PALMER STATION MONTHLY SCIENCE REPORT

January 2025

The R/V *Noosfera* lingers offshore while surrounding icebergs encroach Hero Inlet. The ship was at station for a nine-day port call transporting ASC and NSF visitors, swapping out deployed grantees, and delivering cargo.
Image credit: Dr. Natasja van Gestel

NEWS FROM THE LAB

Hannah James, Summer Lab Supervisor

The month of January was busy and incredibly productive in the Palmer Station labs and surrounding field areas. The first half of the month provided excellent weather for lots of fieldwork on the water and surrounding islands, whereas the second half of the month was busy on station with the mid-season port call and turnover of a majority of deployed grantees. Nearly all of the LTER crew swapped out, and the B-086-P (van Gestel) had a film crew of two on station as part of the "Broader Impacts" portion of Dr. Natasja van Gestel's grant. The R/V *Noosfera* tied up to the Palmer Station pier on January 18. As mentioned in previous reports, there have been a number of icebergs in the boating local area, which forced the ship to untie and hold off away from the pier for a number of days throughout the portcall. Thanks to our Boat House and other qualified operators, station was able to shuttle visitors and station personnel to and from the ship in the morning and evening. We were incredibly lucky to have the excellent calm weather and stable sea state during this port call. Among visitors was the National Science Foundation's current Program Director of the Antarctic Organisms and Ecosystems, Dr. Becky Gast. Dr. Gast toured the labs, local boating area and islands, and met with numerous grantees and ASC staff to discuss science projects supported by Palmer Station. It was a pleasure having her on station.

Amongst the new arrivals at Palmer were the C-024-P (Friedlaender) and C-045-P (Van Mooy) labs. These groups spent the first few days of their arrival orienting themselves to station, conducting boat operator and lab training, and preparing to jump right into summer field work. The C-024-P (Friedlaender) team conducts most of their marine mammal field work independently off of SOLAS *Avior*, whereas the C-045-P (Van Mooy) group joins the C-019-P (Schofield) and C-020-P (Steinberg) groups on R/V *Hadar* for twice-weekly sampling at Station

E and (as weather allows) acoustic transects. Since both of these new arrivals were busy enough jumping into the heart of summer fieldwork, I told them not to worry about writing up a report for the month of January, but they surely will have lots to report on next month's report! For now, enjoy the write-up from each group below.

B-086-P: Antarctica as a Model System for Responses of Terrestrial Carbon Balance to Warming

Dr. Natasja van Gestel, Principal Investigator, Department of Biological Sciences, Texas Tech University.
Personnel on station: Dr. Natasja van Gestel, Tiego Ferreira de la Vega, Liz Smith and Scott Simper.

Science

We were able to measure carbon fluxes in all warmed and control plots in the field several times in January. Incoming and outgoing carbon fluxes are lowest near the glacier where there are no visible higher plants (see Figure 1, Site 1), whereas they are the highest at the most mature, vegetated site on Litchfield Island (see Figure 1, Site 4). Preliminary data show that moss carbon uptake of moss peatbanks at Litchfield Island is reduced with warming. In contrast, warming increases carbon uptake of recently deglaciated soils where photosynthesis is primarily through microbial life.

Each time we measure carbon fluxes, we also measure temperatures of the surface (vegetated and non-vegetated) of all plots to get a sense of the microclimate of the plants and microbes. These measurements will complement the air and soil temperatures (at 5 cm depth) that are measured continuously in our plots.

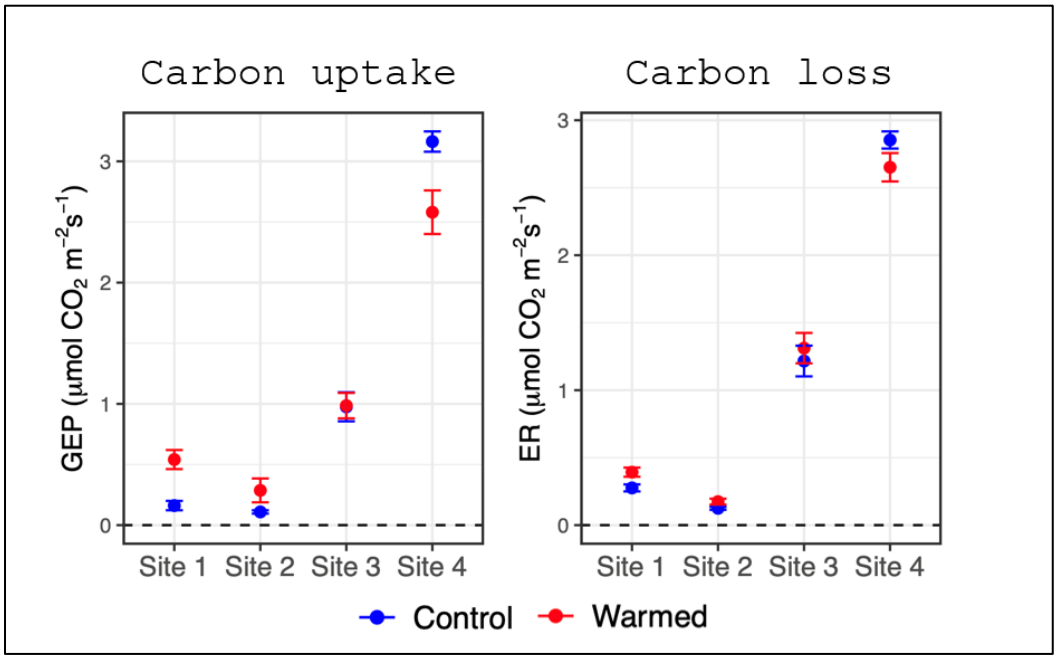

Figure 1. Carbon uptake and loss from control and warmed plots in the first week of January. GEP = Gross ecosystem productivity; ER = Ecosystem respiration. Site 1 is closest to the glacier and site 4 is the farthest, on Litchfield Island. In the first field season of this project, in 2022-2023, the ages of the sites (i.e., since deglaciation) were: <1 years old (site 1), circa 25 years old (site 2), 65 years old (site 3) and >600 years old (site 4, Litchfield).

Figure 2- Tiego Ferreira de la Vega and Dr. Natasja van Gestel in the field with the LI-6800 carbon flux instrument (LI-COR Inc., Lincoln, Nebraska). *Image credit: Danny Tropper*

We also buried plant root simulator probes (PRS® probes, Western Ag Innovations), i.e., "soil fertility sticks", that remained in the soil for the month of January. These contain a membrane that are either positively or negatively charged in order to attract anions or cations, respectively (see Figure 3). Because they are buried in the soil for a period of time, these provide a more comprehensive evaluation of soil fertility rather than a spot measurement based on a soil sample.

With the mid-season turnover for other science groups, the B-086-P (van Gestel) team added two more members during the PAL25-01 port call. Liz Smith and Scott Simper are part of the broader impacts of the project, and were on site to film many important aspects of my terrestrial research, as well as research from other science groups following permissions from the respective PIs. Additionally, they filmed segments that can be used by USAP and NSF. For instance, some footage is planned to be used as an introduction to the *Live from Antarctica* event that I plan on hosting on March 14.

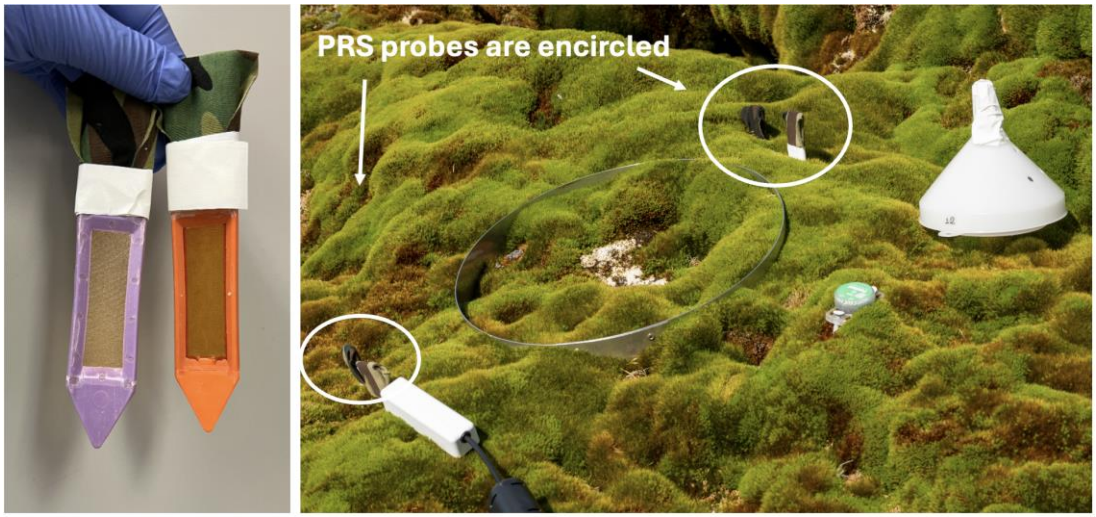

Figure 3- Plant Root Simulator probes (PRS® probes, Western Ag Innovations) are used to quantify soil fertility. These "sticks" provide minimal disturbance, while giving valuable information on soil nutrient availability over a longer time period. The sticks are covered with strips from a camouflage shirt to (try to) outsmart curious skuas at our sites. *Image credit: Natasja van Gestel*

Outreach/Broader Impacts

On January 9th Palmer Station received a visit from the ARA *Bahía Agradable*, an Argentine navy vessel. It was a great visit in which I communicated effectively with the visitors, touring

them around station in Spanish (my mother was Panamanian). Then on January 16th the M/V *Oosterdam* returned. I was one of eight participants in the Q&A session of the off-shore lecture given by Ken Keenan and Hannah James. Lastly, my Instagram @AntarcticResearchAdventures has grown further, to 396 followers (up from 350 at end of December).

