Antarctica New Zealand

Science Programme 2025/26

New Zealand's Antarctic 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

K022A — A long sweltering night: Unravelling winter survival strategies of Mt Erebus cyanobacteria
The University of Waikato

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 Mount Erebus (up to 65C) cannot rely on the same cooling effect. Previous research has shown high endemism at Erebus, meaning unique species live there that are found nowhere else on Earth. This study will test whether these cyanobacteria use alternative survival strategies or die annually and recolonise from cooler areas. Researchers will run darkness experiments, genetic and physiological tests, and shading trials, as well as study a geothermally formed ice cave. By exploring these unusual habitats, researchers aim to uncover new survival

K023A — Erebus subsurface geothermal microbes
The University of Waikato

The southernmost active volcano, Mount Erebus, is home to remarkable microorganisms uniquely adapted to survive the extreme pressures of a geothermal environment. The team is studying these microorganisms in the geothermally warmed subsurface soils of Mt Erebus venturing to Tramway Ridge and the Western Crater to recover microbial sampling devices that were placed during the 2024/25 season. They will remove installations from boreholes at each site, including temperature recording systems. The results of this study will expand knowledge of geothermal microbial diversity and broaden our understanding of the conditions that can support life on Earth–and potentially on other planets.

K025A — Microbial and hydrogeological implications of groundwater in the McMurdo Dry Valleys
The University of Waikato

Groundwater systems in Antarctica's McMurdo Dry Valleys are only beginning to be understood, yet they may play a critical role in shaping local ecosystems and coastal waters. This project will investigate groundwater beneath Taylor Valley in McMurdo Dry Valleys. The research aims to: determine where this groundwater comes from and whether it connects with systems further up valley; uncover, for the first time, the microbial communities and their functions within these hidden waters using advanced DNA sequencing; and analyse the chemistry and nutrient content of the groundwater to assess its influence on nearby environments such as McMurdo Sound and the Ross Sea. With climate change expected to alter polar hydrology, understanding how these briny groundwater systems form, connect and impact Antarctic life is increasingly important.

K051A — Marine predator connections in the Southern Ocean
University of Canterbury

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. Shifts in one population can reflect environmental change, but these species also interact with one another, meaning that studying a single population may overlook the bigger picture. This season, a research team will work at Cape Crozier to tag Weddell seals and emperor penguins, while also collecting biological samples from these species and Adélie penguins. The aim is to understand how the three predators share space and resources. Trail cameras will be deployed to track population dynamics and phenology (the timing of key life cycle events) to see how environmental change influences these species.

K082A — Antarctic seafloor seeps: A driver of ecosystem change?
Earth Sciences New Zealand

Large amounts of methane are thought to be stored beneath the seafloor around Antarctica. As the climate warms, this gas could leak out, creating 'seafloor seeps'. Seeps have already been discovered in the Ross Sea, and this research team is investigating whether they drive ecosystem change in the region. The team will travel to Cape Evans and Granite Harbour–where new seeps were identified last year–to explore them using remotely operated vehicles (ROVs). They will also sample the water column and sediment biogeochemistry to determine the source of the seeps and their impact on the environment. This work will help fill a major gap in Antarctic research by understanding how fluid flows and gas seeps shape the marine ecosystem, while also creating a baseline for tracking future coastal changes.

K882U — Antarctic aquatic ecosystems
The University of Waikato

The microbial communities that colonise the lakes and ponds of the McMurdo Dry Valleys are unique, surviving in one of the coldest and harshest environments on Earth. These communities are highly vulnerable to climate change, with a real risk that these ecosystems could disappear as Antarctica warms. This team is investigating how aquatic microbes in the Dry Valleys respond to environmental change, particularly rising lake levels caused by glacial melt. This season, researchers will collect water samples from Lake Fryxell for analysis of trace gases and metals, helping to reveal interactions with groundwater beneath the lake. The project continues a collaboration with the United States–led Long Term Ecological Research (LTER) programme.

K884A — Functional attributes of Antarctic Sponges
The University of Waikato, Alfred Wegener Institute, Wageningen University and Research

