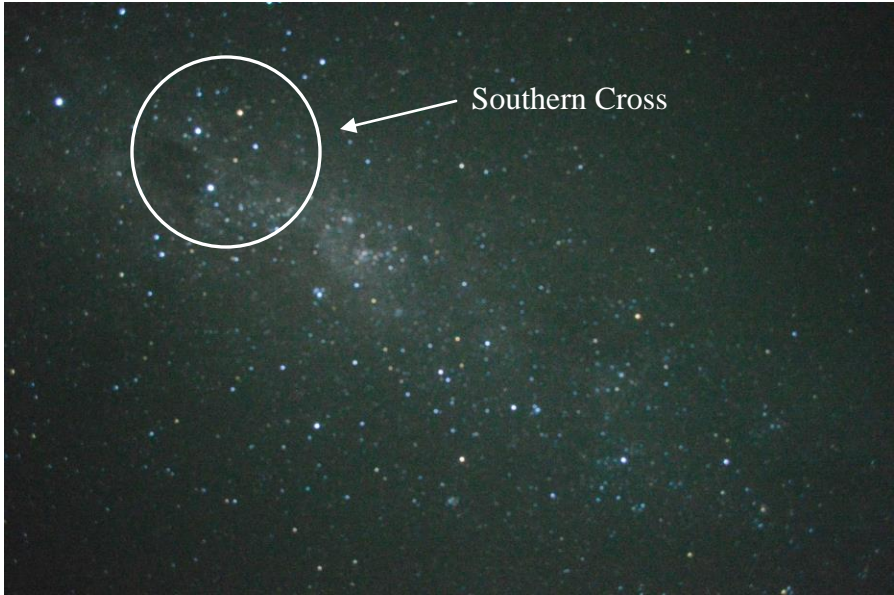




PALMER STATION MONTHLY SCIENCE REPORT
MARCH 2014



As the summer draws to a close, we once again have dark night skies here at Palmer Station.
(Image Credits: Dr. Shellie Bench)

NEWS FROM THE LAB

By Carolyn Lipke, Assistant Supervisor of Laboratory Operations

March definitely came in like a lion this year at Palmer Station. Several weeks of almost continually windy weather made sampling a bit more difficult, but everyone was still able to get their work accomplished. The *ARSV Laurence M. Gould* (LMG) departed station mid-month, taking with them departing Kohut (B-005), Bench (B-018), Saba (B-069), Corbett (O-176), and Yu (G-094) groups. We finished off the cruise ship season this month, and also had visits from the *RRS James Clark Ross* and the *HMS Protector*. At the end of the month the LMG returned with the winter ASC crew, and most of the summer ASC staff and the remaining LTER science groups departed station.

During the 2013-2014 summer Palmer Station supported 11 deployed science groups, and the Research Associate supported an additional 15 ongoing science projects. We also supported two artists through the NSF's Antarctic Artists and Writers program. We had 11 port calls with the LMG and hosted 15 cruise ship/yacht/research vessel/military visits to station, as well as four off-shore cruise ship visits.

The end of March marks the finish of the summer season here at Palmer Station. But things will not be quiet around here for long. In April five new science groups will arrive to begin the winter science season.

MARCH 2014 WEATHER

By Graham Tilbury, Research Associate

The stormy, wet weather of the previous month moderated during March as the season cooled. There were less windy days and, due to the cooler temperatures, far less precipitation. The average temperature dropped almost a degree lower than last month, settling at 0.1 C (33 F). The high temperature for the month was 5.8 C (42 F), and the low was -3.8 C (25 F).

A number of low pressure systems, with associated strong winds and snowfall, swept across the station, the lowest of 958 mb occurring on the 6th,

The average wind speed was 10 knots, with the strongest gust of 58 knots recorded on the 6th.

Precipitation dropped to 25.9 mm. for the month. A total of 33cm snow fell, and the maximum accumulated depth at the snow stake reached 10cm.

No sea ice was observed. The Arthur Harbor glacier continued calving at a steady pace, dumping large amounts of ice into the waters around the station. Ice of land origin, plus swaths of brash ice and occasional bergy bits, were seen on most days.

A moderate sized ice berg appeared off the station around mid- month. By months end it had broken into three pieces and grounded itself, just south of the station. Sea water temperatures, measured at Palmer's pier, hovered around the 0 C level for most of the month.