Figure 4- The visiting film crew capturing the glacier edge from Amsler Island. *Image credit: Natasja van Gestel*

C-013-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (PAL-LTER): ECOLOGICAL RESPONSE TO "PRESS-PULSE" DISTURBANCES ALONG A RAPIDLY CHANGING WEST ANTARCTIC PENINSULA

Dr. Megan Cimino, Principal Investigator, University of California at Santa Cruz.
Personnel on Station: Megan Roberts, Darren Roberts, Victoria Hermanson, Ricky Robbins, Helena Dodge, Allison Northey, Wriley Hodge.

Weather this month allowed us to carry out 29 days of boating fieldwork. A significant focus was placed on monitoring the breeding chronology and success of Adélie, Gentoo, and Chinstrap penguins. This involved conducting indicator colony counts and a comprehensive chick census at local sites and across Dream, Biscoe, and the Joubin Islands. In addition, we measured Adélie penguin chicks and furthered our foraging ecology studies, deploying and successfully recovering GPS, depth, radio, and video camera tags. These efforts spanned multiple sites, including Torgersen, Humble, Point 8, and Biscoe Islands. Diet sampling of Adélie and Gentoo Penguins also took place throughout the month, providing valuable insights into their feeding habits.

Figure 5- Gentoo with chicks on Biscoe Island. *Image Credit: Darren Roberts*

Our studies extended beyond penguins, with Brown Skua research continuing across local islands, Dream, Biscoe, and the Joubin Islands. We documented hatches, and kept a close eye on South Polar Skua nesting activities on Shortcut Island. Meanwhile, on Cormorant Island, we tracked the blue-eyed shag colony, while our work with giant petrels included GPS tagging, chick growth and survival monitoring, and a local census and banding effort across approximately 25 islands.

Figure 6- Giant petrel growth measurements on Humble Island. *Image Credit: Megan Roberts*

Marine mammal monitoring also remained a priority. Antarctic Fur Seals began making their seasonal arrival to the Palmer area, while Humpback whale sightings increased significantly, adding an exciting dimension to our observations.

In addition to biological monitoring, we conducted a marine debris survey in the Joubin Islands, contributing to our understanding of environmental impacts on the local ecosystem.

At the end of the month, we underwent a mid-season crew rotation. We bid farewell to part of the team and welcomed Helena Dodge, Allison Northey, and Wriley Hodge, who brought fresh energy and expertise to our ongoing efforts.

A special note of gratitude goes to Dr. Joe Moriarty, whose invaluable consultation this month significantly enhanced our work. His guidance and insights are deeply appreciated.

C-019-P: Palmer, Antarctica Long Term Ecological Research (PAL-LTER): Ecological Response to "Press-Pulse" Disturbances Along a Rapidly Changing West Antarctic Peninsula

Dr. Oscar Schofield, Principal Investigator, Rutgers University, Institute for Earth, Ocean, and Atmospheric Sciences, Department of Marine and Coastal Sciences
Personnel on Station: Abby Tomita, Charlotte Bramich, and Mya Sharpe

The peak of summer is upon us! This month was marked by the arrival of the R/V *Noosfera*, a Ukrainian polar supply and research vessel, which brought a suite of new grantees to Palmer Station, including the newest addition to the Phytoplankton and Bio-optics group, Mya Sharpe. Mya, who is in the second year of her PhD, will be working on the LTER time series and performing experiments to investigate the influence of glacial retreat on the community composition of phytoplankton.

The Western Antarctic Peninsula (WAP) is the fastest-warming region in the world.
As perennial glaciers retreat and meltwater discharge increases, this water flows over rock, scouring micro- and macronutrients that are deposited into the surface coastal ocean. It is crucial to understand the responses of primary producers. Phytoplankton are the foundation of the biological pump and the food web, and this unprecedented warming and increasing glacial meltwater will inevitably alter the ecosystem. Therefore, in the face of climate change, it is critical to investigate how the changing chemical compositions of increasing glacial meltwater influence phytoplankton communities. Changes in phytoplankton diversity propagate up the trophic levels, impacting the structure and dynamics of the entire ecosystem.

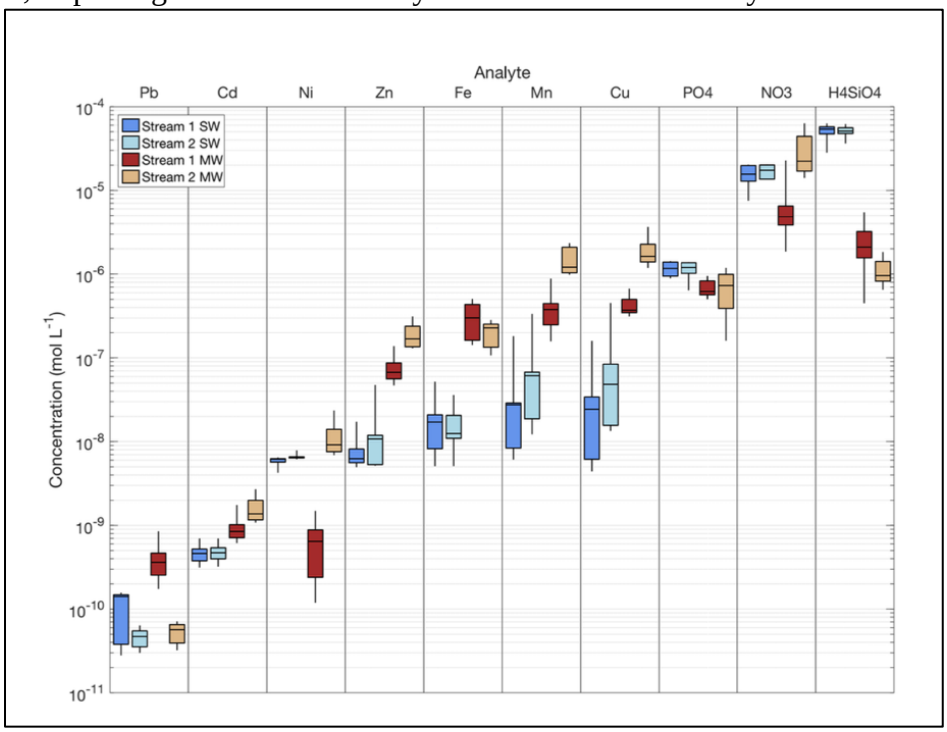

Figure 7- Macronutrients and trace metals in a time series from Marr Glacier meltwater streams 1 and 2. *Figure credit: Michael Brown (2020)*

A previous graduate student under Dr. Schofield, now Dr. Michael Brown, collected weekly samples of macro and micronutrients of glacial meltwater of streams and adjacent coastal water from 2 streams. Glacial Meltwater streams 1 and 2 and coastal seawater samples of macro and trace metal analyte in mol per L concentration. We see copper is the highest micronutrient, near the amount of macronutrients, x1000 higher than surface seawater of the WAP. Copper is a micronutrient, but is also known to be toxic for some phytoplankton at moderate levels, as it can alter the cell's regulatory capacity, negatively impacting its infrastructure (Wei et al., 2014). This begs the question, can elevated copper from meltwater potentially explain the changes in coastal planktonic communities? Mya's research objectives are to (1) Characterize the chemical composition of glacial meltwater and (2) conduct trace metal clean controlled laboratory experiments to understand the effects of copper on phytoplankton species composition. This will increase our knowledge of chemical composition introduced by glacial meltwater increase our understanding of the biogeochemical cycling in polar marine ecosystems and enhance our understanding of the interplay between trace metals and phytoplankton.

