PALMER STATION MONTHLY SCIENCE REPORT

May 2023

Collecting air samples for NOAA HATS (O-264-P) behind Terra Lab. *Image credit: Ben Rosen-Filardo*

NEWS FROM THE LAB
Angela Klemmedson, Winter Laboratory Supervisor

Since the last science report, Palmer Station has had four port calls with the R/V LAURENCE M. GOULD, as the ship alternated between different science cruises. The B-036 (O'Brien) group completed two four-day fishing cruises to collect red-blooded notothenioids and hemoglobinless icefishes to bring back to Palmer Station for hypoxia experiments. The B-459 (Bernard) and B-038 (Huckstadt) groups shared ten cruise days and traveled south, past the Antarctic Circle, to areas surrounding Adelaide Island. During their cruise, the Huckstadt group searched for crabeater seals to tag during the days and the Bernard group fished for juvenile krill during the nights. While these groups were away, the O'Brien group kept busy at Palmer Station conducting experiments in the labs and aquarium.

During May, we also completed the first Winter 2023 time point for the NASA study. Multiyear readers of this report will be familiar with the X-597-P (Crucian) study that uses Palmer Station as a ground analog to investigate potential countermeasures to the immune dysregulation that occurs for astronauts during deep space missions. The past two winters were a pilot year and control year, respectively, and this winter is the first of two countermeasure years for this study. Approximately three-quarters of the winterover population has volunteered to participate in the study this year, which entails participating in monthly sample collections, taking daily health supplements, and following the suggested exercise and meditation regimens. We have been implementing the countermeasures for two months now and completed the first time point this

month, in which blood, saliva, and hair samples were collected and processed by lab staff and the station doctor. During that week, participants also logged their exercise, meditation, and diet and wore activity monitors (watches and rings). We will complete three more time points throughout the season.

Lab staff collecting blood samples for Time Point 1 of the NASA study. From left to right: Angela Klemmedson, Kim Sonderland, and Ben Rosen-Filardo. *Image credit: Jenn Eisner*

The junior birders completed their final trip to Humble Island on May 25 to count and weigh giant petrel chicks for C-013 (Cimino). By that date, all 24 of the chicks had fledged and left their nests. Although the primary objective of ASC staff is to support science, the junior birders enjoyed having the opportunity to directly assist this project and continue collecting data after the science group's departure. Similarly, everyone on station was excited to participate in Global Big Day on May 13, in which Palmer Station continued a nine-year streak of contributing to the international birding census organized by Cornell's eBird.

As for the weather, Palmer Station started the month of May with above-average snow accumulation, but ended with below-average snow accumulation after several long periods of rain. May was a very wet month – check out the meteorology section of this report for more information and graphics. Fortunately, the first few days of June have brought snow, and everyone on station is hopeful that the snow will be here to stay!

B-036-P: ANT LIA: HYPOXIA TOLERANCE IN NOTOTHENIOID FISHES

Dr. Kristin O'Brien, Principal Investigator, Institute of Arctic Biology, University of Alaska Fairbanks; Dr. Yangfan Zhang, Senior Personnel, Harvard University

Personnel on station: Dr. Kristin O'Brien (UAF), Dr. Yangfan Zhang (Harvard University), Augustus Snyder (UAF), Noelle Picard (UAF), Danae Paredes (Universidad Austral de Chile), and Christian Bolton (UAF)

During the first part of May, we focused our efforts on measuring the critical oxygen tension (Pcrit) of notothenioid fishes to inform the oxygen level for 48-hour hypoxia acclimation experiments. Yangfan Zhang completed measurements for Pcrit and the incipient lethal oxygen saturation level (ILOS; oxygen level at which animals lose equilibrium) of the red-blooded notothenioid species, *Notothenia coriiceps*, and the hemoglobinless icefish, *Chaenocephalus aceratus* (n=8 for each species), as well as for four individuals of the icefish *Pseudochaenichthys georgianus*, which unlike *C. aceratus*, expresses the oxygen-binding protein myoglobin in its heart. For these experiments, animals were transferred into respirometry chambers, allowed to

Dr. Yangfan Zhang (left) and Gus Snyder (right) preparing to measure Pcrit. *Image credit: Kristin O'Brien*

recover, and metabolic rate measured over ~36 hours using intermittent respirometry. On day 3, Pcrit was measured by slowly reducing DO levels in the tank while measuring metabolic rate. Animals were harvested at the completion of the experiments and tissues collected and flash frozen in liquid nitrogen for biochemical and molecular analyses at our home institution. Blood serum osmolarity, hemoglobin and hematocrit were quantified in fresh blood (the latter two in red-blooded species only). The number of *P. georgianus* in our catch has been very small but we hope to complete experiments for this species following our third and final fishing trip. Pcrit and ILOS will also be measured in the red-blooded species, *Gobionotothen gibberifrons*.