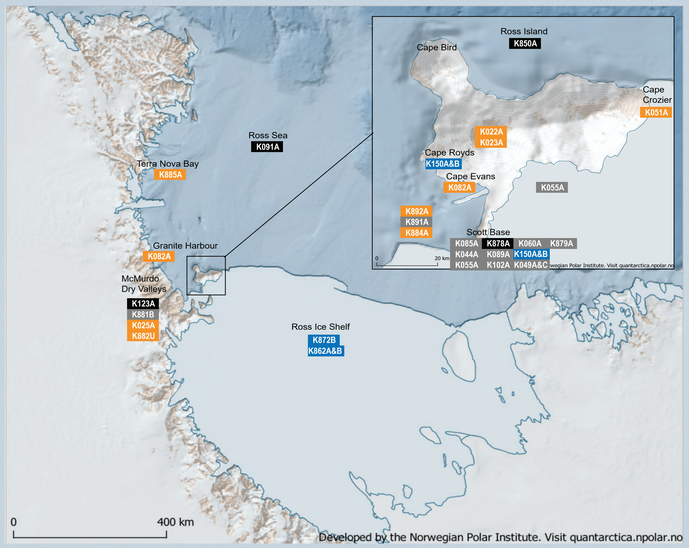
Glass sponges are important species in the Antarctic ecosystem, yet their role in linking the ocean floor to the water column and their physiological needs remain largely unknown. This makes it difficult to model how sensitive they are to environmental changes. To address these gaps, a research team will gather data this season by documenting the population structure of glass sponges around Ross Island using remotely operated vehicles. Divers will tag individual sponges for photogrammetry and conduct in situ experiments to study their diet, feeding rates, and metabolism. Environmental data will be collected from the surrounding area. This research will contribute to biogeographic models developed by the Antarctic Science Platform, helping to better understand the vulnerability of these iconic reef-building organisms to changing environmental conditions.

K885A — Seafloor communities' response to warming
University of Otago, KOPRI

This team is investigating the response of benthic (seafloor) organisms to warming ocean temperatures. A set of panels will be installed on the ocean floor offshore of Korean Jang Bogo Station in Terra Nova Bay. The panels will be heated to temperatures of 0.5 to 2 degrees above ambient, replicating future ocean warming, then placed on the seafloor at approximately 20 m depth. The plates will be left in place for a year, when they will be photographed to identify which seafloor organisms are growing on them. The research will improve understanding of how Ross Sea marine communities will respond to future ocean warming resulting from climate change.

K892A — Platelet ice as a habitat
Earth Sciences New Zealand

Beneath the Ross Sea's ice lies a fragile, largely unexplored world of delicate platelet ice layers, which form a unique habitat. These layers protect algae and bacteria and serve as a nursery for Antarctic silverfish, playing a crucial role in the Ross Sea food web. The team will be recovering a seafloor-mounted mooring from the 2024/25 summer season. The mooring will provide valuable measurements of ocean temperature, salinity, and current flow. Ultimately, the information will contribute to an improved understanding of ice–ocean processes and the seasonal cycle of ocean circulation from beneath the McMurdo Ice Shelf cavity.



Protecting Antarctic and Southern Ocean environments

K091A — Antarctic toothfish survey *
SoFish, MPI

This team will transit through Scott Base before boarding a fishery survey vessel cruising in the southern Ross Sea. The survey is undertaken in deep water 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 that stock assessors and managers can better understand stock dynamics. The toothfish stock assessment has been running since 2012, accumulating a valuable store of data on Ross Sea toothfish population structure and variability. The results of the survey are used to sustainably manage the toothfish fishery and inform how well the Ross Sea region Marine Protected Area is achieving its conservation objectives.

K123A — Soil climate stations *
Bioeconomy Science Institute

This event is responsible for a soil-climate monitoring network, which is comprised of nine soil climate stations located at Scott Base and throughout the McMurdo Dry Valleys, and two borehole sites located at Marble Point and Bull Pass. The soil climate stations monitor soil temperatures, air temperature, wind speed, solar radiation and relative humidity. The team will download data at the soil climate stations and repair any damage sustained over the previous year. Measurements began in 1999. This long-term dataset is invaluable as it enables scientists to better understand the impacts of climate change on the McMurdo Dry Valleys region.

K850A — Penguin population monitoring*
Antarctica New Zealand, Bioeconomy Science Institute

This team will complete an annual Adélie penguin census for colonies located on Ross Island. High resolution photographs will be taken from a helicopter and later analysed in New Zealand to determine the number of breeding pairs. The late November timing of the census is important because it coincides with males incubating eggs while females are feeding at sea. Only one parent is present on the nest making it easier to identify breeding birds when photographs are reviewed. Analysis of the aerial photographs relates annual changes in the number of breeding penguins to factors such as weather, sea ice and other climate variables. Aerial surveys of Ross Sea Adélie penguins began in the early 1980s.