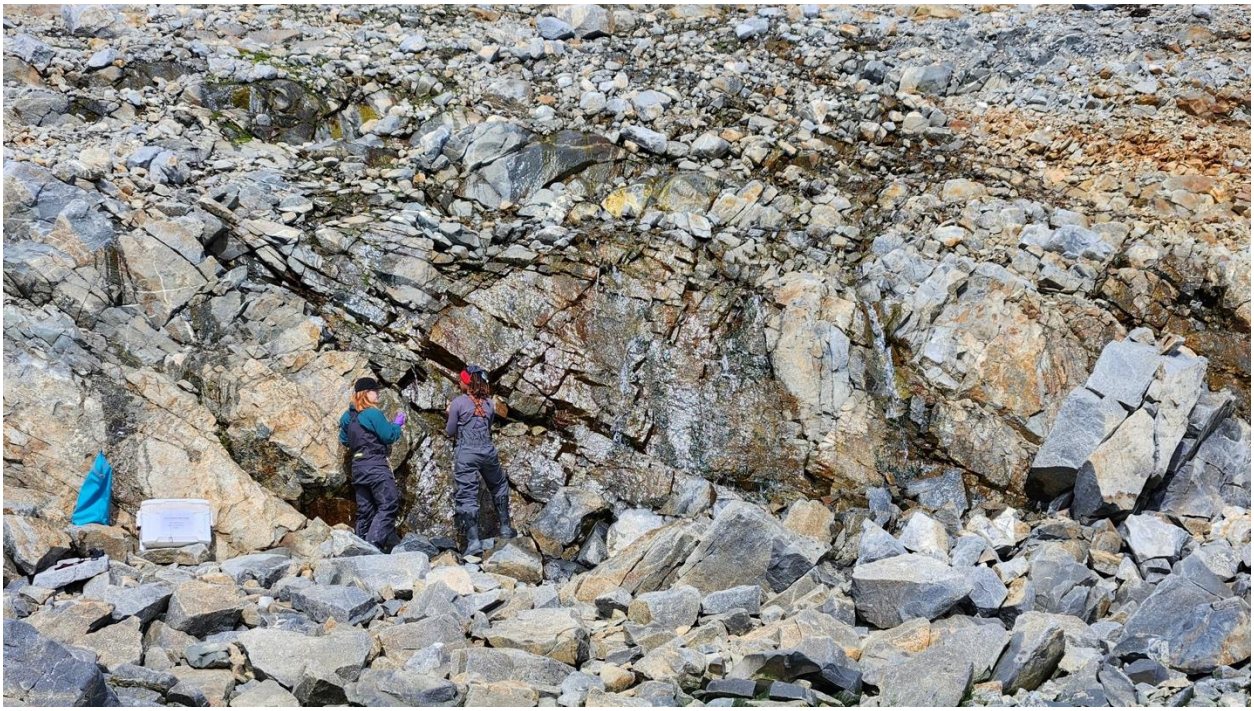

Figure 8- Abby Tomita and Mya Sharpe collecting glacial meltwater from outflow in the backyard
Image credit: Matt Gosselin

The Rutgers University AUV glider, RU26, has completed the 600 line of the LTER cruise track, collecting data along the way. Without an LTER cruise this year, the data that RU26 collects is incredibly valuable to the time series. The glider is currently on its way to the Palmer Deep

Canyon. Currents interact with this bathymetric feature, upwelling nutrients from depth into the surface ocean, creating a biological hotspot in this region.

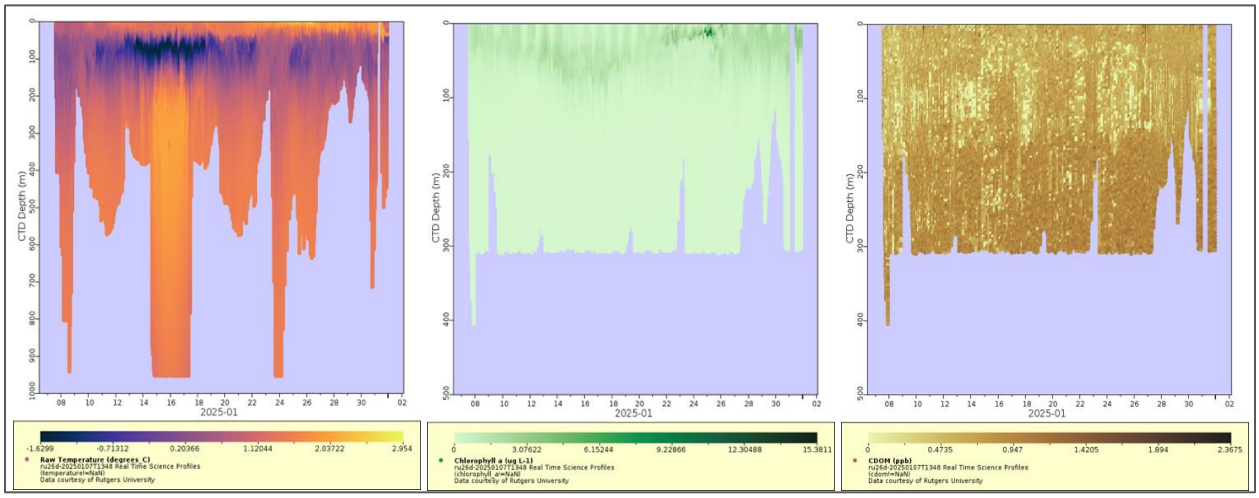

Figure 9- Plots of Temperature (ºC), Chlorophyll A (□g L-1), and Colored Dissolved Organic Matter (CDOM, ppb) from data collected by RU26 *Courtesy of RUCOOL Glider Deployment Data*

The C-019-P (Schofield) group and Palmer Station said a somber goodbye to Charlotte Bramich, who finshed her role as a field technician for the first half of the season. The lab wishes her a safe journey on her way north!

C-020-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (PAL-LTER): ECOLOGICAL RESPONSE TO "PRESS-PULSE" DISTURBANCES ALONG A RAPIDLY CHANGING WEST ANTARCTIC PENINSULA

Dr. Deborah Steinberg, Principle Investigator, Virginia Institute of Marine Science, William & Mary's Batten School, Section for Coastal & Ocean Processes

Personnel currently on station: Meredith Nolan, Isabelle Castro, Maya Thomas, Benjamin Klempay

Another month is in the books for the C-020-P (Steinberg) group! This month we continued our normal sampling schedule (net tows at Station E on Tuesday and Friday). Salps (sp. *Salpa thompsoni*) continue to be the most abundant macrozooplankton at Station E (see Figure 10). Salps are gelatinous zooplankton that are non-selective filter feeders. They are typically found in warmer, ice-free waters, in contrast to Antarctic krill, which are typically found in colder waters with ice. Salps have both a solitary (asexually reproducing) and an aggregate (sexually reproducing) stage (Figure 10). When conditions are favorable, salps can reproduce quickly, forming a bloom. We encountered a bloom at Station E this month, where we caught hundreds of salps in one net tow. When blooms occur, salps produce large, fast-sinking fecal pellets that have a large role in carbon export and biogeochemical cycling.

Figure 10- a) The contents of a net tow at Station E. Both salps and krill were caught. *Image credit- Meredith Nolan* b) Meredith holds a solidary salp. c) A large aggregate salp. *Image credits- Abby Tomita.*

As weather allows, we have also continued to conduct acoustic transects in penguin foraging grounds in collaboration with the C-019-P (Schofield) and C-013-P (Cimino) groups. We have two different surveys, as seen on Figure 11: one over the Palmer Canyon called the "Adélie survey" (pink line on map) which is an Adélie foraging region. The other is by Biscoe point and the Wauwerman Islands called the "Gentoo survey" (green line on map), named for the Gentoo foraging region. The goal of these surveys is to see how environmental and phytoplankton dynamics drive krill abundance and distribution in each foraging region, and how this influences penguin foraging behavior. We conduct CTD casts (marked by the white diamonds on Figure 11) across a cross-shelf transect to collect environmental and chlorophyll data. We also conduct an acoustic survey using an EK80 echosounder along the pink and green lines on the map, which gives us krill abundance and distribution data. During the acoustic survey we also conduct a visual predator survey, which gives us data on foraging in the region.

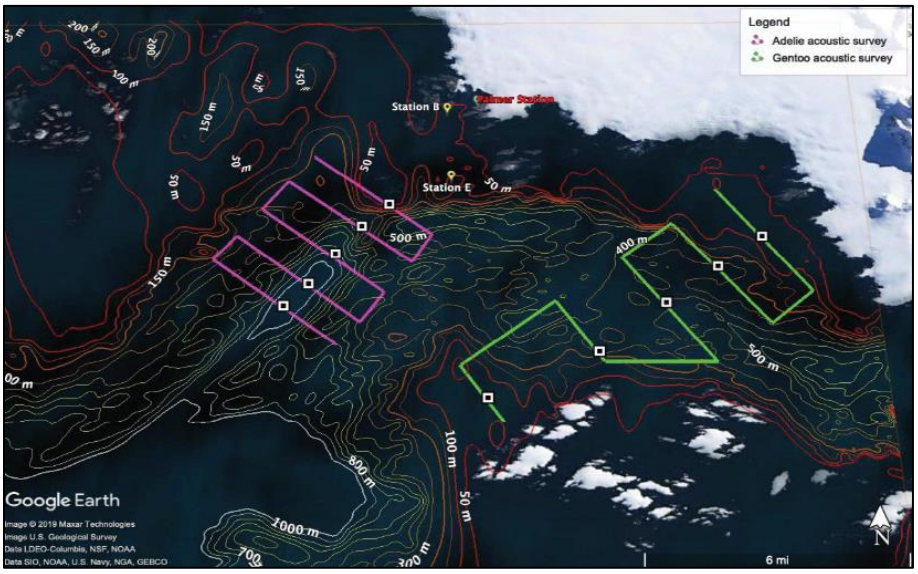

Figure 11- Map of the collaborative acoustic surveys.

The second half of the season has also brought new personnel to the Steinberg lab. Maya Thomas, a Ph.D. Candidate at VIMS, is returning for her third season at Palmer Station. She is joined by Dr. Benjamin Klempay, a microbiologist (turned zooplankton ecologist for the season). This is his first trip to the Antarctic. Maya and Benjamin will remain at Palmer until the end of the summer season (April 2025). They are taking over the normal zooplankton operations (Station E and acoustic transects) and will be conducting some additional work for Maya's Ph.D. They will continue the sediment trap work and zooplankton excretion experiments that were conducted during the 2023-2024 summer season at Palmer Station. The Steinberg lab is excited to continue sampling the coastal zooplankton community in February!