Members of B-036 on the R/V LAURENCE M. GOULD. From left to right: Gus Snyder, Noelle Picard, Christian Bolton, Danae Paredes, Kristin O'Brien. *Image credit: Kristin O'Brien*

All members of our field team participated in the second fishing trip of our season from May 14 to May 17 on the R/V LAURENCE M. GOULD. In total, 25 trawls were conducted in north Dallmann Bay and off the southwestern shore of Low Island, resulting in a catch of 78 fishes, including *N. coriiceps, Notothenia rossii, G. gibberifrons, C. aceratus, P. georgianus,* and *Chionodraco rastrospinosus*. Pots were not set during this trip because there was concern that high winds in the forecast might prevent us from retrieving the pots within 24 hours.

When we returned from the fishing trip, we began hypoxia acclimation experiments in the cascade tanks at Palmer Station, exposing animals to dissolved oxygen (DO) levels equivalent to their Pcrit for 48 hours. For these experiments, animals were transferred into a cascade tank on day 1 and allowed to recover from the stress of handling overnight. On the following day for the hypoxia treatment, the water flow was reduced to 1 GPM, DO level was lowered and maintained at the DO level equivalent to Pcrit for 48 hours by pumping nitrogen gas into the seawater through a degasser that was regulated by an oxygen controller. Nitrogenous waste, temperature and DO levels were monitored throughout the experiment and ice was added to the tanks as needed to maintain temperature, requiring members of our group to monitor the hypoxia tanks every 4-5 hours at a minimum during the 48-hour acclimation period. Normoxic animals are treated similarly but tanks were fully aerated. Thus far, we have completed 48-hour acclimation

Harvesting tissue samples requires many hands to rapidly preserve samples for biochemical and molecular analyses. *Image credit: Kristin O'Brien*

experiments for seven normoxic and six hypoxic *C. aceratus*, seven normoxic and four hypoxic *N. coriiceps*, and eight normoxic *G. gibberifrons*. Animals were harvested at the completion of experiments and tissues collected and flash frozen in liquid nitrogen for biochemical and molecular analyses at our home institution. Blood serum osmolarity, hemoglobin and hematocrit were quantified in fresh blood (the latter two from red-blooded species only), nuclei were isolated from liver tissues for measuring levels of the transcription factor HIF-1α, gills were preserved for quantifying changes in morphology, and mitochondrial function was quantified in permeabilized heart ventricle tissue.

The staff at Palmer Station assisted us with capturing *N. coriiceps* by hook and line off the floating dock for 5-day hypoxia acclimation experiments that will be conducted by some members of our group (Zhang, Snyder and Paredes) while others participate in the third and final fishing trip of the season (O'Brien, Picard and Bolton). Capturing *N. coriiceps* at Palmer will permit us to focus our fishing efforts on trawling for icefish, which can't be captured in the baited pots, to complete our experiments.

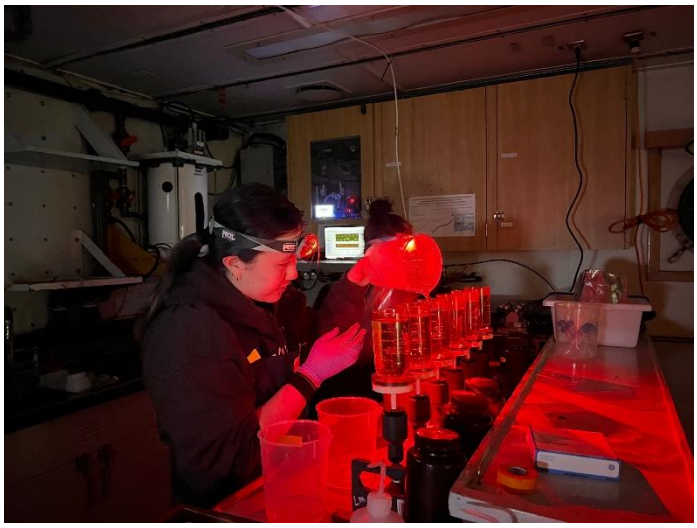
We are grateful for the outstanding support from the staff at Palmer Station, especially the Lab Manager, Angela Klemmedson, for coordinating our activities and ensuring we have all of the tools necessary to complete our work.

