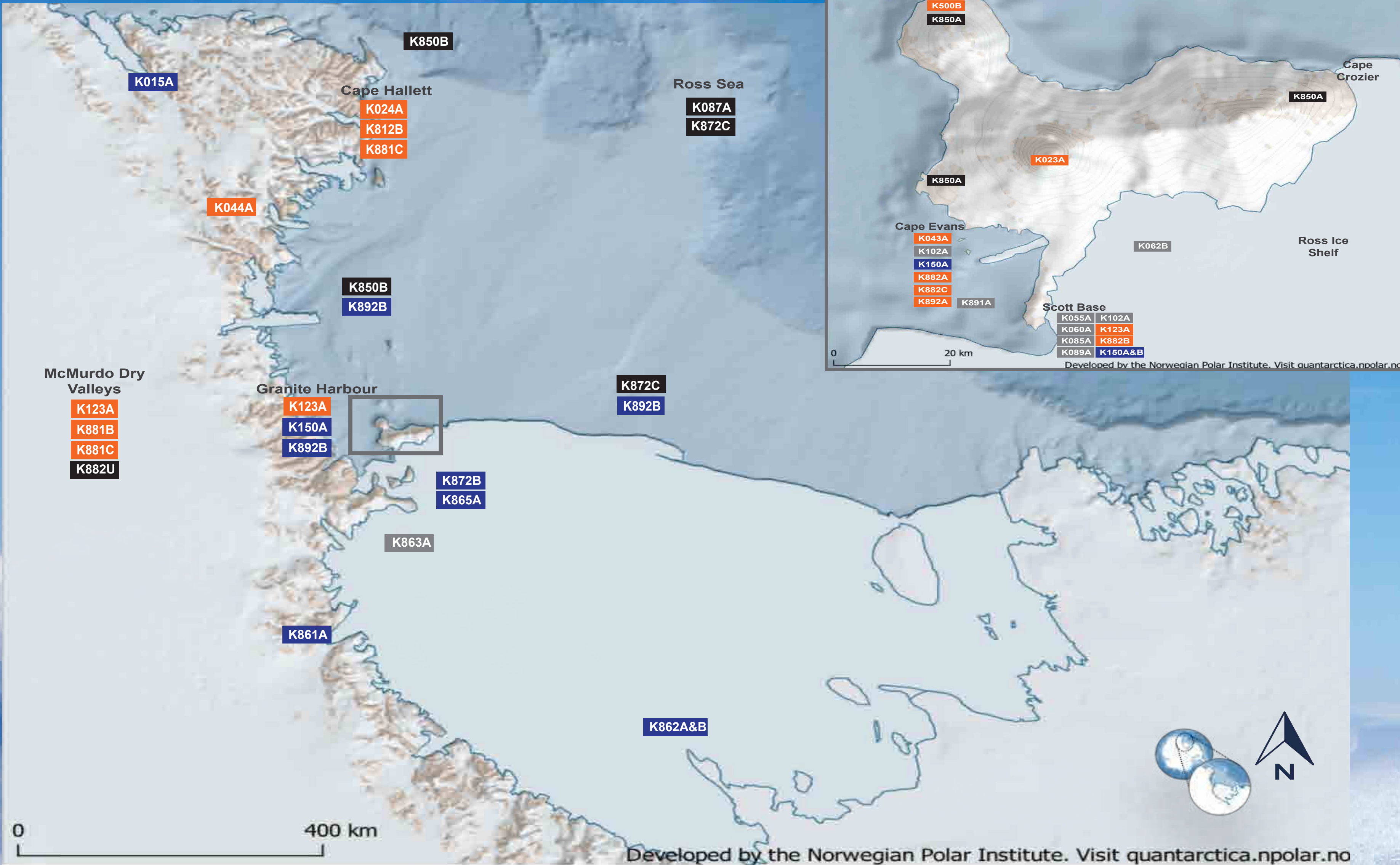




Antarctica
New Zealand

Science Programme 2023/24

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 strategic themes.



Protecting Antarctic and Southern Ocean environments

Cryosphere- ocean-atmosphere connections and implications of change

K850
A&B

Penguin population monitoring*
Antarctica New Zealand, Manaaki Whenua
This team will complete an Adélie penguin census on Ross Island and also for Northern Victoria Land colonies. High resolution photographs will be taken from a helicopter, and 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 at this time 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.

K882U

Antarctic aquatic ecosystems
University of Waikato, University of Otago
This team is investigating how aquatic microbial communities in the McMurdo Dry Valleys will respond to environmental change, particularly rising lake levels resulting from melting glaciers. This season researchers will study microbial mats at Lake Fryxell in the McMurdo Dry Valleys, using a combination of remotely operated vehicles (ROV), under-water experimentation and sampling techniques. This work continues a collaboration with the United States-led long-term ecological research programme (LTER).