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
January 2025
Ben Rosen-Filardo

Ukrainian staff travel via Zodiac from the R/V NOOSFERA to Vernadsky Station, January 22, 2025. This season, the R/V NOOSFERA served as the mid-season supply vessel for Palmer Station.
Image credit: Ben Rosen-Filardo

A-111-P: THE NEXT GENERATION OF GEOSPACE RESEARCH FACILITIES AT PALMER STATION

Dr. Hyomin Kim, Principal Investigator, New Jersey Institute of Technology; Newark, NJ

Extremely Low Frequency/Very Low Frequency (ELF/VLF) radio wave observations at Palmer Station are used to provide a deeper understanding of lightning and its effects on the Earth's inner radiation belt. Lightning source currents are estimated or directly measured by experimental observations of individual natural and rocket−triggered lightning flashes in North America. Together, the North American and Antarctic data sets are used to experimentally identify and analyze the components of lightning and the effects of lightning, such as lightning-induced electron precipitation (LEP), that are observed in the Antarctic, more than 10,000 km away.

The ELF/VLF radio wave observations at Palmer Station contributes to the wider network of experiments studying high-latitude geospace variables. Together with South Pole and McMurdo,

these staffed U.S. Antarctic geophysical stations measures the interactions between Earth's upper atmosphere, the magnetosphere, and solar wind. In 2026, this imperative network will be managed by the NJIT-Polar Engineering Development Center (PEDC).

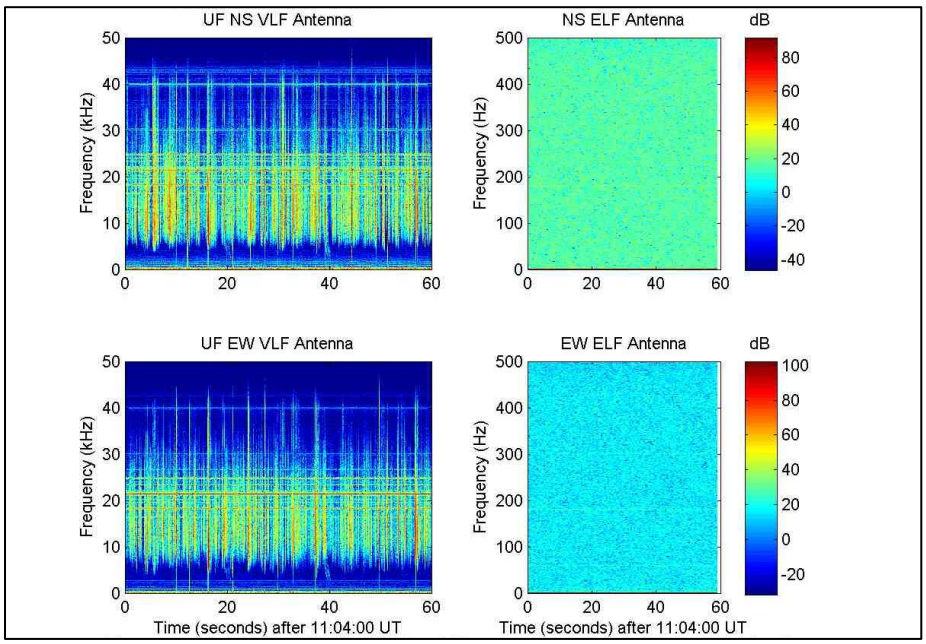

Figure 12. Real-Time broadband VLF and ELF Spectrogram from Palmer Station, Antarctica.

The VLF/ELF radios have been turned on, though are not logging data. The bi-weekly antenna inspections continued as weather allowed. The VLF PC was downgraded to Windows 10 but the DAQ is not yet up and running. A new computer arrived this month on the mid-season vessel and work is underway to set it up.

On January 16, the ground in Hero Inlet was pulled up for cleaning.

Figure 13. Logistics Specialist and Instrument Technician assisting with cleaning the VLF/ELF ground in Hero Inlet. *Image credit: Ben Rosen-Filardo*

When online, current VLF/ELF data from Palmer Station can be observed at: http://halo.ece.ufl.edu/realtime_palmer_bb.php.

A-111-P: SAMBA MAGNETOMETER
Dr. Hyomin Kim, Principal Investigator, New Jersey Institute of Technology; Newark, NJ

The three-axis fluxgate magnetometer at Palmer is one in a chain of eleven longitudinal, ground-based magnetometers extending down though South America and into Antarctica. The primary scientific goals are the study of Ultra Low Frequency (ULF) waves and the remote sensing of mass density in the inner magnetosphere during geomagnetically active periods. Palmer's magnetometer is also a conjugate to the Canadian Poste de la Baleine Station, allowing the study of conjugate differences in geomagnetic substorms and general auroral activity. In 2024 the project was taken over by Dr. Hyomin Kim.

SAMBA stands for South American Meridional B-field Array. The sites are approximately along the 0° geomagnetic longitude and ranging from -5° to -48° geomagnetic latitude. In combination with other magnetometer chains, including the AGO (Automated Geophysical Observatory) systems elsewhere in Antarctica, the stations create an almost complete, cusp-to-cusp-long meridional chain at approximately 0° magnetic meridian.

The magnetometer was originally installed at Palmer in 2005, and a replacement installed in April of 2008. A new Raspberry Pi system was installed in 2023. The system has been down since December 8th due to ongoing issues with the data acquisition software. More information can be found at: http://magnetometers.bc.edu/index.php/palmer.

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION.
Dr. David Wilson, Supervisor Research Geophysicist, USGS Earthquake Hazards Program, Albuquerque, NM

Palmer's seismic station, code named PMSA, is part of the Global Seismic Network (GSN), a collection of 150+ sites worldwide, operating under the aegis of the Incorporated Research Institutions for Seismology (IRIS), and managed by the United States Geological Survey's Albuquerque Seismological Laboratory (ASL). The site was installed in March 1993. As of August 2006, PMSA is also used as an ancillary seismic system for the CTBT/IMS installation; CTBT-specific protocols for the seismic system are covered in the CTBT (T-998-P) section this document.

A standard seismic station consists of three seismometers oriented to detect ground motion along three mutually perpendicular lines. Most of the time the directions chosen are north-south, east-west, and up-down. The seismometers in the Palmer Station installation are "forced balanced" instruments, which means that they work by keeping an inertial mass stationary with respect to the instrument (and the earth). When a seismic wave arrives, the ground moves, carrying along the housing of the seismometer. The inertial mass tends to remain stationary and not move with the instrument, but it is electronically "forced" to travel along with the instrument (and the earth). The amount of "force" necessary to make it move with the rest of the instrument is proportional to the ground acceleration and is recorded as the raw data from the seismometer.

By examining time of arrival, azimuth, magnitude, frequency and wave type of the incoming waves, seismologists can determine the location, depth of focus, magnitude, type of faulting that occurred, ground acceleration in gravitational force and the structure of the medium (the earth) through which the waves traveled to reach the station. The Research Associate operates and maintains on-site equipment for the project.

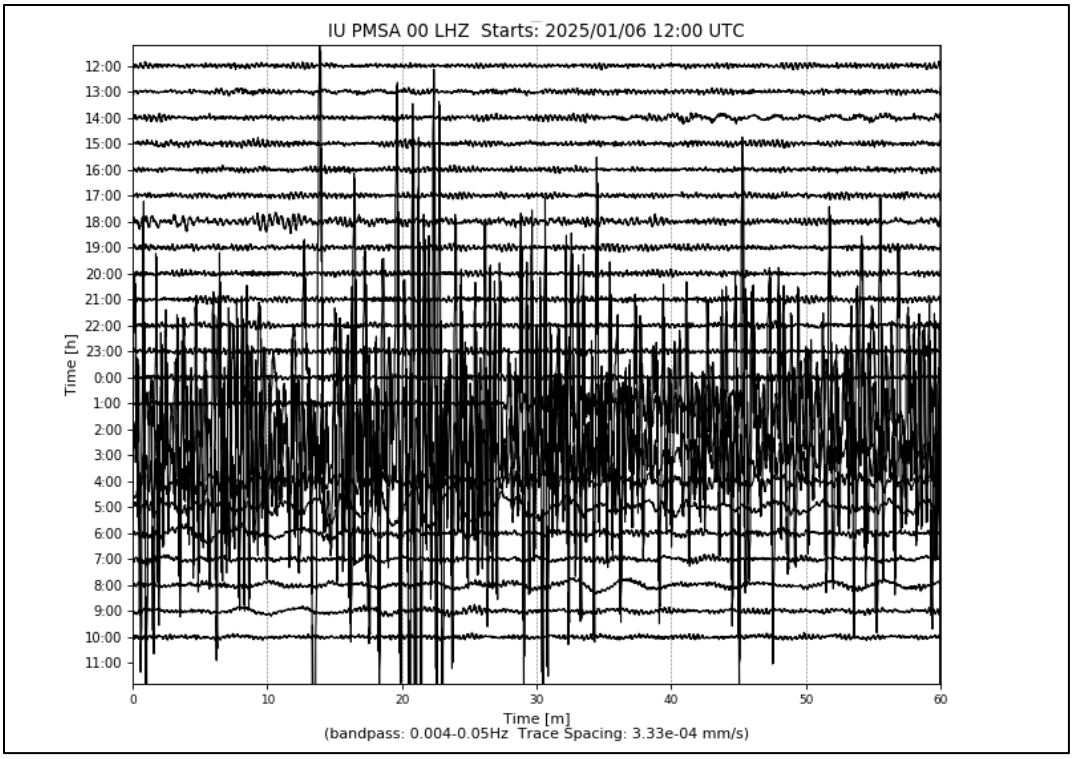

Figure 14. A January 7th magnitude 7.1 earthquake in Tibet, as recorded from the Palmer seismic station. The earthquake killed at least 126 people and damaged more than 27,200 buildings.