B-459-P: CAREER: "The Omnivore's Dilemma": The effect of autumn diet on winter physiology and condition of juvenile Antarctic krill

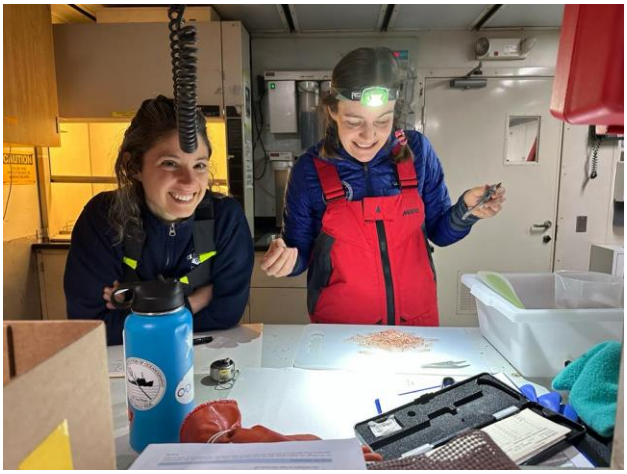
Dr. Kim Bernard, Principal Investigator, College of Earth, Ocean, and Atmospheric Sciences, Oregon State University

Personnel on Station: Kim Bernard, Rachel Kaplan, and Abby Tomita

Operations and Activities: We transited south to Palmer Station aboard the R/V LAURENCE M. GOULD, departing Punta Arenas on May 6. Unlike in our previous two field seasons (2019 and 2022), we did not fish for krill on the southbound transit and instead are joining the Huckstadt group on two cruises, one 11-day cruise to the south and one 13-day cruise to the north. We arrived at Palmer Station on May 12 and spent the few days following that preparing for the first of the two Huckstadt cruises. We departed Palmer Station on May 19 and headed south to Adelaide Island. For the first three nights, we conducted acoustic surveys, CTD casts, and net tows to sample for krill and other zooplankton around Porqoui Pas Island and off Rothera Point on Adelaide Island. We then transited across Marguerite Bay to sample for one night over Marguerite Trough before transiting around the north side of Alexander Island into Lazarev Bay. In Lazarev Bay, we conducted



Abby Tomita (left) and Rachel Kaplan (right) filter seawater for later measurement of chlorophyll-a concentrations. *Image credit: Kim Bernard*



Rachel Kaplan (left) and Kim Bernard (right) preparing a sub-sample of Antarctic krill for length measurements. *Image credit: Abby Tomita*

acoustic surveys and trawled for krill. Unfortunately, despite catching large amounts of adult krill, we did not find juvenile krill in sufficient abundances for our research on the first of the two cruises.

Looking ahead: Over the next month, we will return to Palmer Station briefly with any juvenile krill caught in the south. After this, we will join the Huckstadt team on their second cruise. We anticipate that cruise may involve two days in Crystal Sound and Lallemand Fjord, but most of the 13-days will be spent in the Gerlache Strait. We have successfully collected thousands of juvenile krill in the Gerlache Strait in the past and we are confident that we will find some there again. After the second Huckstadt cruise, B-459 will officially move into our allocated labs on station and will begin the long-term experiment. Once day-length has increased sufficiently following the Winter Solstice, we will begin running acoustic surveys from Palmer Station.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
May 2023
Ben Rosen-Filardo

Performing a NOAA HATS (O-264-P) air sample on Gamage Point, May 28, 2023.
Image credit: Ben Rosen-Filardo

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

Andrew Gerrard, Principal Investigator, New Jersey Institute of Technology

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.

