

K894A — Terrestrial survey sites

This research team is investigating how changes in ice dynamics will impact ecosystem function.

This year they will install equipment at Lake Vanda to monitor heat fluxes to and within the lake. They will also use Remotely Piloted Aircraft Systems (RPAS) to document how the albedo (reflected light) of the lake ice cover varies across the lake, and the size of the melted moat. This will support interpretation of imagery taken on a fixed camera nearby.

At Pyramid Trough the team will set up programmes to relate vegetation growth to moisture patterns, to better understand how changes in the latter could put existing vegetation at risk.

They will investigate the reflectance spectrum, including the UV range, using both RPAS for broad-scale observations and an autonomous robot for fine-scale measurements.

Protecting Antarctic and Southern Ocean Environments

K051A — Southern Ocean Connections

Predators such as Weddell seals, and emperor and Adélie penguins are important indicators of Antarctic ecosystem health because they depend on sea ice and specific prey species.

This team is working to understand how the three predators above share space and resources, and see how environmental change influences their behaviour.

This season researchers will collect biological samples such as scat, feathers and whiskers from all three species at Cape Crozier. They will also deploy tracking tags on 20 animals and service two trail cameras that were installed in previous seasons.

K091A* — Antarctic toothfish survey

This team will transit through Scott Base before boarding a fishery survey vessel in the southern Ross Sea. The annual toothfish survey is taken at depths of 500-900m, using longline fishing techniques.

The data from the survey are used to determine year, class, strength and variability of young fish so stock assessors and managers can better understand stock dynamics. The results are used to sustainably manage the toothfish fishery and inform how well the Ross Sea region Marine Protected Area is achieving its conservation goals.

The survey has been running since 2012.

K850A* — Aerial photography of Ross Island Adélie penguin colonies

This team will complete the annual Adélie penguin survey, which has been ongoing since the early 1980s. High-resolution photos will be taken from a helicopter and later analysed in New Zealand, to determine the number of breeding pairs. Data is passed on to CCAMLR to inform management decisions.

The late November timing of the survey is important because it coincides with males incubating the eggs while the females are at sea. Having only one parent present makes it easier to identify breeding birds.

Quantifying the Antarctic contribution to sea level rise

K865A — Measuring the velocity of the Ross Ice Shelf

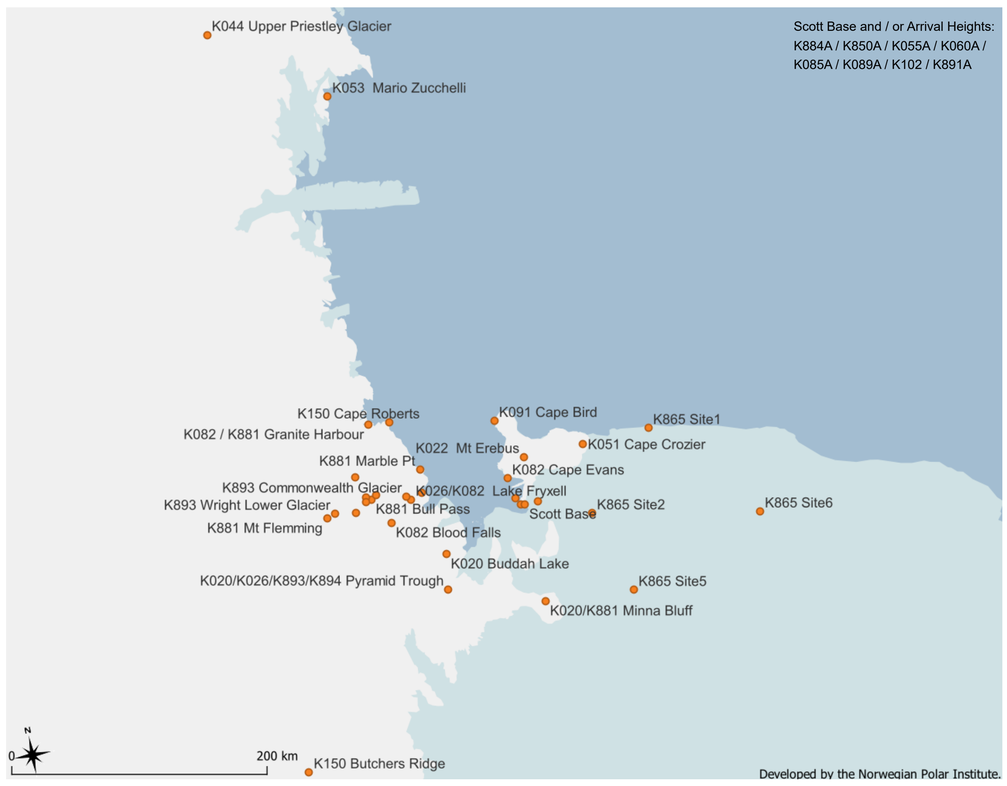
This team aims to extend their six-year record of year-round velocity measurements of the Ross Ice Shelf. These continuous measurements give the team an idea of how speed changes over periods of hours to seasons, helping them understand the processes controlling ice shelf motion. The ice shelf is a key control on sea level rise, so understanding its behaviour is critical for accurately predicting future change.