The system performed normally during the month. The time stamp and seismic activity found on the Heliplot was checked daily. Current data from Palmer station can be found on the USGS site: https://earthquake.usgs.gov/monitoring/operations/stations/IU/PMSA/#heliplot.

O-264-P: A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL DECADAL VARIATIONS IN TERRESTRIAL AND MARINE ECOSYSTEMS.

Drs. Vanda Grubisic and Ralph Keeling, Principal Investigators, National Oceanic and Atmospheric Administration /Global Monitoring Laboratory; Boulder, CO and Scripps Institution of Oceanography; La Jolla, CA

The goal of this project is to resolve seasonal and inter-annual variations in atmospheric O_2 (detected through changes in O_2/N_2 ratio), which can help to determine rates of marine biological productivity and ocean mixing as well as terrestrial and oceanic distribution of the global anthropogenic CO_2 sink. The program involves air sampling at a network of sites in both the Northern and Southern Hemispheres.

The Scripps Institution of Oceanography flask sampling project analyzes air samples to assess variations in the atmospheric oxygen content caused by exchanges of O_2 between the atmosphere

and the Southern Ocean. The oceans tend to be a source of oxygen to the air in the spring and summer, and a sink for oxygen in the fall and winter. The spring emissions are mostly due to photosynthesis in the water, while the winter uptake is due to mixing processes, which bring oxygen depleted waters from depth up to the surface. These exchanges lead to variations in the oxygen content of the air above the water, and these changes are rapidly mixed around the latitude band by zonal winds. Measurements of the seasonal variations in oxygen content at Palmer and other sites may be valuable for documenting changes in the biological productivity of the southern oceans over time.

The percentage changes in oxygen are very small. Relative to the 20.95% background, the summer-winter differences are only about 0.01%. Some special precautions are necessary so that the O_2 content of the samples isn't perturbed at this low level. Among these precautions are maintaining a constant pressure and temperature in the flasks during sampling. This dictates the installation of the sampling station indoors and the use of a pump module with a bypass valve for avoiding pressure buildup. The Research Associate collects samples fortnightly from Terra Lab.

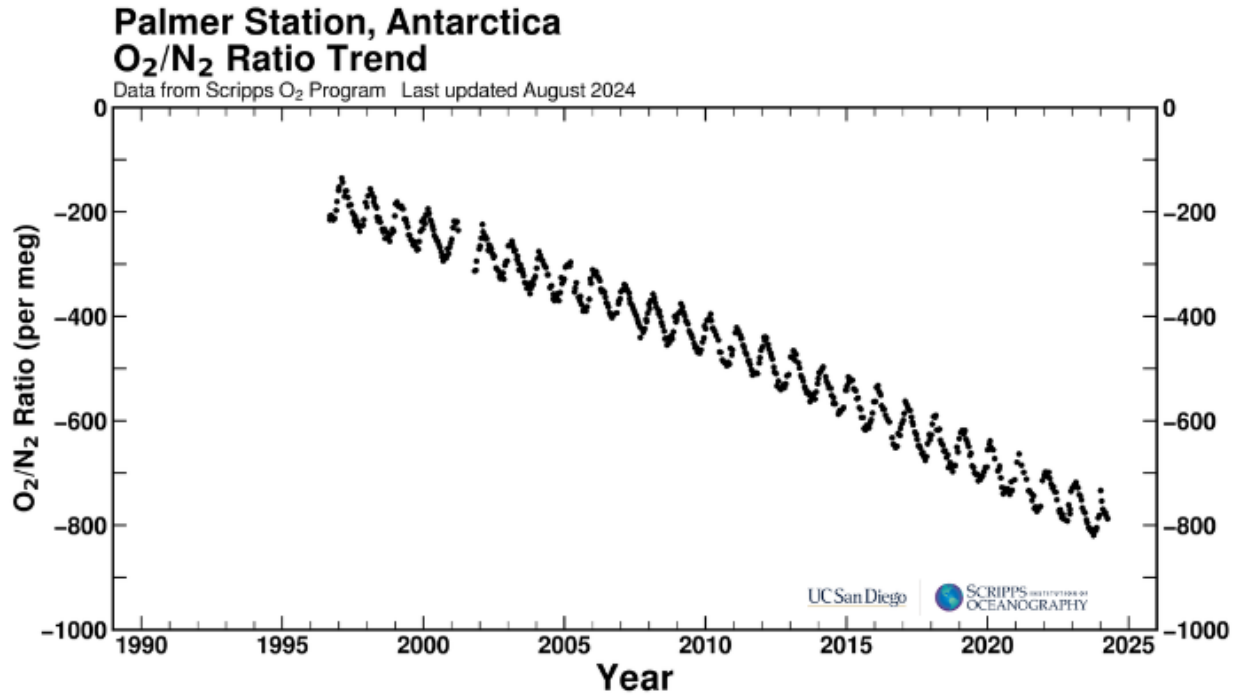

Figure 15. Historical plot of O_2/N_2 ratio per meg and CO_2 ppm, updated August 2024.

Air samples were collected on January 1st, 15th, and 30th. Wind conditions must equal or exceed 5 knots from a direction between 5° to 205° constantly for over an hour with no interference from human traffic on foot or in vessels. These air samples are shipped to the Scripps Institution of Oceanography in California for analysis. More information and data can be found at: https://scrippso2.ucsd.edu/graphics-gallery/o2n2-graphics/psa.html.

O-264-P: COLLECTION OF ATMOSPHERIC AIR FOR THE NOAA/GMD WORLDWIDE FLASK SAMPLING NETWORK

Dr. Vanda Grubisic, Principal Investigator, National Oceanic and Atmospheric Administration /Global Monitoring Laboratory; Boulder, CO

The NOAA ESRL Carbon Cycle Greenhouse Gases (CCGG) group makes ongoing discrete measurements to document the spatial and temporal distributions of carbon-cycle gases and provide essential constraints to our understanding of the global carbon cycle. The Halocarbons and other Atmospheric Trace Species (HATS) group quantifies the distributions and magnitudes of the sources and sinks for atmospheric nitrous oxide (N_2O) and halogen containing compounds. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group. Wind must be between 5 and 15 knots and consistently blow from one sector with no people, equipment, or boats upwind of the sampling location.

Carbon Cycle Greenhouse Gases (CCGG) samples were collected on January 7th, 13th, and 27th during favorable wind conditions. More information and data for the Carbon Cycle group can be found at: https://gml.noaa.gov/ccgg/.

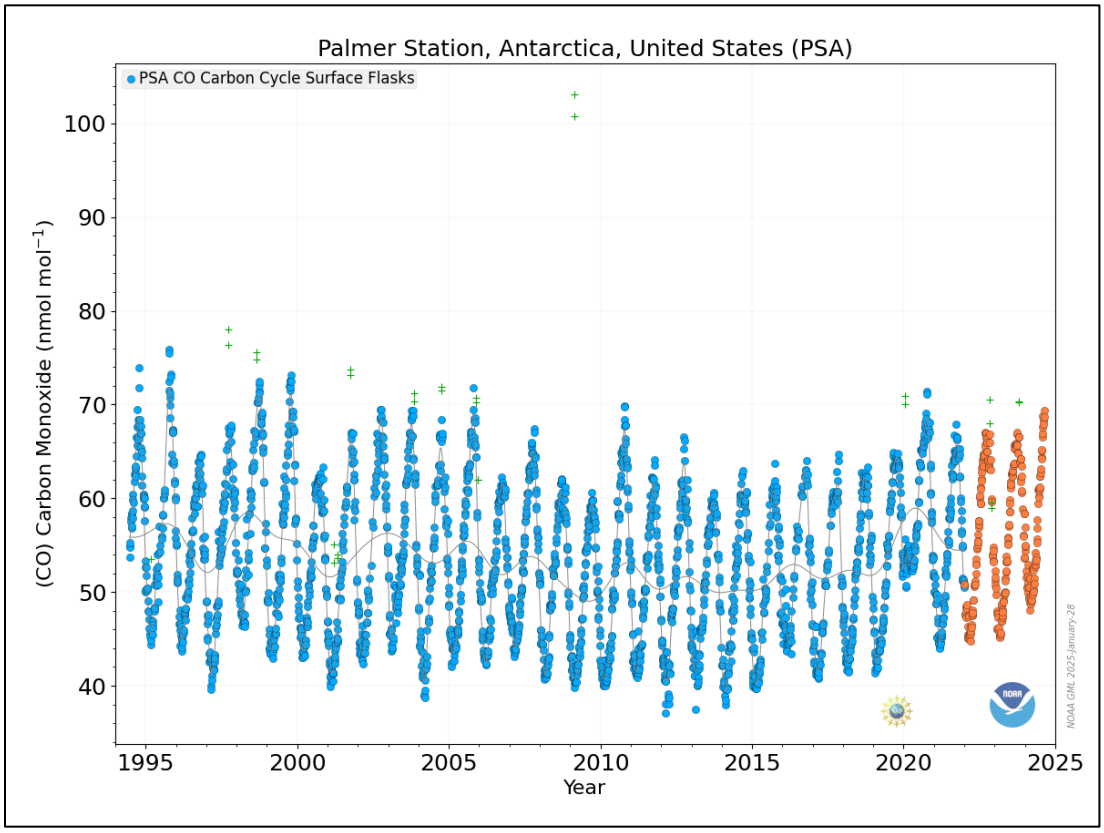

Figure 16. Carbon Monoxide (CO) levels at Palmer Station dating back to 1994. Orange dots are preliminary data and green pluses are poorly mixed air masses, which should not indicate background conditions.