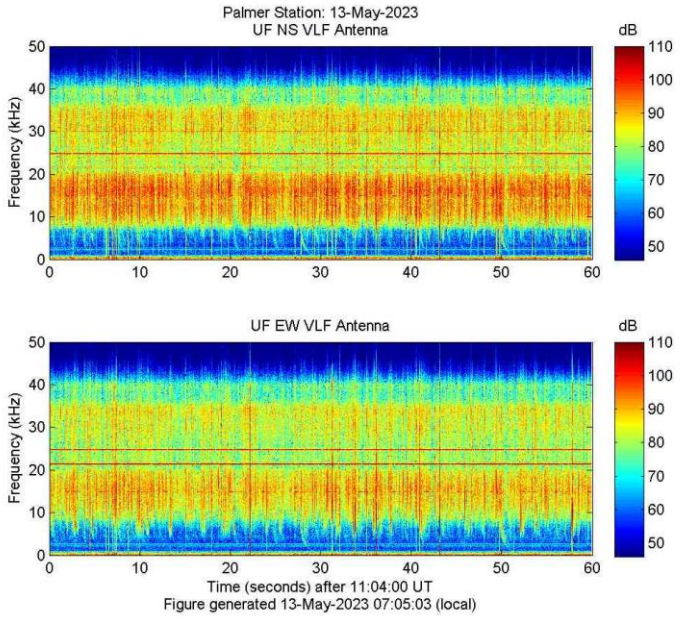


Figure 1. *Real-Time broadband VLF Spectrogram from Palmer Station, Antarctica.*

Both the Extremely Low Frequency and Very Low Frequency systems operated well this month. The spectrograms were reviewed daily and bi-weekly antenna inspections were done as weather allowed.

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

Andrew Gerrard, Principal Investigator, New Jersey Institute of Technology

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.

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. In 2017 the project was taken over by Andrew Gerrard. On March 27th, 2017 the USAP IT blocked all northbound VPN traffic under a larger umbrella of blocking all northbound encrypted-tunnel traffic. Since that time there has been much discussion, but the magnetometer is still considered a security vulnerability. The Research Associate has been working with the home institution at the University of California, Los Angeles to resolve this issue. As of September 30th, 2020 at 7:45am local time, the magnetometer was removed from the network. The instrumentation and computer are still operational. Data will continue to be collected and stored locally. The project is preparing to ship the new system that will be compatible with the network down this year. More information can be found at: http://magnetometers.bc.edu/index.php/palmer.

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION.
Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

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.

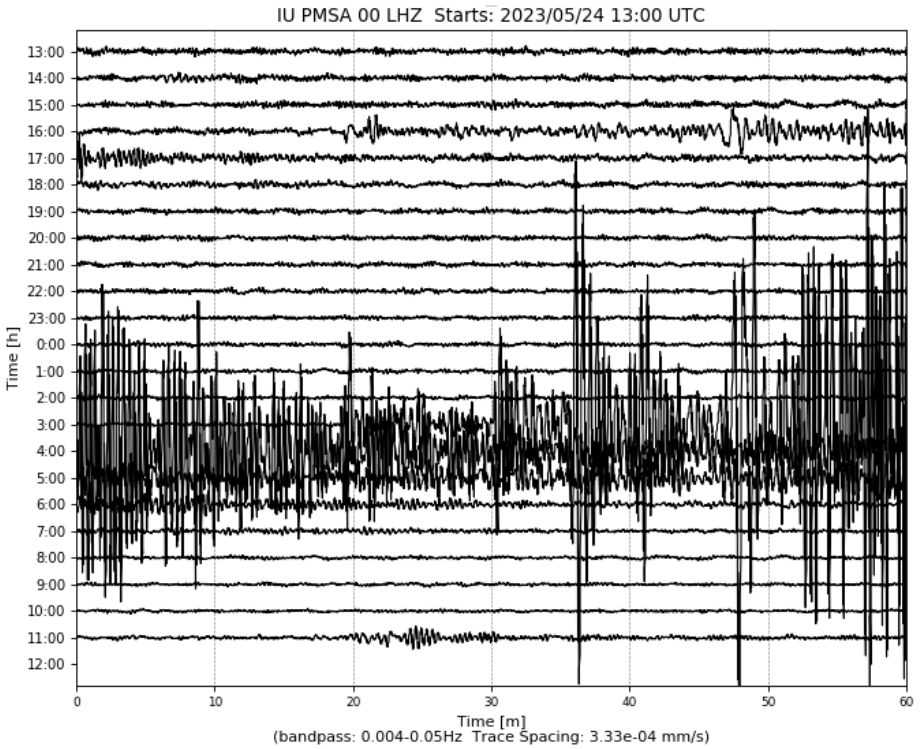


Figure 2. *An earthquake on May 25, 2023 in the Panama-Colombia border region as recorded from the Palmer seismic station.*

The system operated consistently throughout 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.

