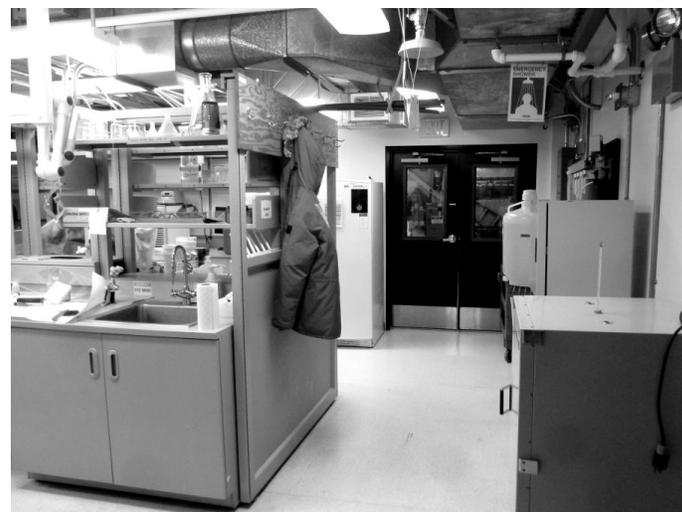


PALMER STATION MONTHLY SCIENCE REPORT

OCTOBER 2014



Views of Palmer Station from 1968-1969 (top row) and 2014 (bottom row). Some views have changed dramatically, like the outside of the Bio Lab building. Other views, like the inside of the labs, are remarkably similar. (Image Credits: Historic photos courtesy of the family of Emmett L. Herbst, from the National Science Foundation USAP Photo Library. 2014 photos by Carolyn Lipke)

NEWS FROM THE LAB

Carolyn Lipke, Summer Laboratory Supervisor

Palmer Station residents began October land-bound by alternating bouts of sea ice and high winds. The ARSV *Laurence M. Gould* returned to Palmer bringing the first summer science grantees, two LTER groups (Schofield C-019 and Ducklow C-045) and Shellie Bench (B-018). There was one afternoon of boating on October 21st, and then the ice promptly returned the next

morning, and stayed in until Oct 28th. The newly arrived summer science groups had to begin their season collecting seawater samples from the seawater pump house.

During the LMG14-09 port call ASC engineers conducted a site review, the first step in moving forward with a plan for major upgrades to Palmer Station. It was an interesting process for all involved, thinking about what works well at Palmer and why, and what can be improved. ASC communications manager Elaine Hood also arrived on station for a brief stay. She has been conducting outreach video conferences and documenting Palmer Station activities. Elaine presented a great science lecture on the various USAP outreach activities and resources that are available to everyone, including the USAP photo library which has open source photos, both current and historical, taken at Palmer Station (<http://photolibrary.usap.gov/>).

This month we said goodbye to the Detrich group (B-037-P) winter-overs as they completed their project. As the days get noticeably longer, it is starting to feel more like summer, despite the snow and ice. The amount of wildlife around Palmer Station seems to be increasing. Adélie penguins have returned to Torgersen Island. A Weddell seal pupped in Hero Inlet this month, and a large male elephant seal made a brief stop at Palmer one evening (utilizing the new boat ramp). Hundreds of cormorants were seen flocking together in the area on several occasions, a very impressive sight.

Finally at the end of the month the ice blew out for just long enough to allow all of the grantees to complete boating training. We are looking forward to a productive and exciting summer season.

OCTOBER 2014 WEATHER

Mark Dalberth, Research Associate

For most of October, Palmer Station was locked in ice. A series of low pressure systems moved across the peninsula in the beginning of the month bringing with them gusty winds and precipitation. The maximum wind gust was 55kn on October 6th. On average, the wind speed was 11 kn this month which is close to the 25 year average of 11.8 kn.

In the middle of the month, when a high pressure system was moving into the area, we experienced the coldest temperatures getting down to -14.8 C on the 14th. This is still about 3 degrees warmer than the lowest October temperature.

As more low pressure systems moved through the area in the second half of the month we had several windy, gray days bringing more precipitation. The total melted precipitation measured was 54.8 mm which is 2 mm less than the 25 year average. The snowfall this month was 46 cm - 6 cm more than the 25 year average. This lends credence to the belief on station that we have been shoveling more than usual this October. On October 31, the year-to-date snowfall was 277 cm – a full 33 cm less than the 25 year average. We should praise the efforts of the intrepid shovelers of yester-year.

As the final low pulled out of the area at the end of the month, easterly winds pushed the ice away from Anvers Island giving us a few days of good boating.

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)

We had a fairly smooth Drake Passage crossing, and the ship arrived on station on October 9th. I spent about a week setting up the laboratory, including cleaning, unpacking, organizing, and checking inventories for two sets of supplies (four call-forward boxes from last year, and supplies provided this year as requested in my SIP). I reconciled my inventories and set up all the equipment and reagents to test out my process for filtering water samples. I also spent time preparing for the station's weekly science that I presented on October 28th. High winds and sea ice kept us from boating until the last few days in October, when the science groups, including myself, were finally able to get out for Boating II training.