K872C

Laura Bassi voyage
Italian National Antarctic Program, Antarctic Science Platform
The Antarctic Science Platform (ASP) is collaborating with the Italian National Antarctic Program on a joint Italian-NZ research voyage to the Ross Sea in January-February 2024 aboard the RV Laura Bassi (operated by the Italian National Institute for Oceanography and Applied Geophysics (OGS)). NZ's research focus for this voyage will be the Ross Sea polynya, the Marine Protected Area, and seabed coring. These objectives are aligned to the Platform's research programmes and objectives, in particular Project 2 (Ocean Mechanics) and Project 3 (Ecosystems) and this voyage provides a critical component to the success of these projects. Antarctica NZ is logistically supporting this through the provision of Antarctic clothing, and providing air travel to/from Antarctica for some of the NZ voyage members.

K087

Antarctic toothfish survey *
NIWA, MPI
This team will transit through Scott Base before boarding a fishery survey vessel cruising in the Ross Sea. While onboard the vessel the team will complete a longline survey for Antarctic toothfish. 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 Marine Protected Area is achieving its conservation objectives.

K863A

Discovery Deep Geophysical Surveys
NIWA, University of Wellington, University of Otago, Alfred Wegener Institute
This team is surveying and mapping the site characteristics at Discovery Deep, on the Ross Ice Shelf, including the sub-seafloor geology, ice structure and configuration of physical bodies (eg. ice, ocean and sediments). Researchers will use a range of geophysical techniques including seismic (using explosives), gravity and radar surveys. The work will provide important data to inform future drilling objectives on the Ross Ice Shelf.

K085A

Atmospheric gases *
NIWA
This team will work at Scott Base and Arrival Heights to complete upgrades and perform annual maintenance activities on a suite of specialised instruments used to measure atmospheric gases in the stratosphere (the layer of atmosphere that is located 30 to 50km above Earth's surface). They will also launch a small number of scientific balloons, which will carry instruments to measure water vapour and ozone in the stratosphere. Atmospheric measurements taken in Antarctica are combined with information from mid-latitudes (including New Zealand), and the tropics to provide data for Southern Hemisphere climate models, and to validate satellite measurements. Measurements have been made continuously since 1982.

K062B

Tere Tipako Tio: Rapid ice sampling
University of Otago, University of Canterbury
K062B will begin tests of an innovative new drill system, designed to allow rapid sampling of Antarctic ice. A hot-water drill will be adapted to sample to 200m depth, and ice-coring tools will be created to sample from the sides and bottom of the drilled boreholes. This new system will allow for samples to be taken in difficult to access locations, and will enable the collection of critical data sets, to improve ice sheet models. Field tests will be undertaken at a field camp close to Scott Base this season, and will move onto the McMurdo Ice Shelf in future seasons. A better understanding of ice sheet dynamics will give insight into their response to climate change.

K089A

Long term climate observations *
NIWA
K089 will work on the climate stations at Scott Base and Arrival Heights. These climate stations maintain a significant 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, as well as assisting with operational decisions. The climate measurements are needed for characterising the local climate and state of the environment, identifying climate variations and changes, and for research on climate-sensitive processes and ecosystems.

K055A

Dynamics in the Antarctic atmosphere *
University of Canterbury
This team will calibrate and maintain the medium frequency (MF) radar system, and provide on-site training in the use of this equipment for Antarctica New Zealand staff. The MF RADAR is a transmitter located at Scott Base, which fires pulses of radio waves into the atmosphere via a single antenna. The information helps us to understand how variations in the middle atmosphere are linked to changes in the Earth's surface climate, and monitor the impact of human-induced change on the Antarctic atmosphere. Data are also used to improve global climate models, and further understanding of atmospheric ozone chemistry, and how the emission of ozone depleting substances have impacted Antarctica's climate.

K102A

Magnetic field measurements *
GNS Science
The K102 event is responsible for maintaining a long-term record of changes in the Earth's geomagnetic field, which began at Scott Base in 1958. The Earth's geomagnetic field is created by the movement of liquids within the Earth's core, it extends from the core into space, and is constantly changing. The team will work at Arrival Heights to check the new Scott Base Geomagnetic Observatory (SBA), installed in 2021/22 to mitigate impacts of the Scott Base Redevelopment. This season the team will also work at Cape Evans to conduct magnetic surveys that were first made at Cape Evans in 1911!

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 AARD-VARK. The goal of AARDDVARK is to increase understanding of energy coupling between the Earth's atmosphere, the Sun, and space, which in turn improves knowledge of global climate change, communications, and navigation. Data also contributes to the WWLLN (World Wide Lightning Location Network), which provides real time locations of lightning all over the globe. The programme continues measurements that began in 2008.