Ralph Keeling, Principal Investigator, Scripps Institution of Oceanography

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.

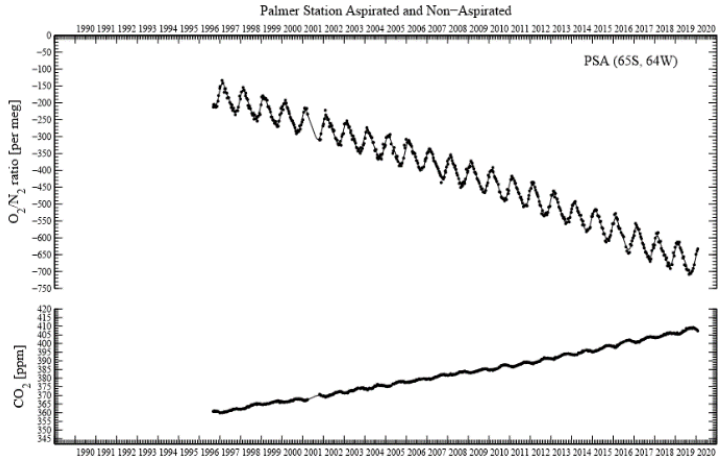


Figure 3. *Historical plot of* $\boldsymbol{O_2/N_2}$ *ratio per meg and* $\boldsymbol{CO_2}$ *ppm updated on July 29, 2020.*

Air samples were collected on May 14 and May 31. 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/osub2sub-data.html.

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

Don Neff and Steve Montzka, Principal Investigators, 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 May 3, May 9, May 16, May 24, and May 29 during favorable wind conditions. More information and data for the Carbon Cycle group can be found at: https://gml.noaa.gov/ccgg/.

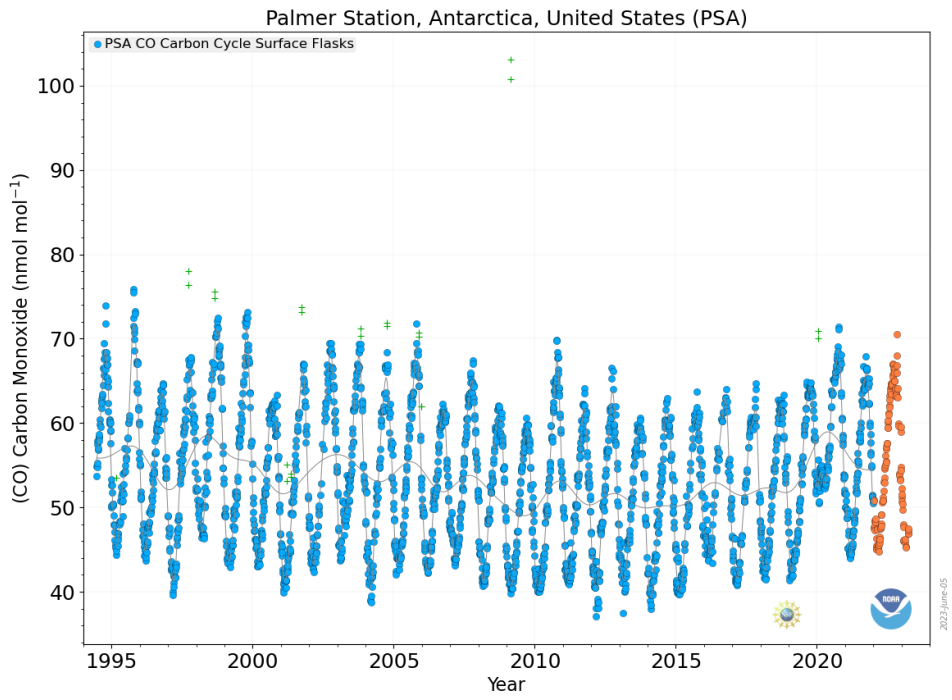


Figure 4. *Carbon Monoxide (CO) levels at Palmer Station dating back to 1994. Orange dots are preliminary data.*