B-005-P: COLLABORATIVE RESEARCH: IMPACTS OF LOCAL OCEANOGRAPHIC PROCESSES ON ADÉLIE PENGUIN FORAGING ECOLOGY

Dr. Josh Kohut, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences; Dr. William R. Fraser, Co-PI, Polar Oceans Research Group; Dr. Kim Bernard, Co-PI, Oregon State University; Dr. Peter Winsor, Co-PI, University of Alaska, Fairbanks; Dr. Matthew Oliver, Co-PI, University of Delaware

Personnel on station: Kim Bernard and Dominique Paxton

We completed our field season in early March with a final acoustic survey for krill and left Palmer Station on March 10. We would like to thank the entire support team at Palmer for the incredible work they do, without which we would not be able to complete our research.

B-013-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, APEX PREDATOR COMPONENT

Dr. William R. Fraser, Principal Investigator, Polar Oceans Research Group, Sheridan, MT

Personnel on station: Shawn Farry, Ben Cook, Carrie McAtee, and Madison McConnell

Adélie penguin work concluded this month with the end of the presence/absence radio transmitter study on Humble Island. Gentoo Penguin breeding was slightly behind Adélie penguins this year with work during March largely focused on determining the timing of chick fledgling and obtaining fledging weights.

Brown skua work also concluded this month with nest monitoring and growth measurements ending with the fledgling of our last study chick. For the third year South polar skuas failed to fledge any chicks within our Shortcut Island study area, however scat collections and band observations continued throughout March.

Giant petrel chick banding on local islands was completed this month while growth measurements of giant petrel chicks continued on Humble Island.

Marine mammal monitoring continued with observations of large numbers of fur seals, rapidly declining elephant seal numbers, sporadic leopard seal and crab-eater seal sightings and a return of a few Weddell seals to the area.

Sediment trap contents were collected from Adélie colonies on Torgersen, gentoo colonies on Biscoe Island and chinstrap colonies on Dream Island. Local sediment trap samples as well as Avian Island samples were all processed this month. Limpet trap contents were also collected from kelp gull colonies on four local islands. Project gear and supplies were cleaned, inventoried and crated in preparation for shipment north.

ASC continued to provide great support this month and we'd like to thank everyone on station for their efforts and attitude throughout the entire summer. Special thanks to Carolyn Lipke for providing great support this entire season, Resident Marine Technicians Julie Jackson, Meredith Helfrich, and Dave Moore for keeping us on the water and to Jeff Otten and Chuck Kimbell for all the IT and communication support.

B-018-P: MOLECULAR ASSESSMENT OF PHYTOPLANKTON COMMUNITY DYNAMICS AND METABOLISM IN THE WEST ANTARCTIC PENINSULA

Dr. Shellie Bench, Principal Investigator, Stanford University, CA

Personnel on station: Shellie Bench (PI and Post-Doctoral Research Fellow)

I was on station until March 9th, and collected and processed water one day in that time. The LTER groups and I went out sampling on 3/1/14, but after that high winds prevented sampling until 3/7/14. At that point it would not have been possible to process my sample before I needed to pack my lab supplies, so the sample on the 1st was that last of my season. I spent my last few days clearing out my lab; doing things such as returning supplies and equipment, taking inventory and packing my supplies that will be shipped north, and preparing my samples for shipment.

Despite being locked in by sea ice for a large portion of the season, samples for my project have been collected that likely represent the important aspects of the annual changes in phytoplankton dynamics. In sum, over 17 weeks at Palmer Station, I collected water 29 samples that represent 27 different days (5 near shore, 4 from the sea water intake, and 20 zodiac-based sites). In addition, I have 6 spatially separated samples collected across the LTER grid during the annual cruise. Accompanying each set of filters for DNA (or RNA) are samples for further microscopic and flow cytometric analyses. While only a subset of the season's samples will be used for molecular analyses, the temporal and spatial variability captured this season will be critical in ensuring that the subset used will be representative of the phytoplankton community dynamics.

As I begin my transit north, I feel the need to point out that my success this season is largely thanks to the support provided by all of the ASC staff at Palmer Station, from the chefs, to the IT team, to the lab and boating support staff, to the station managers. All of their time and effort make this station a great place to do science. I also would like to once again acknowledge the B-019 and B-045 LTER groups, because the work they do provides the critical physical, chemical, and biological framework for all of the analyses that are and will be part of my project.