The team will be excavating Global Navigation Satellite System equipment that has been buried in snow; downloading the data and servicing and reinstalling the equipment for continued logging.

K872B — Monitoring Ross Ice Shelf melt

This team is studying how the inflow of warm surface ocean water is contributing to rapid melting on the underside of the Ross Ice Shelf. The more the Ross Ice Shelf (on the sea) melts, the faster the ice sheets (on land) can move into the ocean – melting, raising sea levels and altering ocean currents. To monitor melting, a network of 12 Autonomous Phase-Sensitive Radio Echo Sounding (ApRES) devices were installed in 2021/22 and nine of these remain deployed.

This year the team will be recovering an instrument deployed last year and testing new instruments and hardware at a site near Scott Base. These tests will ensure the ApRES network stays fit-for-purpose to continue monitoring these important processes.



Cryosphere-ocean-atmosphere connections and implications of change

K044A — Ice core biomarkers and tohu signals of change

This research team is conducting three investigations while on the ice:

1) Ice core drilling to understand how phytoplankton biomarkers have changed over the last millennium. This will contribute to a larger research programme looking at how phytoplankton in the Ross Sea modulates climate through the carbon cycle and production of climate relevant aerosols.

2) Snow pit and surface snow sampling to investigate present day snow chemistry and biomarker seasonality.

3) Maramataka observations and journalling using kaupapa Māori frameworks, alongside winter staff recruitment, will be complemented by a taiao assessment using a Patuharakeke-led cultural health assessment tool.

K053A — How is Antarctic Sea Ice being affected by climate change?

The Antarctic sea ice greatly influences Antarctic climate and ecosystems, and is closely linked to ice-ocean processes under the ice shelf. Following dramatic changes to sea ice in recent years, this research team will be aiming to learn more about how the sea ice is changing by using Airborne Electromagnetics (AEM). They will measure the thickness of pack ice and fast ice, as well as quantify the amount of ice exported from small polynyas.

They will also be recording the presence and thickness of any platelet ice layer under the fast ice; the detection of which would add to the map of supercooled water originating from the bottom melt of ice shelves.

K055A* — Dynamics in the Antarctic Atmosphere

This team is investigating the Antarctic atmosphere's response to natural and man-made factors which could affect the climate and change feedbacks in the atmosphere.

This year they will be collecting snow samples for an environmental contamination study; installing a Parsivel Laser Disdrometer to measure precipitation (snow), and for long-term calibration of weather radar; maintaining and calibrating equipment; and providing training to Scott Base technicians.