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 2023, to collect data on the factors influencing the growth of the sea ice, including 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 a sea ice probe that was deployed during winter will be removed. 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

K872B

Ross Ice Shelf melt hotspot
NIWA
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, that is observed to be a melt 'hot-spot', melting at rates much faster than other parts of the ice shelf. The network will be left in place for two consecutive summers to monitor seasonal variability in ice shelf basal melt rates. Collected data will identify the ocean processes that are driving rapid melting in the region.

K862
A&B

Drilling for climate, ice and ocean history: SWAIS 2C
Victoria University of Wellington, GNS Science, multiple international partnerships
SWAIS 2C is an international project seeking to understand how sensitive Antarctica's ice shelves, and the ice sheets that sit behind them, are to warming. This season a multidisciplinary team will work from a field camp on the Ross Ice Shelf (approximately 800 km from Scott Base) where they will use a hot water drill to access the seafloor and recover sedimentary cores. Retrieval of marine sediment cores will help inform studies of the stability of the Ross Ice Shelf during past warm periods.

K150
A&B

Sea level and gravity – global change*
Totu Te Whenua Land Information New Zealand
The K150 team will complete a number of activities this season, including repair and calibration of the Scott Base and Cape Roberts tide gauges, and continuous Global Navigation Satellite System (GNSS) stations, preparatory works for an exciting new global positioning technology called SouthPAN, and survey work for the Scott Base Redevelopment Project and historic huts. The Scott Base tide gauge is the longest running gauge in Antarctica, and was implemented in 1957. The Cape Roberts tide gauge has been in place since 1990. These long-term data sets provide information that is vital for helping to understand long-term trends and variability in sea level, which are associated with climate change.

K865A

Seasonal flow of the Ross Ice Shelf
Victoria University of Wellington
This research is investigating the seasonal flow patterns (forward movement) of the Ross Ice Shelf, using Global Positioning System (GPS) units located on the fastest-flowing zones of the ice shelf. GPS units were installed on the ice in the 2019/20 field season, and units will be visited this season, to download data and undertake maintenance activities. These field measurements will be combined with satellite data to create computer simulations that will inform predictions of the response of the Ross Ice Shelf, and West Antarctic Ice Sheet to climate change.

K015A

Ice sheet subglacial hydrology
University of Auckland, University of Newcastle, Macquarie University, University of Melbourne
The Antarctic Ice Sheet covers almost all of the continent and its base is incredibly difficult to access and study. Fortunately, in small ice-free areas around its margin, unusual deposits, created by meltwater at the base of an ice sheet, can be found. The team will use cutting-edge instruments to sample and analyse these deposits, which will help determine how they formed, and what this tells us about past changes in the presence and composition of water at the base of the ice sheet.

K892B

Airborne sea ice measurements
University of Canterbury, Lincoln Agritech, University of Otago, Alfred Wegener Institute, Australian Antarctic Division
This team is investigating the processes that influence sea ice formation around polynyas (areas of wind forced open water that are important for sea ice production and global ocean circulation). Researchers will measure sea ice thickness and depth of snow cover on the sea ice using specialised instruments flown beneath a twin otter aircraft. Airborne data will be extended by a skidoo-based sea ice team who will undertake on-ice measurements of sea ice and snow thickness. Information will enable scientists to validate satellite measurements of the sea ice, contributing to a better understanding of the current state and likely climate change response of this important modulator of global climate.

Ecosystem dynamics and responses to change

K500B

Cape Bird Protected Area Management Review
Antarctica New Zealand, University of Wollongong, SAI Dynamics
Cape Bird on Ross Island is the location of Antarctica Specially Protected Area (ASPA) 116. The area is protected as it contains some of the richest stands of moss in the Ross Sea region. Early this season, a team will be based at Cape Bird gathering information to support the review of the ASPA Management Plan, including aerial drone surveys of moss and penguin colony extent, and ground sampling of mosses and invertebrates. This is a collaboration with Securing Antarctica's Environmental Future (Australia).

K882C

Fishing for environmental DNA (eDNA)
University of Otago
All living things shed genetic information into their local environment. This is called environmental DNA, or eDNA. Collection of eDNA provides information on the types of animals living in the local area. The K882C team will work through holes in the sea ice to collect fish, and water samples, and will visit Cape Bird, Roysds and Evans to collect samples of penguin guano and seal scat. The samples will be used for eDNA analysis, that will contribute to improved understanding of Ross Sea food webs.

K882A

Coastal seafloor communities
NIWA, University of Tasmania
Researchers will work through holes drilled in the sea ice at Cape Evans, where they will deploy a remotely operated vehicle (ROV), and a specialised camera for collecting very detailed (hyper-spectral) images. A particular focus this season are the coral-like algae that are uniquely present on the seafloor at Cape Evans. The team will also resurvey a long-term monitoring site on the Cape Evans seafloor, and collect seawater and other samples for analysis. The work is part of a larger programme investigating the response of seafloor communities to changes in sea ice cover and other ocean processes that are predicted to occur in a warming world.