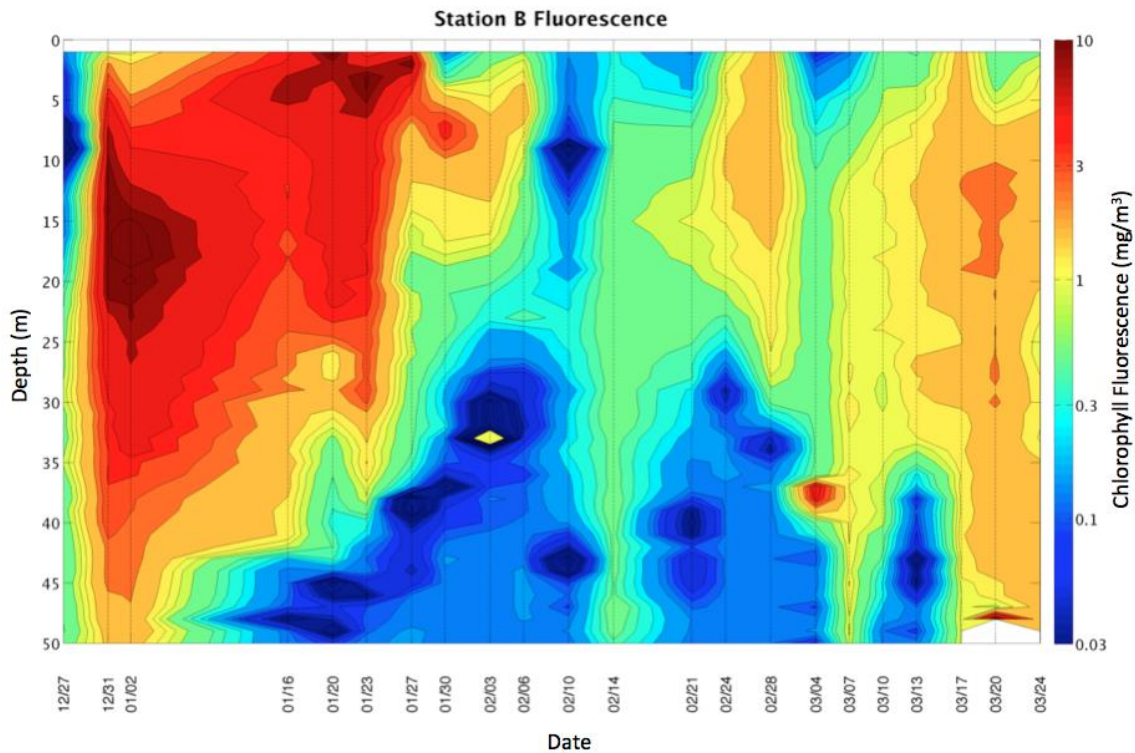
B-019-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, PHYTOPLANKTON COMPONENT

Dr. Oscar Schofield, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences

Personnel on station: Nicole Couto

The month of March began with several days of very high winds. Although this prevented B-019 and B-045 from sampling at stations B and E on many of our planned sampling days, we still managed to get out to both stations twice a week. Halfway through the month, chlorophyll fluorescence began to increase from the low levels we had been seeing since the end of the bloom in January and a smaller secondary bloom was apparent (see figure). Photosynthetic efficiency (F_v/F_m) as measured from discrete samples on the Satlantic FIRE system also increased during this time.

As we wrap up the season, B-019 would like to thank the Palmer Station personnel for all their help in completing another successful field season. We could not do what we do without your continued support!



B-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER) STUDY, MICROBIAL / BIOGEOCHEMICAL COMPONENT

Dr. Hugh Ducklow, Principal Investigator, Lamont-Doherty Earth Observatory, Columbia University, New York, NY

Personnel on station: Fiona Jevon and Sebastian Vivancos

Throughout the month of March we continued to sample stations B and E for bacterial productivity and flow cytometry, as well as preserve samples for DOC, POC, nutrient, and DNA analysis. The bacterial production rates remained relatively stable and consistent with February’s rates, significantly lower than January’s productivity bloom (Fig. 1). Our final sampling day on March 24th concluded a unique and successful sampling season.