Halocarbons and other Atmospheric Trace Species (HATS) samples were collected on May 9 and May 28 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/

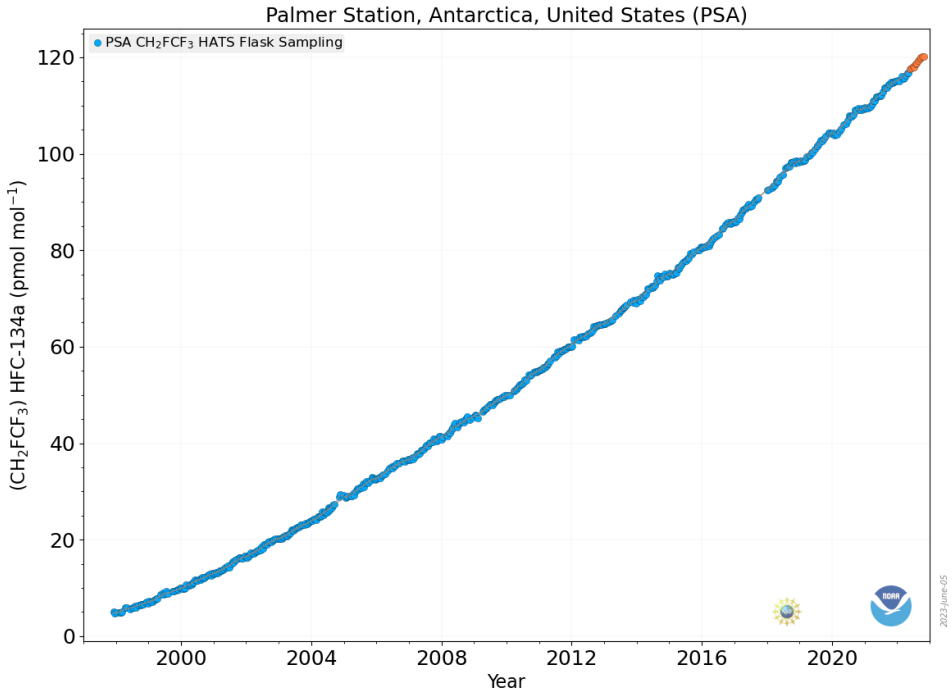


Figure 5. *HFC-134a (CH_2FCF_3) levels at Palmer Station dating back to 1997, one of the Halocarbon and Trace Gases measured at Palmer Station.*

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

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.

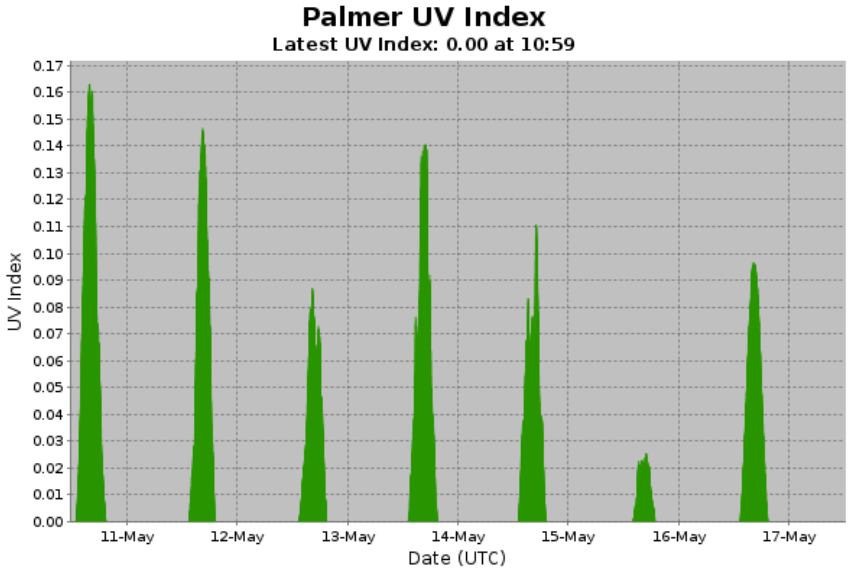


Figure 6. *UV index generated from the GUV-511 radiometer in real time.*

The log was filled out and collectors were cleaned on a daily basis. Once a week level checks were performed 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 May 6 and May 25 without issues. 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.