K060A* — Long-range monitoring of space weather

This team will work at Scott Base and Arrival Heights to maintain antennas and accompanying equipment that have been measuring very low frequency radio waves since 2008.

The instruments are part of a global network called AARDDVARK, which investigates the connection between Earth's atmosphere, the sun and space. This improves knowledge of global climate change, and the impact of space weather on communications and navigation.

Data also contributes to the World Wide Lightning Location Network, which provides real-time locations of lightening all over the globe.

K085A* — Antarctic atmosphere composition: Observing changes in greenhouse and reactive gases

Aotearoa New Zealand has been measuring atmospheric gases in the stratosphere above Antarctica since 1982. Due to the lack of local pollution, measurements made at Arrival Heights and Scott Base are used for assessing large-scale global atmospheric change.

Research topics include: ozone depletion (and recovery), greenhouse gas measurements, sea-ice/atmosphere trace gas interactions, and hemispheric transport and mixing of reactive gases. Researchers measure atmospheric composition throughout the year using ground-based remote sensing instruments and collection of in situ surface air samples.

This year the team will conduct training, maintenance and calibration of the instruments. They will also be supporting other events using the long-term survey instruments for other research (see K089A and K102A).

K089A* — Climate data acquisition: Scott Base and Arrival Heights

Climate stations at Scott Base and Arrival Heights collect continuous climate data, including wind speed and direction; air temperature; relative humidity; barometric pressure; and solar radiation.

The climate record for Scott Base began in 1957 and is one of the longest continuous records in Antarctica. This team will be servicing and calibrating the equipment to ensure each device is collecting accurate, high-quality data.

The measurements taken are used for characterising the local climate and state of the environment, identifying climate variations and changes, and in research on climate-sensitive processes and ecosystems.

K102A* — Scott Base Geomagnetic Observatory (SBA) operations

The Earth's magnetic field is an energy field that extends out into space and protects us from solar wind, a constant stream of charged particles bombarding Earth, and more extreme space weather like solar storms.

Researchers have been monitoring changes in the magnetic field at the Scott Base Geomagnetic Observatory since 1957. The information gathered feeds into an international network which helps inform applications used by scientists, by the military, in aviation and by the public in mobile devices to provide orientation information.

This team will check and perform routine maintenance of all equipment, as well as provide refresher training for Scott Base technicians.

K150A & B — Tide gauge calibrations, GNSS battery replacement and SouthPAN installation

This team will calibrate the tide gauges at Scott Base (installed 1957) and Cape Roberts (installed 1990) to ensure the data they generate is accurate and high-quality. These long-term datasets provide vital information for helping understand long-term trends and variability in sea level, which are associated with climate change. They will also investigate options for a new gauge location at Scott Base.

In addition to the routine GNSS station maintenance at Scott Base and Cape Roberts, EarthScope will assist the team to replace batteries at the station on Butchers Ridge.

The team will install equipment to support establishment of the new Southern Positioning Augmentation Network (SouthPAN) GNSS Reference Station (GRS) in the Arrival Heights laboratory. The GRS will help provide improved GNSS positioning across New Zealand and Australia.

K891A* — Variability of sea ice in the Ross Sea

This team is studying processes that influence sea ice variability. Every winter, Scott Base staff deploy a Sea Ice Monitoring Station which is retrieved by researchers over summer. The data gathered by this station includes air and sea ice temperature, snow cover thickness and water column properties.

The research team will also deploy NZ and US Automatic Weather Stations, along with IOB and SIMI buoys. They will test if the LASSITOS-EM will work to measure ice snow thickness by being towed behind a skidoo and lifted by a kite or drone.

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Although we have assigned each research prgramme to a specific theme from the Aotearoa New Zealand Antarctic and Southern Ocean Research Directions and Priorities report, many contribute and could be categorised under more than one theme. Background image thanks to Lana Young on the Laura Bassi voyage 2024.

*Long-term science