A highlight this month was the visit by the British Antarctic Survey, who came on the *RRS James Clark Ross*. Over the course of the season we had been collecting water at both stations for $\delta^{18}\text{O}$ analysis by Dr. Mike Meredith, and they had collected DOC samples for us. We were able to meet with our collaborators and find out more about the research and life at Rothera, the British station south of us on the peninsula. Personnel at Palmer have graciously agreed to continue collecting water for $\delta^{18}\text{O}$ analysis throughout the winter season, as they did last year, adding valuable breadth to the dataset.

We also retrieved the data from the soil temperature loggers deployed in January for Dr. Natasja van Gestel of Northern Arizona University. These loggers were buried 2.5cm below the surface at various distances from the edge of the glacier, and took hourly temperature measurements from early January through mid-March. Natasja shared some of her preliminary data analysis

with us. She found that the temperature fluctuations were highest in January, and that the soil temperature closest to the glacier was significantly lower than at points farther away (Fig. 2).

In spite of the weather and sea ice setbacks at the beginning of the season, B-045-P had a hugely successful sampling season this year. We couldn't have completed all of the science without the invaluable expertise of the science support staff at Palmer. We therefore would like to give a huge thank you to all of the people at Palmer who contributed to our work, directly or indirectly.

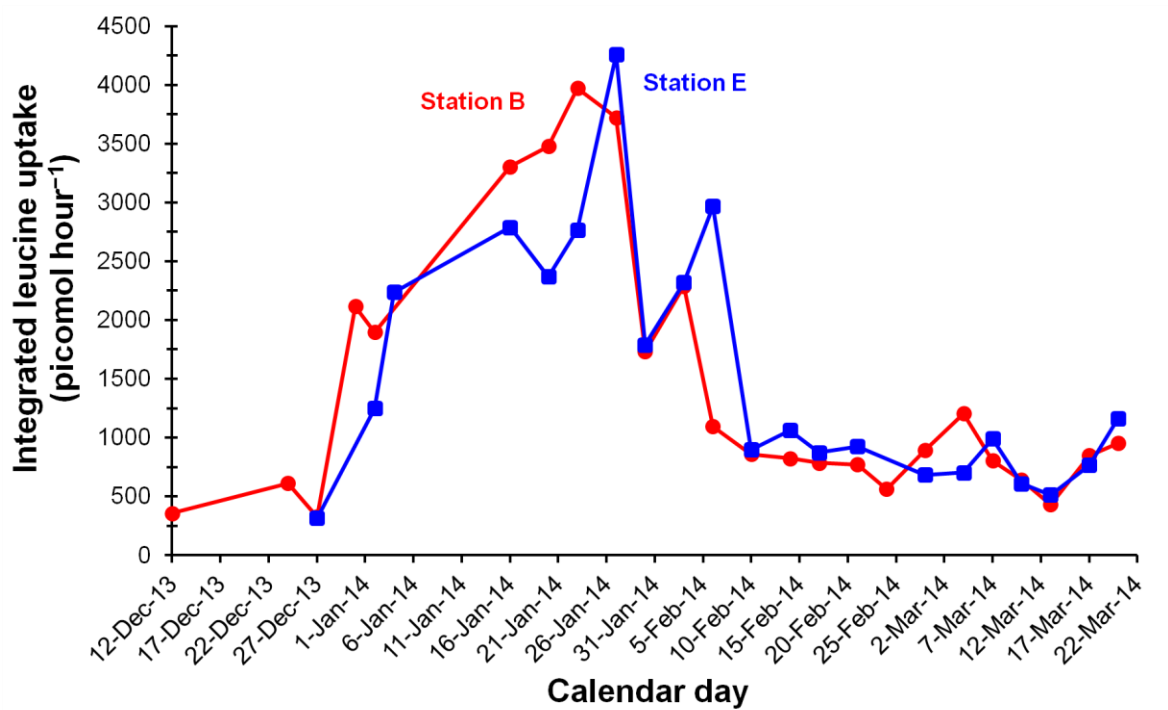


Fig. 1. Integrated bacterial production at stations B (near-shore environment; red, circle) and E (off-shore environment; blue, square) for the 2013-2014 austral summer season.