HATS samples were collected on January 8th and 28th during favorable wind conditions. More information and data for the Halocarbons and other Atmospheric Trace Species group can be found at: https://gml.noaa.gov/hats/

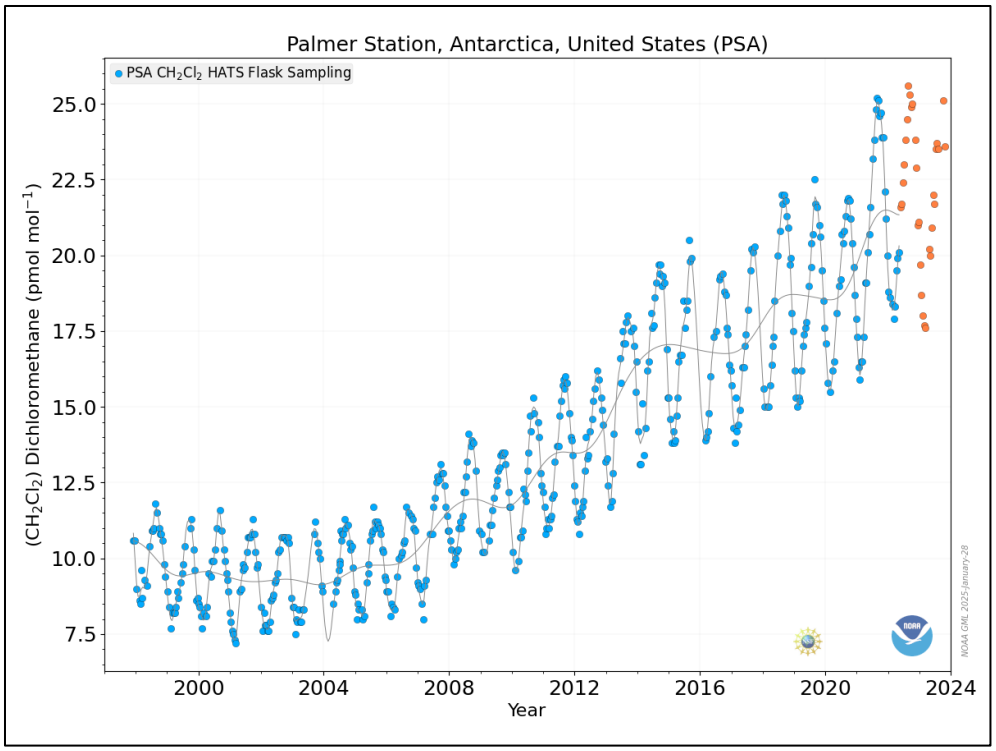

Figure 17. Dichloromethane (CH_2Cl_2) levels dating back to 1997, one of the Halocarbon and Trace Gases measured at Palmer Station. Orange dots are preliminary data.

All samples collected on station are sent back to the Earth System Research Laboratories in Boulder, Colorado for analysis.

O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK

Dr. Scott Stierle, Principal Investigator, National Oceanic and Atmospheric Administration /Global Monitoring Laboratory; Boulder, CO

A Biospherical Instruments (BSI) SUV-100 UV spectroradiometer produces full sky irradiance spectra ranging from the atmospheric UV cutoff near 290nm up to 605nm, four times per hour. A BSI Ground-based Ultraviolet (GUV-511) filter radiometer, an Eppley Precision Spectral Pyranometer (PSP), and an Eppley Total Ultra Violet Radiometer (TUVR) also continuously measure hemispheric solar flux within various spectral ranges. The Research Associate operates and maintains on-site equipment for the project.

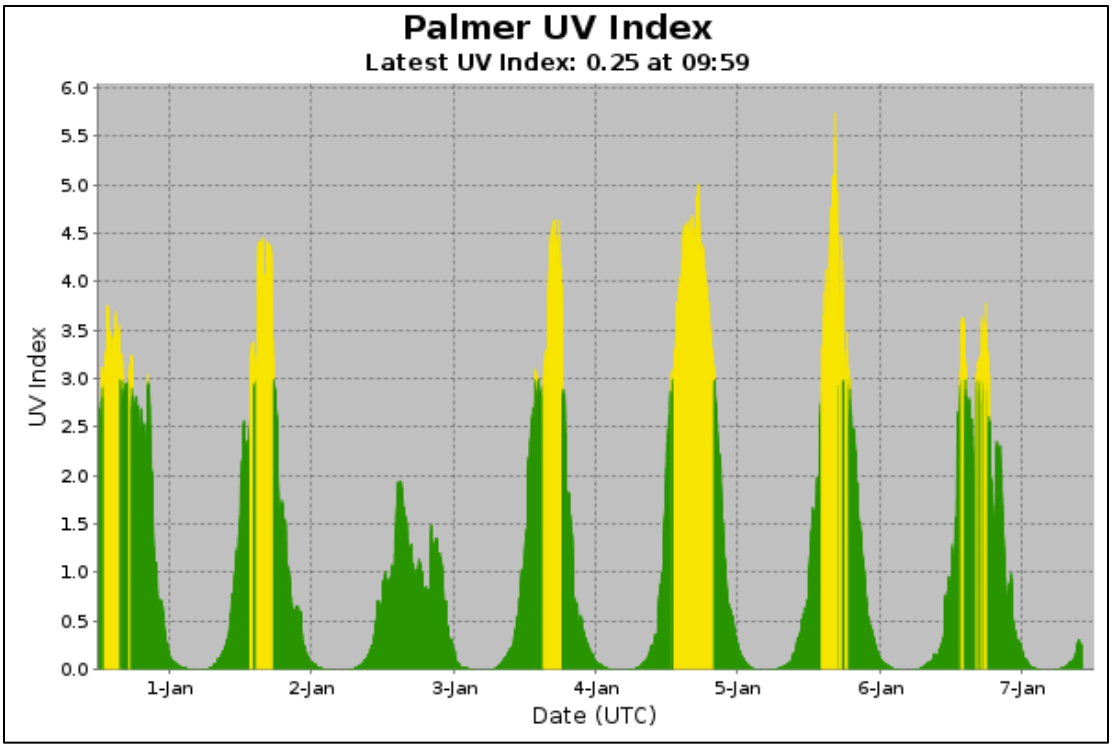

Figure 18. UV index generated from the GUV-511 radiometer in real time.

The log was filled out and collectors were cleaned on a daily basis. Level checks were performed once a week to confirm that the instrumentation was within +/- 0.2 degrees. The weekly log was sent out each Monday, and SUV-100 Absolute Scans were performed on January 14th and 29th without issues. The connector on the TUVR is broken, and the instrument has been intermittently reporting since November 5th.

For more information, visit: https://esrl.noaa.gov/gmd/grad/antuv/.

R-938-P: TERASCAN SATELLITE IMAGING SYSTEM

Justin Maughmer, Principal Investigator, System Administrator, United States Antarctic Program

TeraScan is an integrated system of hardware and software designed for automated reception of data from meteorological/environmental satellites and for processing the data into images and data overlays. The system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. The data files for these images and overlays are of a special format called TeraScan Data Format (TDF). The Research Associate operates and maintains on-site equipment for the project. The TeraScan weather and ice imagery is used for both research and station operations.

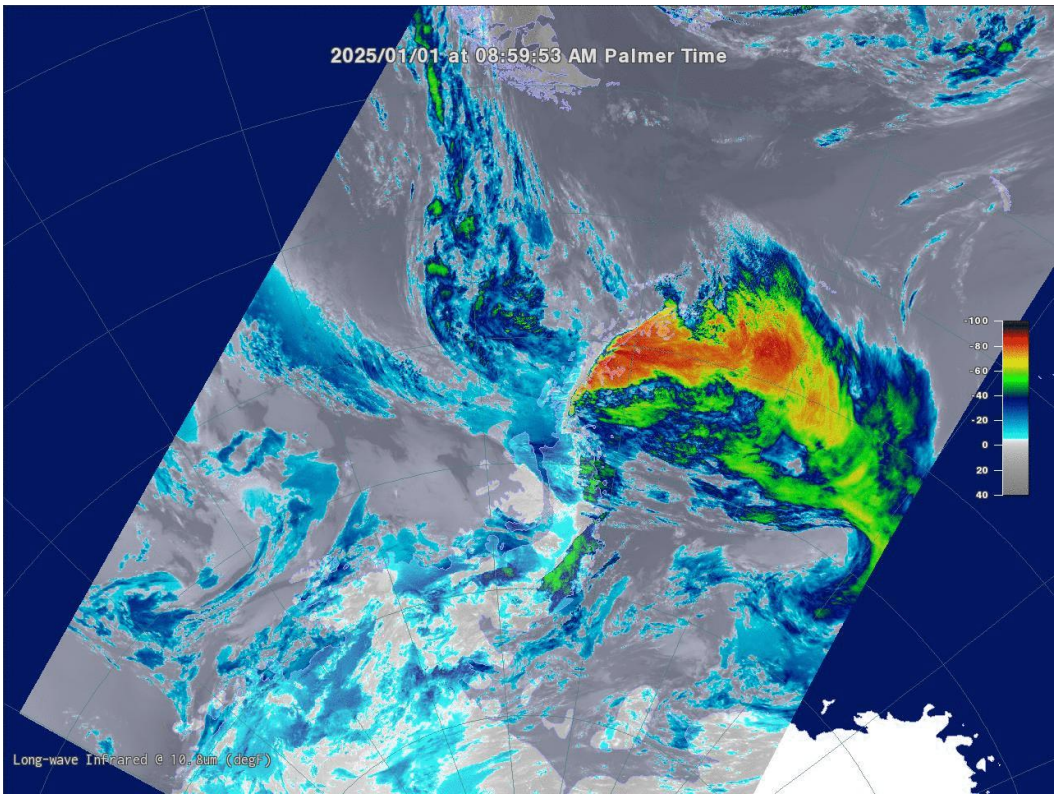

Figure 19. MetOp-1 January 1st satellite pass.