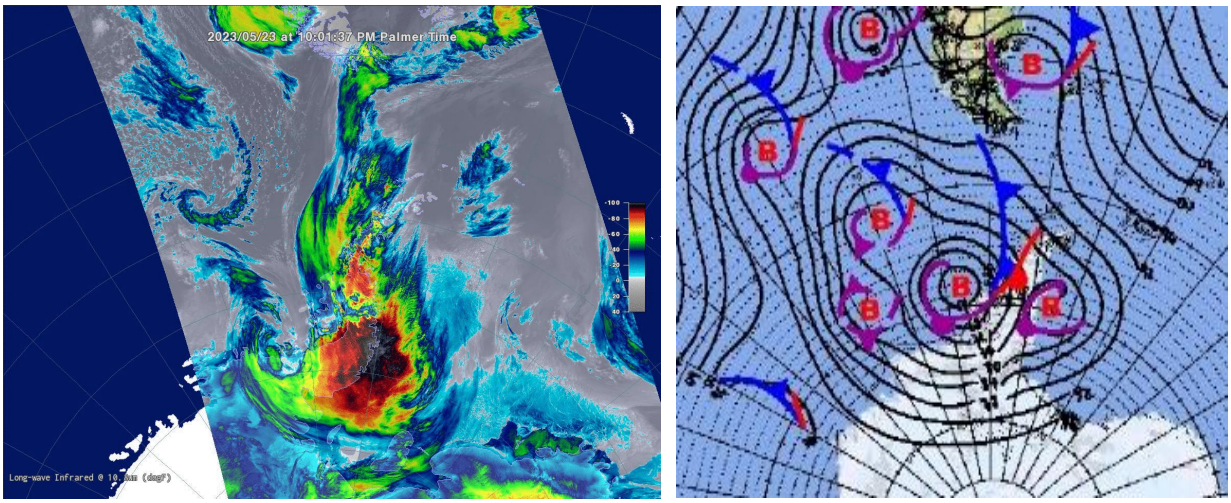


Figure 7. *NOAA-19 May 23 satellite pass (left) explained by the Chilean meteorological chart (right).*

The imagery was checked daily. Both the METOP and NOAA satellite passes were captured normally.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.
Joe Pettit, Principal Investigator, UNAVCO

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 UNAVCO. 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.

Figure 8. *The R/V Laurence M. Gould as seen from the backyard GPS antenna.*

On May 17, both receivers lost contact with the backyard antenna. Troubleshooting is ongoing to identify and resolve the issue.

For more information, visit: https://www.unavco.org/projects/project-support/polar/base_stations_and_survey_systems/palmer/base.html.

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 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 real-time via a virtual private network (VPN) across the Internet 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 RASA GUI was checked daily. The amount of filter material was checked as needed and no anomalies were heard coming from the blower. Daily filters were processed as needed and the monthly log was sent on time. Additional details about the treaty and monitoring stations can be found on the CTBTO website, http://ctbto.org/.

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 height of 11.46 meters (WGS-84). It was reinstalled at this deeper depth after the completion of the Palmer Pier.

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.

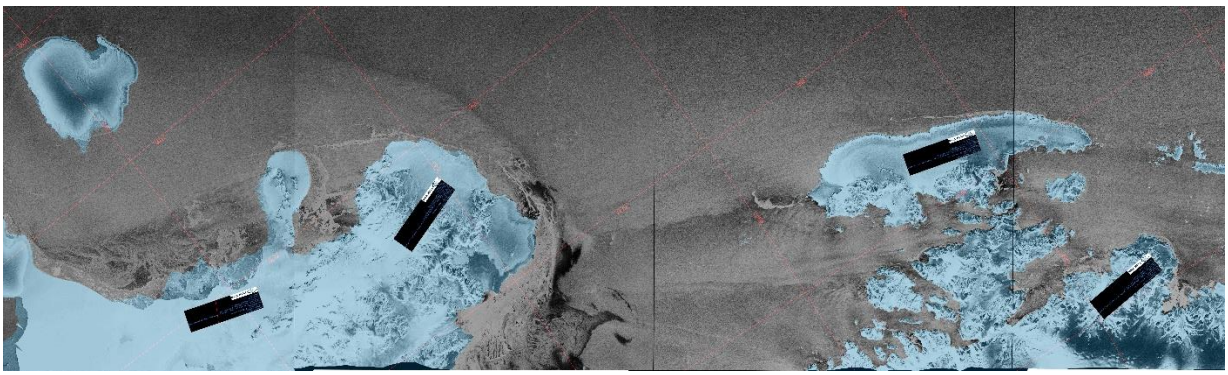


Figure 9. *Alexander & Adelaide Is. sea ice imagery provided to the R/V Laurence M. Gould. Source: Composite of Polar View Sentinel-1 images from May 21, 2023.*