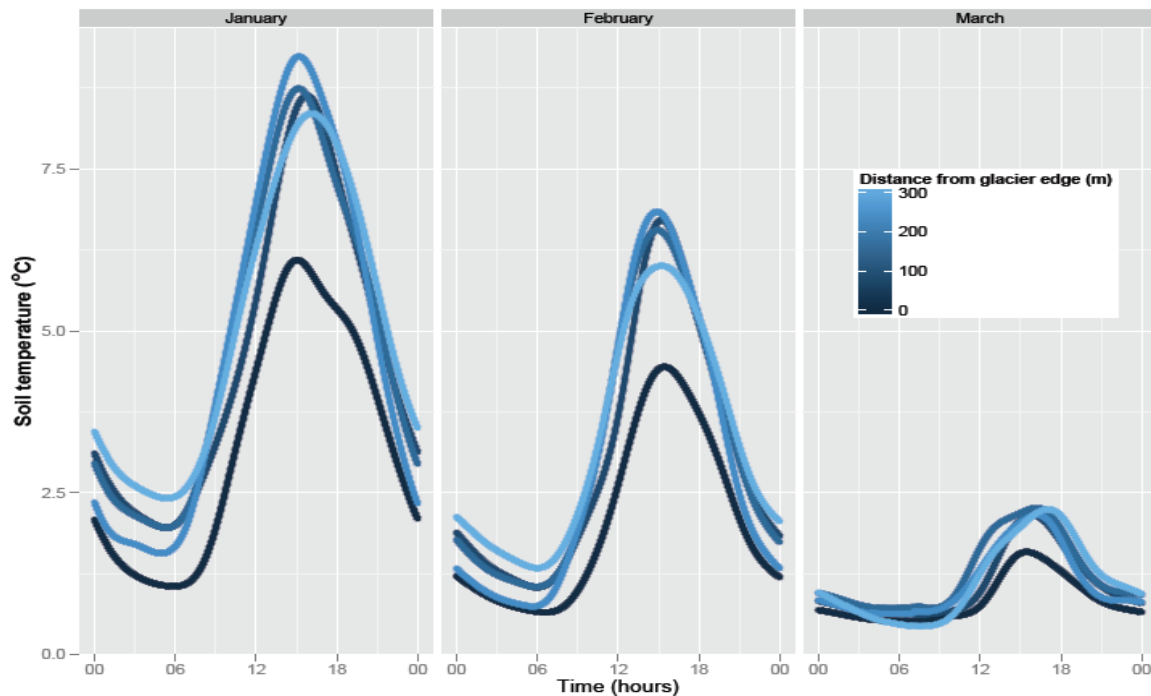


Fig. 2. Average daily temperature fluctuations in January, February and March at various distances from the glacier's edge. Courtesy of Dr. Natasja van Gestel.

B-068-P: COLLABORATIVE RESEARCH: SYNERGISTIC EFFECTS OF ELEVATED CARBON DIOXIDE (CO₂) AND TEMPERATURE ON THE METABOLISM, GROWTH, AND REPRODUCTION OF ANTARCTIC KRILL (*Euphausia superba*)

Dr. Grace Saba, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences; Dr. Brad Seibel, Co-PI, University of Rhode Island

Personnel on station: Abigail Bockus and Ryan Fantasia

“We came, we killed, we conquered” – *Ryan Fantasia*

March marked the end of this project's first field season at Palmer Station. We conducted some additional respirometry and 24 hour acid-base experiments as well as ended a 30 day fecundity experiment. Our last four days were spent packing our extensive field equipment and working in coordination with the ASC staff to provide efficient shipping for all cargo and samples. This year we have procured invaluable preliminary data which will be used to facilitate the most effective experimental approach during our second field season in summer 2014-2015.

G-094-P: RESPONSE OF CARBON ACCUMULATION IN MOSS PEATBANKS TO PAST WARM CLIMATES IN THE ANTARCTIC PENINSULA

Dr. Zicheng Yu, Principal Investigator, Lehigh University; Dr. David Beilman, Co-PI, University of Hawaii Manoa

Personnel on station: David Beilman, Julie Loisel, and Zicheng Yu

The G-094-P (Yu) group continued their explorations and sample collections during the first 10 days of March before they headed north on the LMG14-2 on March 10th. They completed peat coring on Litchfield Island and moss and peat sampling on Hermit Island and Bonaparte Point. During their cruise to Stonington Island (East Base) in Marguerite Bay, they also visited and sampled Léonie, Neny and Petermann Islands. During the cruise north, they took opportunity of a scheduled LMG visit to Argentine's Primavera Base at Cierva Point around 64 degrees latitude South to make their final and valuable sample collections on March 11th. In total they visited and sampled moss peat banks in more than 10 geographic localities along the Western Antarctic Peninsula, including islands and points on the mainland.