K878A — Sense of Place
Antarctic Science Platform

The Sense of Place project provides a unique opportunity to experience Antarctica through a Māori lens, creating meaningful connections that will inform Phase 2 of the Antarctic Science Platform. This initiative is designed to support Māori researchers in developing a deeper understanding of Antarctica and its relationship to Aotearoa, guided by mātauranga Māori. A wide range of activities and focus areas will broaden perspectives, strengthen cultural linkages, and weave together scientific and indigenous knowledge. The team will develop and apply tikanga practices, explore te reo Māori place names to understand whakapapa, and identify dominant atua associated with the environment. They will also observe taonga species, reflect on the history of human presence in the region, and gain first-hand experience of life in a science field camp, building knowledge that connects Antarctica back to Aotearoa.

Crysphere-ocean-atmosphere connections and implications of change

K044A — Maramataka observations
Te Herenga Waka—Victoria University of Wellington

Knowledge about Antarctica's environment comes not only from samples and measurements but also from tohu (environmental indicators). The team is exploring connections between Antarctica, climate, and maramataka to provide a Māori world view and holistic perspective of environmental change. In the 2023/24 season, the team made the first tohu observations in Antarctica using Kaupapa Māori frameworks, recording kaitirotiro observations three times daily at the Pou outside Scott Base over 10 days. In 2025/26, the project will expand to a full lunar cycle in a different season, adding sites such as Observation Hill to include ocean observations. This work is part of a wider study using ice core biomarkers to link phytoplankton changes to sea ice variability.

K049 A&C — Antarctic Sea Ice Switch – preparing for new threats
Te Herenga Waka—Victoria University of Wellington

The Antarctic Sea-Ice Switch (ASIS) Programme aims to understand recent abrupt changes in Antarctic sea ice, and elucidate the far-reaching impacts of these changes. By improving models of future trends, ASIS will help forecast consequences for global climate, sea level rise, and ecosystems in the Ross Sea region Marine Protected Area. The project also aims to provide a 200-year record of past sea ice conditions. This season, the team will install equipment to sample phytoplankton offshore near Scott Base and test a new ice-core drilling system at Windless Bight. The programme will provide New Zealanders with reliable scientific information to understand and prepare for changes in Antarctic sea ice and their consequences for the Ross Sea region and Aotearoa.

K055A — Dynamics in the Antarctic atmosphere *
University of Canterbury

This season, a research team will calibrate and maintain the medium frequency (MF) radar system and weather radar at Scott Base and provide training for Antarctica New Zealand staff. The MF radar transmits pulses of radio waves into the atmosphere, helping researchers track human impacts on the Antarctic atmosphere and understand how changes in the middle atmosphere influence climate at the Earth's surface. These measurements improve global climate models and knowledge of ozone chemistry, including the effects of ozone-depleting substances. The team will also install a new instrument–the parsivel disdrometer–to support weather radar calibration and collect snow samples for microplastics research from sites including Windless Bight, Centipede Nunatak and Scott Base.

K060A — Space Weather *
University of Otago

This team will work at Scott Base and Arrival Heights to maintain antennas and accompanying equipment that measure very low frequency radio waves (VLF), and download data collected over the previous year. The instruments are an important part of a global network called AARDDVARK, which investigates the between Earth's atmosphere, the sun, and space, which in turn improves knowledge of global climate change, communications and navigation. Data also contributes to the World Wide Lightning Location Network, which provides real time locations of lightning all over the globe. These measurements that began in 2008.

K085A — Antarctic Atmospheric gases *
Earth Sciences New Zealand

Antarctica provides a unique setting for studying atmospheric gases because it is isolated from local pollution. Since 1982, continuous measurements have been made using specialised instruments that monitor gases in the stratosphere, 30–50km above Earth's surface. Data from Antarctica are combined with measurements from New Zealand and the tropics to build a comprehensive dataset that supports Southern Hemisphere climate models and validates satellite observations. This season, the team will maintain instruments at Scott Base and Arrival Heights, and install new equipment, including a spectral emission radiometer (AERI) to enhance atmospheric monitoring. Measurements from AERI support NASA's satellite mission PREFIRE, which is measuring how much heat the Earth emits into space.

K089A — Long term climate observations *
Earth Sciences New Zealand

This team will work on the climate stations at Scott Base and Arrival Heights. The climate stations maintain a continuous climate record, which began in Antarctica in 1957. The stations collect temperature, wind, barometric pressure and solar radiation data. Together these data are key to characterising and identifying changes to local and global climate, analysing long-term climate trends, and assisting with operational decisions. The Scott Base Electronic Weather Station is a part of the recently established Global Climate Observing System Surface Reference Network pilot programme. This season's activities include station inspection and calibration, data verification and sensor exchange.