The imagery was checked daily. Both the MetOp and NOAA satellite passes were captured normally this month.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Joe Pettit, Principal Investigator, EarthScope Consortium; Washington, DC and Socorro, NM

The National Science Foundation (NSF) tasked and funded the USGS Antarctic Program to establish a GPS (Global Positioning System) Continuous Operation Reference Station (CORS) at Palmer to serve a variety of scientific investigations in Antarctica. A permanent GPS CORS known as PALM (1003) was established during April and early May of 1997. Four reference marks were set and, along with 10 existing survey marks, PALM was tied in by differential GPS methods.

The GPS data collected supports the International GPS Service (IGS). This system is used for global geophysical studies such as crustal motion monitoring and determination of the global frame. PALM also provides Palmer scientists with real-time differential GPS positioning capabilities. Continuous 15-second epoch interval GPS data files are collected at station PALM, compressed, and transmitted to the NASA-JPL in Pasadena, CA.

JPL/NASA is contracted to maintain the system, and they have sub-contracted to EarthScope. While operation and maintenance of the GPS/CORS base station is the responsibility of the Research Associate, it is available for grantees who wish to use the roving systems and/or differential post-processing using data from the fixed reference station. Users are expected to have proper training prior to deployment to Palmer. The Research Associate may offer support to visiting grantees at their discretion.

Due to potential issues with the antenna and/or splitter, the Trimble receiver is currently disconnected. A new antenna arrived this month and will be used for troubleshooting. For more information, visit: https://www.unavco.org/polar-services/forward-fielded-instruments/palmer-station/

T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE COMPREHENSIVE NUCLEAR TEST BAN TREATY ORGANIZATION. (CTBTO)

Managed by General Dynamics

The Comprehensive Nuclear Test Ban Treaty (CTBT) bans all nuclear explosions. Although not ratified, the U.S.A. is following through with the treaty, including the installation of monitoring stations around the world. The global verification regime for monitoring compliance is called the International Monitoring System (IMS). The radionuclide air particulate sampling station was installed at Palmer in October of 2005. Palmer's radionuclide sampler/analyzer (RASA) is a primary station in the IMS, known by its treaty code USP73 (and RN73). The pre-existing USGS seismic system is an auxiliary station, treaty code AS106.

Data collected by Palmer's RASA unit is relayed back to the CTBT Organization (CTBTO) in Vienna. As of August 2006, both the RASA and seismic systems have been certified by CTBTO. Palmer is now officially part of the IMS. The automated RASA continually filters ambient air and tests for particulates with radioisotope signatures indicative of a nuclear weapons test. The Research Associate operates and maintains the instrument.

The system operated consistently this month. The amount of filter material was checked as needed. Daily filters were processed on January 2nd, 11th, 17th, and 29th. The monthly log was sent on time. From January 18th to 26th, Dillon Bull of GDMS was on site performing annual maintenance. In collaboration with the Research Associate and Facilities Department, the inlet stack, sample head, and T-bracket were replaced. Additional details about the treaty and monitoring stations can be found on the CTBTO website, http://ctbto.org/.

Figure 20. Carpenter and Maintenance Specialist replacing the RASA inlet on the Terra Lab roof.
Image credit: Ben Rosen-Filardo

PHYSICAL OCEANOGRAPHY

Palmer Station has a tide and conductivity gauge located on the west side of the pier at -64.774558° -64.055580° at a depth of 11.46 meters (WGS-84). It was reinstalled at this deeper depth after the completion of the Palmer Pier in June 2022.

The Research Associate acts as the station's physical oceanography observer by maintaining and observing the sea state. Observations of sea ice extent and growth stage is recorded along with continuous tidal height, ocean temperature, and ocean conductivity. Observations of sea ice around station were made daily.

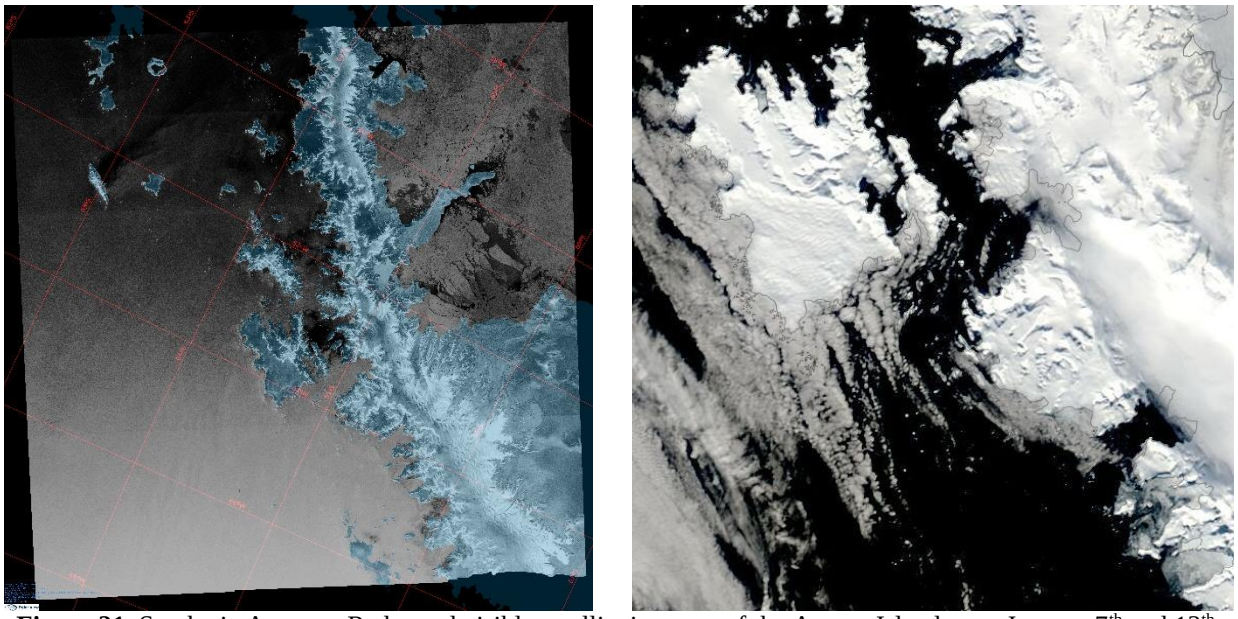

Figure 21. Synthetic Aperture Radar and visible satellite imagery of the Anvers Island area, January 7th and 13th, respectively. *Sources: Polar View/Sentinel-1A, NASA/MODIS Terra*

Tide level, sea water conductivity, and sea water temperature data is archived on the AMRDC website: https://amrdcdata.ssec.wisc.edu/dataset?q=Palmer+Station.

METEOROLOGY

Mike Carmody, Principal Investigator, United States Antarctic Program

Palmer Station is Station 89061 in the World Meteorological Organization (WMO) Worldwide Network. Automated surface synoptic observations are made 8 times each day and emailed to the National Atmospheric and Oceanographic Administration (NOAA) for entry into the Global Telecommunication System (GTS).

The Palmer Automatic Weather Station (PAWS) is a collection of sensors, computers, and software that records the meteorological data and generates synoptic reports. PAWS began recording data in September of 2015. It was a replacement for the Palmer Meteorological Observing System (PalMOS) that was taken down in November 2017. The PAWS sensors and data acquisition hardware are located on a ridge in the backyard at -64.774130° -64.047440° at an elevation of 38.3 meters above sea level using the World Geodetic System-84. In addition to the synoptic and METAR reporting, PAWS also archives the current conditions at one-minute intervals and displays both raw data and graphs of the sensor data on our local intranet.

The Research Associate acts as Chief Weather Observer on station, measuring, compiling and distributing all meteorological data. Snow accumulation is physically observed at five accumulation stakes found near the PAWS system. All weather data is archived locally and forwarded to the University of Wisconsin on the first day of each month for archiving and further distribution.

On January 9th, the Research Associate performed a service visit to AWS #1, located on Island #514 in the Wauwermans island group. The station was not reporting, and the DCP's power connector was found to be corroded. The DCP was removed and taken back to station for further evaluation and repair. Back in Terra Lab, the AWS #1 radio was transferred to a spare DCP, which was then configured to serve as AWS #1.When weather permits, the unit will be installed at the site.

One-minute weather data is archived on the AMRDC website: https://amrdcdata.ssec.wisc.edu/dataset?q=Palmer+Station.