In addition to meeting their primary field objectives of collecting moss peat bank cores, they also explored other measurements and data collections, including soil and microclimate data, slope measurements and ecosystem net CO₂ exchange measurements. For example, they used LiCOR Automated Soil CO₂ Flux System (model LI-8100A) and a clear chamber (8100-104C) to measure Net Carbon Exchange between ecosystems and the atmosphere at several moss peat banks and moss carpets on Litchfield, Galindez and Hermit Islands (Figure 1). These measurements will help them understand the controlling factors of carbon accumulation in these ecosystems (such as temperature, moisture, photosynthetically-active radiation (PAR)) and help interpret the past carbon accumulation patterns and dynamics derived from peat-core analysis.

The 3-week field expedition was a resounding success, again thanks to all the logistics support we have received from *the ARSV Laurence M. Gould*, Palmer Station and Ukraine's Vernadsky Station.

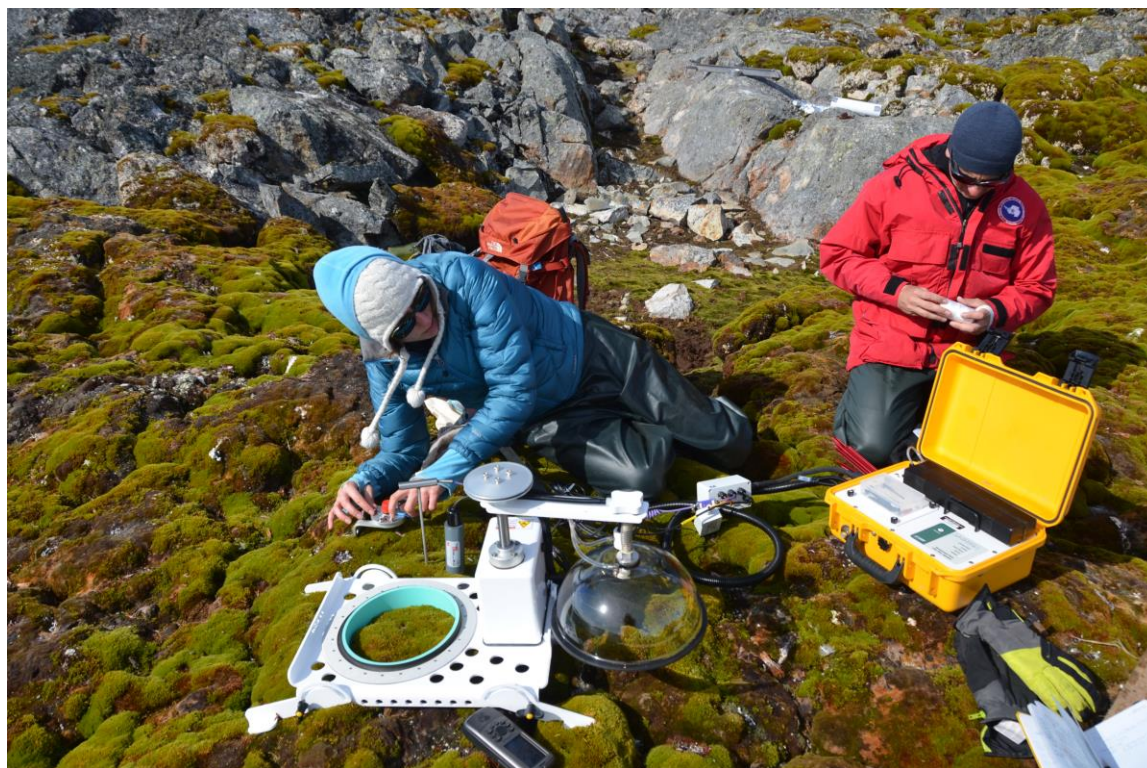


Figure 1. G-094-P Group members David Beilman and Julie Loisel working on setting up LiCOR Soil CO₂ Flux System for Net Carbon Exchange measurements at a moss peat bank

(Lewis Smith's Stella Creek site) on Galindez Island, Argentine Islands, near Vernadsky Station. The system includes automated clear chamber, control unit, and sensors for instantaneous measurements of PAR, soil temperature and soil moisture.