K102A — Magnetic field measurements *
Earth Sciences New Zealand

Earth's magnetic field, commonly known as the geomagnetic field, is a dynamic protective shield generated by the movement of molten iron and nickel in the planet's outer core. It extends from the core into space and is in a constant state of flux. This team is responsible for maintaining a long-term record of changes in the Earth's geomagnetic field, which began at Scott Base in 1958. The team will work at Arrival Heights to test that all geomagnetic instruments are operational while also conducting absolute observations of baseline quality in the Scott Base Geomagnetic Observatory. The data collected at the geomagnetic huts at Scott Base are used to ground truth satellite measurements and contribute to global reference models of the Earth's geomagnetic field.

K879A — Kura hau awatea, kura hau pō, Southern Skies
Massey University

Hundreds of years ago the ancestors of Māori looked towards the stars to guide them across the Pacific Ocean. Early this season, researchers made observations of the winter night and twilight sky, inspired by records showing Māori used astronomical knowledge to reach the Southern Ocean. The team is especially interested in solar halos, common in Antarctica – known as kura hau awatea (sun halo) and kura hau pō (moon halo). These observations will expand understanding of the sun, moon, and stars from a Southern Hemisphere perspective, while deepening knowledge of mātauranga Māori by exploring links between Māori astronomy and Antarctica's environment. The project also highlights the strong connection between culture and science and why Antarctica matters to all New Zealanders.

K881B — Automatic weather stations: McMurdo Dry Valleys
University of Canterbury

This research team is using data from a network of automatic weather stations to develop regional and local-scale climate models. These models will improve understanding of how climate-driven changes in the physical environment affect land-based ecosystems. A key focus is how a warming climate leads to increased local melting and wetness, and how these processes impact living organisms. This season, the team will carry out maintenance and upgrades, and install two new stations at Granite Harbour and Mt Fleming. The data collected will support the creation of detailed local-scale climate simulations, providing more specific insights into the impacts of climate change on Antarctic ecosystems than regional models alone, and helping to predict future environmental responses.

K891A — Sea ice growth in McMurdo Sound *
University of Otago

This team is studying how melted ice shelf water (ISW) flowing from upstream ice shelves influences sea ice formation in McMurdo Sound. A sea ice mass balance station was deployed in the McMurdo Sound sea ice in winter 2025 to collect data on the factors influencing the growth of the sea ice, including the thickness of the overlying snow cover and the properties of the water column at the ice/water interface. This sea ice monitoring system will be removed, and sea ice cores will be taken to test salinity and temperature. Sea ice trackers will also be deployed on first-year ice. The information collected will contribute to 20 years of sea ice measurements in McMurdo Sound, improving understanding of the impact of changing sea ice conditions on Earth's climate.

Quantifying the Antarctic contribution to sea level rise

K150 A&B — Tide gauge calibrations and SouthPAN
Toitu Te Whenua Land Information New Zealand

This team will complete several of activities this season, including calibration of the Scott Base and Cape Roberts tide gauges, and maintenance of the continuous Global Navigation Satellite System (GNSS) stations, preparatory works for a new global positioning technology called SouthPAN, and survey work for the Scott Base wind turbines and Cape Royds historic hut. Installed in 1957, the Scott Base tide gauge is the longest running gauge in Antarctica. The Cape Roberts tide gauge has been in place since 1990. These long-term datasets provide vital information for helping to understand long-term trends and variability in sea level, which are associated with climate change.

K862 A&B — SWAIS2C: Drilling for climate, ice and ocean history
Te Herenga Waka—Victoria University of Wellington, Earth Sciences New Zealand, multiple international partnerships

Antarctic ice shelves and ice sheets are highly sensitive to rising ocean and air temperatures, but there is still uncertainty about how–and how quickly–the Ross Ice Shelf and West Antarctic Ice Sheet will respond as the planet warms. To help answer this, scientists study seafloor sediment cores, which preserve evidence from past warm periods, when conditions were similar to those projected for the coming decades. SWAIS2C is an international project investigating how vulnerable Antarctica's ice shelves, and the ice sheets behind them, are to warming. This season, a multidisciplinary team will establish a field camp on the Ross Ice Shelf. Using a specialised drill, they will recover marine sediment cores and other scientific measurements to better understand ice sheet stability during past warm periods.

K872B — Ross Ice Shelf melt hotspot
Earth Sciences New Zealand

Ice shelves (ice floating on the ocean) are a 'safety band' around Antarctica, slowing the flow of the ice sheet (ice on land) toward the ocean. 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. In 2021/22 researchers established a network of phase-sensitive Radar Echo Sounders (ApRES) on the Ross Ice Shelf, at a location east of Cape Crozier–a melt 'hot-spot' where ice is melting at rates much faster than other parts of the ice shelf. The network remains in place to monitor seasonal variability in ice shelf basal melt rates. This season, site visits will be made, for data download and instrument maintenance activities.

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* Long-term science