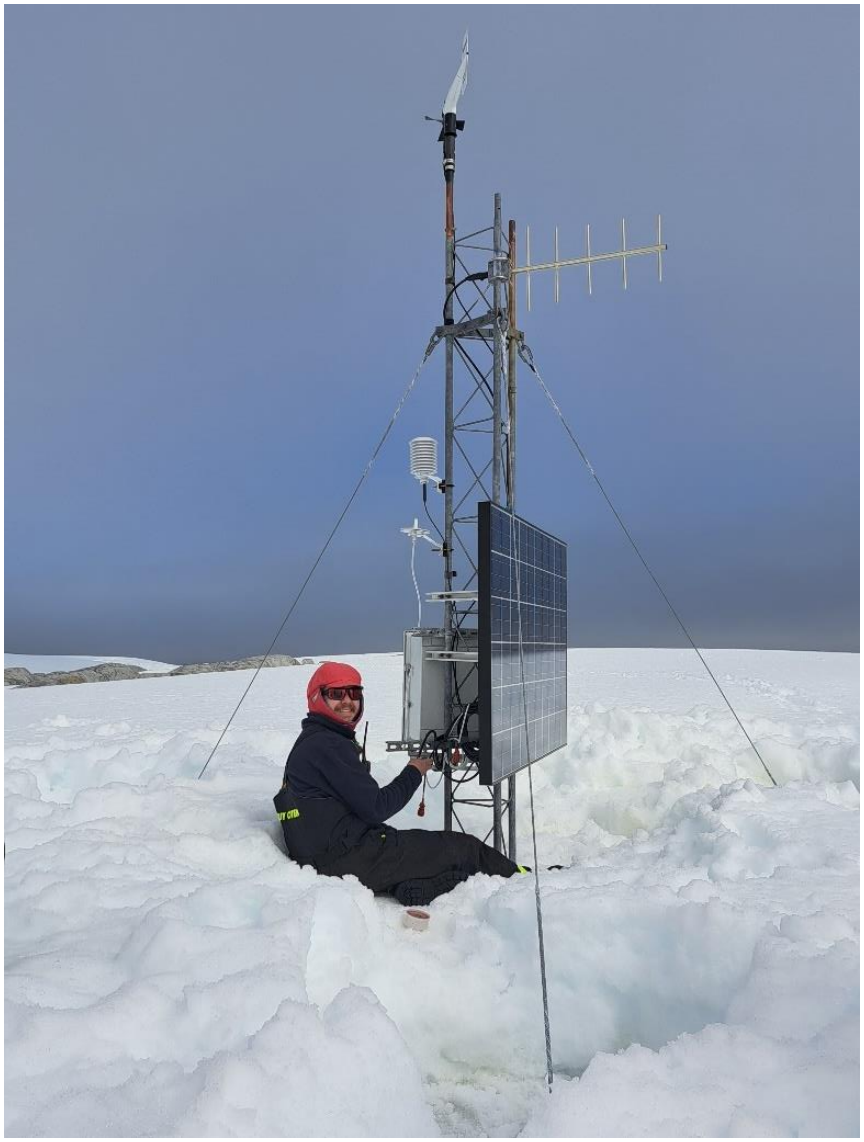

Figure 22. Research Associate servicing AWS #1 on Island #514 in the Wauwermans island group.
Image credit: Amanda Joy

Palmer Monthly Met summary for January, 2025

Temperature
Average: 2.1 °C / 35.8 °F
Maximum: 6.7 °C / 44.06°F on 2 Jan 01:50
Minimum: -2.2 °C / 28.04°F on 24 Jan 10:25
Air Pressure
Average: 982.7 mb
Maximum: 1004.7 mb on 1 Jan 00:38
Minimum: 961.8 mb on 28 Jan 07:27
Wind
Average: 8.4 knots / 9.7 mph
Peak (5 Sec Gust): 46 knots / 53 mph on 2 Jan 00:42 from NE (39 deg)
Prevailing Direction for Month: NNW
Surface
Total Melted Precipitation: 23.9 mm / .94 in
Total Snowfall: 2 cm / 0.8 in
Greatest Depth at Snow Stake: 30.8 cm / 12 in
WMO Sea Ice Observation: 11-20 bergs, bergy bits, growlers, brash ice
Average Sea Surface Temperature: 1.15 °C / 34.1 °F

2025 is starting off similarly to 2024, with less precipitation than recent years. January 2025 saw 23.9 mm of melted precipitation, the second-driest January since 2019 (21.9 mm).

On January 24th, the last of the snow melted away from the snow stakes. This was only 6 days earlier than the median melt date of January 30th (2017-present).

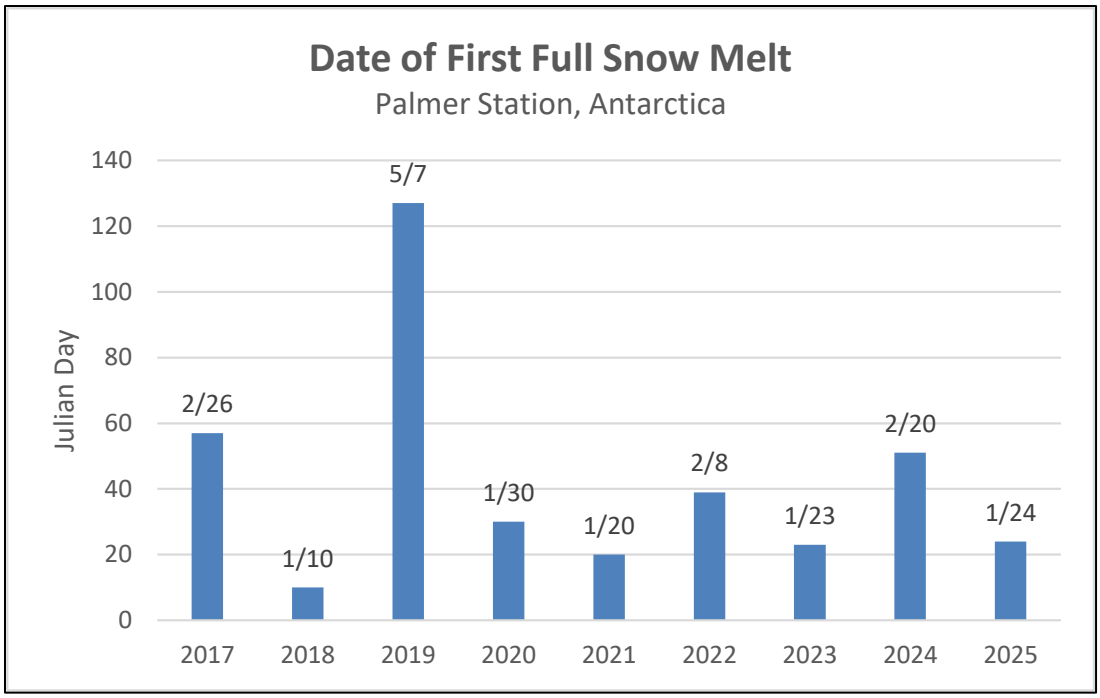

Figure 22. Date of first full snow melt (0 cm measured at all five backyard snow stakes), 2017-2025.

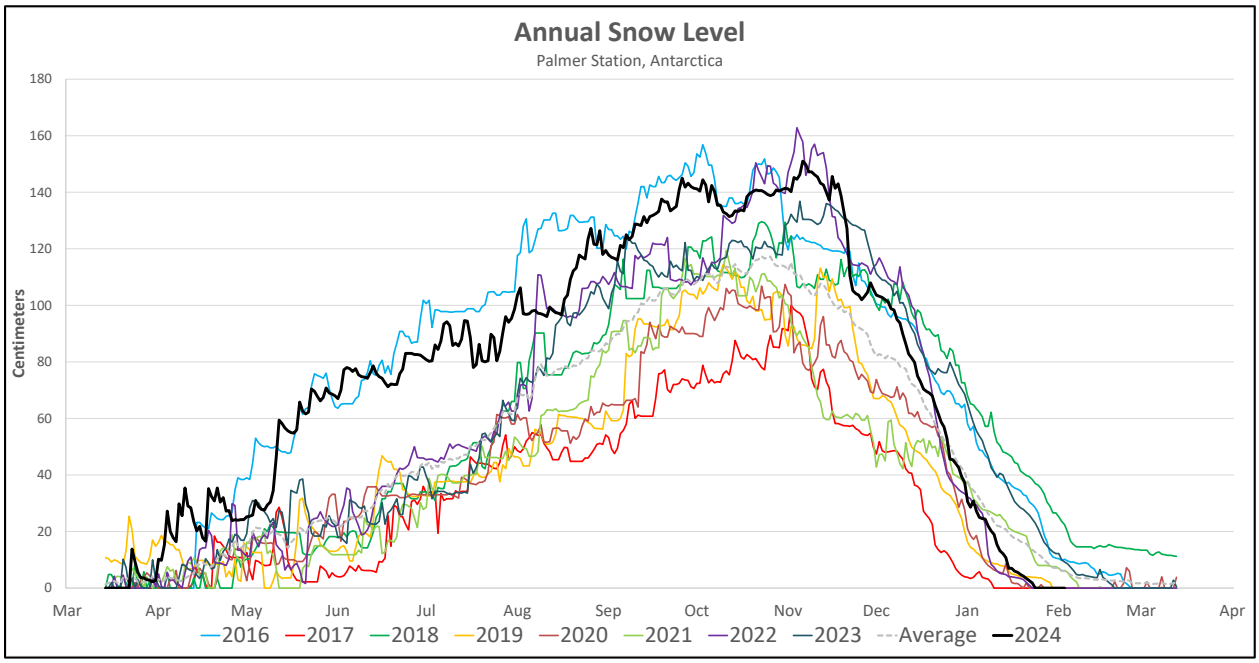

Figure 23. Snow level as measured by the average of the five backyard snow stakes. The black line shows the 2024-2025 snow level through January 31st, 2025.