O-176-P: SUBMARINE GROUNDWATER AND FRESHWATER INPUTS ALONG THE WESTERN ANTARCTIC PENINSULA

Dr. Reide Corbett, PI; Dr. Kimberly Null, Co-PI, Institute for Coastal Science and Policy, East Carolina University; Dr. Berry Lyons, Co-PI, Ohio State University

Personnel on station: Ian Conery, Reide Corbett, Jared Crenshaw, Kimberly Null, Leigha Peterson, Richard Peterson, and David Young

We returned to station upon completion of our 5-day research cruise in the fjords and across the continental shelf on February 26th and continued sampling the terrestrial end-members and nearshore environment. We were able to complete another glacier ice experiment from the Marr Glacier near Arthur Harbor where we collected buckets of glacier ice to melt and measure our tracers (radium and radon). We also completed a higher resolution sampling (e.g., geochemical water tracers, Fe, nutrients) of one of the streams discharging from the glacier (Figure 1) and measured resistivity to identify the groundwater flow paths. Unfortunately the weather did not cooperate and sampling by zodiac was limited once again. Winds calmed down for two days and we finished another glacier ice experiment from another one of our sites, Point 8. The last day of sampling involved a higher spatial-resolution of surface samples in Arthur Harbor and a radon-survey near Point 8. After that, the winds were over 20 knots sustained and gusting as high as 65 knots for three days. This concluded our 2013-2014 season at Palmer Station. The remainder of the days involved analyzing the final nutrient and tracer samples, and cleaning and packing all equipment to head home. We had a very successful season at Palmer Station and met all of our sampling objectives. Thank you to all the ASC staff for their tremendous support. We are extremely grateful to all those involved!

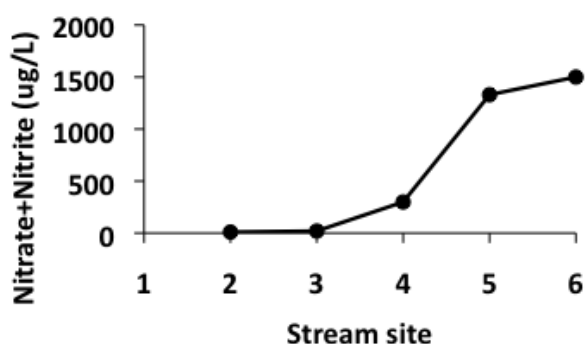


Figure 1. Nitrate+Nitrite ($\mu\text{g/L}$) at each site along the stream flow path. Site 2 is at the glacier terminus and Site 6 is before discharging to Arthur Harbor. Distance of flow path is approximately 175m.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
March 2014
Glenn Grant and Graham Tilbury

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

Station PMSA is one of more than 150+ sites in the GSN, monitoring seismic waves produced by events worldwide. Real-time telemetry data is sent to the U.S. Geological Survey (USGS). The Research Associate operates and maintains on-site equipment for the project.

The system operated normally throughout the month.

A-109-P: ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY (ELF/VLF) OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION (LEP).

Robert Moore, Principal Investigator, University of Florida

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. The Research Associate operates and maintains on-site equipment for the project.

The VLF system is operational again following repairs to the line receiver. The temporary antenna is functional, and serving well until the permanent antenna can be erected this coming month. The system restarted itself following a brief power outage on 29 March.

O-202-P: ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC) SATELLITE DATA INGESTOR.

Mathew Lazzara, Principal Investigator, University of Wisconsin

The AMRC computer processes satellite telemetry received by the Palmer Station TeraScan system, extracting Automated Weather Station information and low-resolution infrared imagery and sending the results to AMRC headquarters in Madison, WI. The Research Associate operates and maintains on-site equipment for the project.

The data ingestor operated normally through the month.

O-204-P: A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL TO DECADEAL VARIATIONS IN TERRESTRIAL AND MARINE ECOSYSTEMS.