K023A

Erebus subsurface geothermal microbes
University of Waikato, University of Canterbury, University of Southern California, Northeastern University
This team will be investigating how microorganisms have adapted to geothermal environments on Mt Erebus. The results of this study will increase knowledge of geothermal microbe diversity and ultimately broaden understanding of conditions that can support life on Earth, and the possible existence of life on other planets.

K812B

Terrestrial monitoring programme – Korean collaboration
University of Waikato, Korean Polar Research Institute
This project is a scientific collaboration between New Zealand and Korean researchers (the Korean Polar Research Institute, KOPRI), that is investigating the impacts of a warming global climate on Antarctica. The K812B event focuses on terrestrial (land-based) systems. This season the team will work at Cape Hallett in Northern Victoria Land, where they will use innovative new technologies to study the large Adélie penguin colony located there, including an automated penguin tracking system and time-lapse camera. While onsite researchers will also take samples to monitor for the presence/absence of avian flu.

K882B

Sampling 'marine drifters' (plankton)
University of Waikato, University of Otago
This team is studying the marine plankton community ('marine drifters'), the microscopic floating plants, animals and bacteria that live beneath the sea ice, using an autonomous sampling technology, the Hauwa20. The instrument will collect plankton samples and take environmental measurements throughout the year, providing new information on sea ice communities during winter and summer. The research will improve our understanding of the role of sea ice as a habitat for these marine organisms, and how this might be impacted in a warming world. This season foreshore works will be undertaken to prepare for deployment of the sampler next season.

K881C

Terrestrial Sampling and Sentinel Sites
University of Canterbury, University of Waikato, University of Edinburgh
Ice-free areas in the Ross Sea region harbour unique biota not found outside Antarctica or even elsewhere in Antarctica. Climate-driven changes in the environment have the potential to expand the habitats for these unique biotas or destroy them. That is why this team will be conducting baseline characterisation and sampling at identified biological data-poor sentinel sites in Trough Lake, Canada Glacier, Cape Hallett, and Botany Bay. The baseline data will be able to inform policymakers of the changes likely to be experienced by these ecosystems, allowing them to respond with conservation actions.

K024A

Adélie penguin mounds: contaminant transfer
University of Waikato
The K024 team are investigating whether Adélie penguins transfer contaminants (eg lead, mercury, DDT, microplastics) from the sea onto land at their nesting sites. Using the penguin mounds (nest sites) at Cape Hallett as a natural archive, they will dig soil profiles (pits) and sample soil, eggshells and bones to measure the concentration of contaminants, and develop a time series of contaminant accumulation. This research will contribute to a deeper understanding of the life histories of contaminants and how they accumulate in diverse ecosystems. The study will be the first of its kind to show the chronological history of human-made contaminants in ice-free terrestrial Antarctica.

K123A

Soil climate stations *
Manaaki Whenua, University of Waikato
The K123 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, and also have an above-ground suite of instruments that measure 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 12 months. 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.

K043A

Sea ice microbes
Victoria University of Wellington, University of Tasmania, Israel Institute of Technology
This team will be working on the sea ice in southern McMurdo Sound, where they will deploy a remotely operated vehicle (ROV), collect sea ice cores, and seawater samples to study sea ice microbes. The microbes of interest have recently been found to contain light utilising proteins called rhodopsins. The researchers will investigate the response these cells have to environmental stressors, which in turn will provide insight into the possible effects of climate change for these unique microbes. This work is important as changes in microbial community composition could impact the energy flow of the entire food web. This study will also help to understand more about the biodiversity and ecosystems of the Ross sea.

K881B

Automatic weather stations: McMurdo Dry Valleys
University of Canterbury, University of Otago
This team will use data from existing and newly installed automatic weather stations to develop regional and local-scale climate models. The climate models will contribute to increased understanding of climate-driven change in the physical environment, such as increased meltwater production, and how these changes will impact land-based ecosystems. This season the team will visit the network of weather stations to perform maintenance and upgrade activities.

K892A

Under-ice oceanographic mooring
NIWA, Victoria University of Wellington, University of Otago
The K892A team will be working on the sea ice in McMurdo Sound to recover and then redeploy a seafloor-mounted mooring, that was positioned in the 2022/23 summer season. The mooring utilises innovative technology, that allows for year-long deployment, and, when retrieved, will provide valuable measurements of ocean temperature, salinity and current flow. Ultimately, the information will contribute to improved understanding of ice-ocean processes, and the seasonal cycle of ocean circulation from beneath the McMurdo ice shelf cavity.

* Long-term science