Tide level, sea water conductivity, and sea water temperature data is archived on the AMRC website: http://amrc.ssec.wisc.edu/data/ftp/pub/palmer/.

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 by taking an average of 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.

Figure 10. *Working on the backyard weather station.*

As of May 28, all remote island sites have gone dark for the winter. On May 29 & 30th, there was a communications issue between the backyard weather station and Terra Lab. This resulted in an ~18 hour data outage.

One minute weather data is archived on the AMRC website:
http://amrc.ssec.wisc.edu/data/ftp/pub/palmer/.

Palmer Monthly Met summary for May, 2023

Temperature
Average: -.5 °C / 31 °F
Maximum: 5.7 °C / 42.26 °F on 31 May 16:54
Minimum: -7.6 °C / 18.32 °F on 5 May 10:36
Air Pressure
Average: 977.5 mb
Maximum: 999.1 mb on 10 May 16:05
Minimum: 949.4 mb on 5 May 22:35
Wind
Average: 15.1 knots / 17.4 mph

Peak (5 Sec Gust): 64 knots / 74 mph on 8 May 14:42 from NNE (22 deg)
Prevailing Direction for Month: NNE
Surface
Total Rainfall: 107.2 mm / 4.22 in
Total Snowfall: 54 cm / 21.1 in
Greatest Depth at Snow Stake: 38.6 cm / 15.1 in
WMO Sea Ice Observation: 1-5 bergs, bergy bits, growlers, brash ice, and grease ice
Average Sea Surface Temperature: -.07 °C / 31.9 °F

2023 is on track to be another record-breaking year for precipitation. May saw 107.2 mm of melted precipitation and a YTD total of 550.8 mm, the second highest on record after 2021.

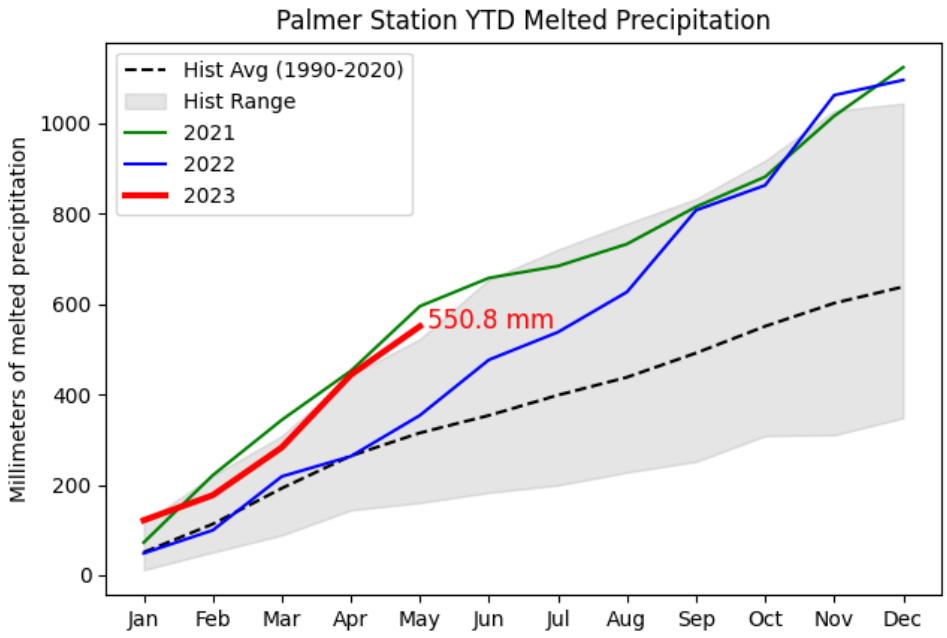


Figure 11. *Palmer Station YTD melted precipitation, 1990-present.*