Ralph Keeling, Principal Investigator, Scripps Institution of Oceanography

The goal of this project is to resolve seasonal and interannual variations in atmospheric O₂ (detected through changes in O₂/N₂ 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 CO₂ sink. The program involves air sampling at a network of sites in both the Northern and Southern Hemispheres. The Research Associate collects samples fortnightly from both TerraLab and the VLF Building.

Air samples were collected throughout the month.

O-215-P: IN-SITU OBSERVATIONS OF MARITIME SOURCES/SINKS OF AEROSOL AND CLOUD CONDENSATION NUCLEI AT PALMER STATION, ANTARCTICA: PAEROS PILOT PHASE.

Gregory Roberts, Principal Investigator, Scripps Institution of Oceanography

A miniaturized aerosol package (PAEROS) has been deployed at Palmer Station Antarctica for the austral summer to measure aerosol physical properties, cloud condensation nuclei (CCN), radiative fluxes and meteorological parameters. The Research Associate assists the grantees with maintenance of the system.

The Research Associate supported periodic maintenance of the system. The system operated normally until the planned shutdown, and conclusion of the event, in early March. All instrumentation and materials have been packaged for northbound shipment back to the grantees.

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

James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; 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 (N₂O) and halogen containing compounds. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon samples were taken throughout the month.

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

James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; 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 GUV-511 filter radiometer, an Eppley PSP Pyranometer, and an Eppley TUVR radiometer also continuously measure hemispheric solar flux within various spectral ranges. The Research Associate operates and maintains on-site equipment for the project.

Data was collected normally during the month. The RA performed a special sequence of absolute scans to establish the performance of two new calibrated lamps.

O-283-P: ANTARCTIC AUTOMATIC WEATHER STATIONS (AWS).

Mathew Lazzara, Principal Investigator, University of Wisconsin

AWS transmissions from Bonaparte Point are monitored using the TeraScan system and the University of Wisconsin's Data Ingestor system. Data collected from this station is freely available from the University of Wisconsin's AMRC website. The Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point.

The system operated normally.

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

Joe Pettit, Principal Investigator, UNAVCO

Continuous 15-second epoch interval GPS data files are collected at station PALM, compressed, and transmitted to the NASA-JPL in Pasadena, CA. The Research Associate operates and maintains on-site equipment for the project.

The primary GPS station collected data normally throughout the month. The failed NASA computer remains broken; the grantees are shipping a replacement PC.

T-312-P: TERASCAN SATELLITE IMAGING SYSTEM

The TeraScan system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. 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.

Satellite passes were captured, recorded, and distributed normally throughout the month.

B-466-P: FLUORESCENCE INDUCTION AND RELAXATION (FIRe) FAST REPETITION RATE FLUOROMETRY (FRRF)

Deneb Karentz, Joe Grzymiski, Co-Principal Investigators, University of San Francisco

The focus of this project is to identify and evaluate changes that occur in genomic expression and physiology of phytoplankton during the transition from winter to spring, i.e., cellular responses to increasing light and temperature. A Fast Repetition Rate Fluorometer (FRRF) with a FIRe (Fluorescence Induction and Relaxation) sensor is installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

Weekly cleaning of the instrument and data downloads were performed as scheduled. A short station power outage forced the restart of the system on 29 March.

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

Managed by General Dynamics

The IMS Radionuclide Aerosol Sampler and Analyzer (RASA) is part of the CTBTO verification regime. 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 collected data normally during the month.

OCEANOGRAPHY

Daily observations of sea ice extent and growth stage are also recorded, along with continuous tidal height, ocean temperature, and conductivity at Palmer's pier.

The RA modified the tide level, conductivity and sea water temperature software so as to use data from the new gage and display it on Palmer's LAN. Further diagnosis of the tide pressure sensor indicated that the sensor may be faulty; the manufacturer is sending a replacement. An initial datum for was established for the new gage, and an estimated mean sea level (MSL) calculated.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. Weather data collected using the automated electronic system is archived locally and forwarded twice each month to the University of Wisconsin for archiving and further distribution. Synoptic reports are automatically generated every three hours by the Palmer Meteorological Observing System (PalMOS) and emailed to the National Weather Service for entry into the Global Telecommunications System.

The system collected data normally throughout the month.