In conjunction with a 24 hour sampling experiment carried out by the C-045 group, I collected and processed two water samples from the pump house on October 31st. My two samples were collected 12 hours apart and coincided with the middle and last time points of the C-045 experiment. These samples also served as a test of my filtering process, which went smoothly. Based on sea-ice conditions, and weather predictions, I expect we will be out collecting samples at Station B within the first week of November.

B-037-P: PROTEIN FOLDING AND EMBRYOGENESIS IN ANTARCTIC FISHES: A COMPARATIVE APPROACH TO ENVIRONMENTAL STRESS

H. William Detrich, Principal Investigator, Marine Science Center, Northeastern University

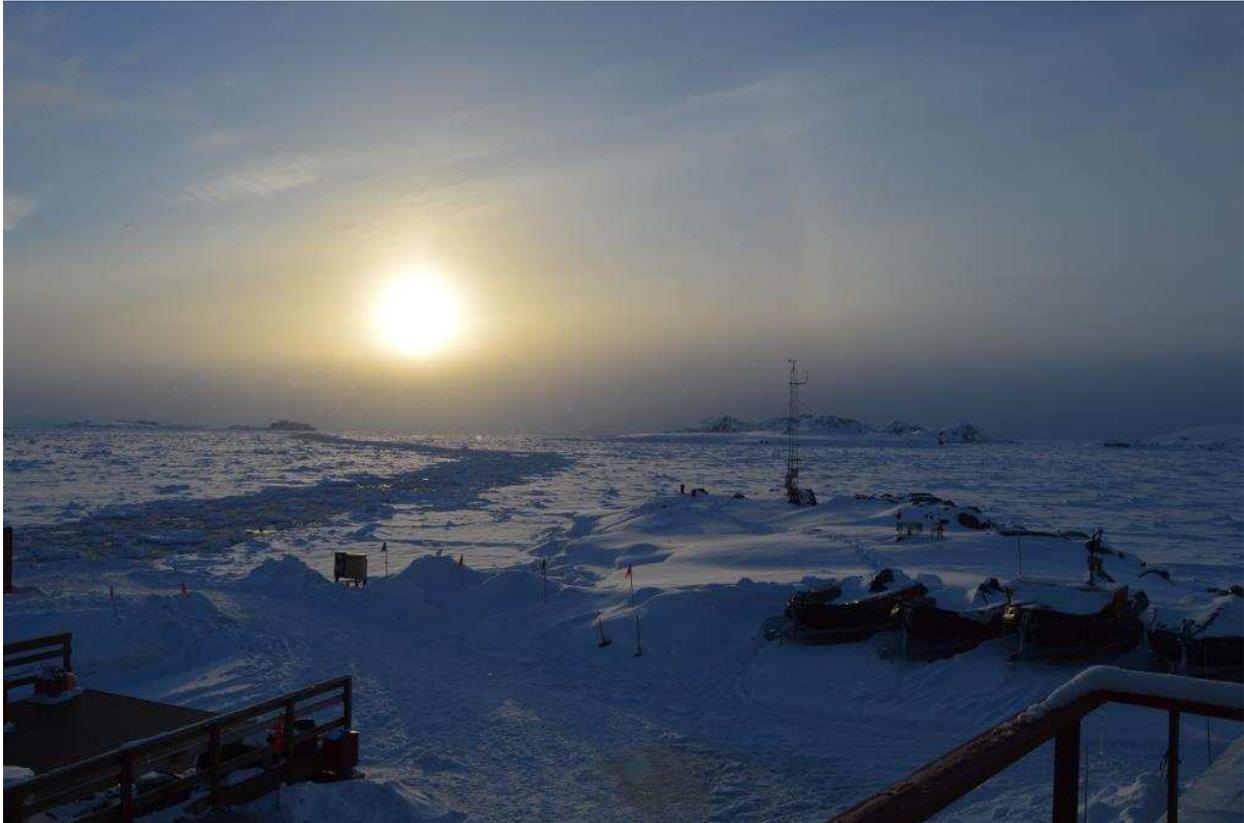
Personnel on Station: Nathalie R. Le François and Eileen Sheehan

Antarctic notothenioid fishes have evolved a suite of characters that makes them well adapted to their Southern Ocean (SO) habitat, which cooled to the freezing point of seawater (-1.9°C) by ~8-10 million years ago and has remained at this temperature to the present. However, these cold-adapted stenotherms are now threatened by rapid warming of the SO, the temperature of which is likely to increase by $2-5^{\circ}\text{C}$ over the next two centuries. We are investigating the impact of this projected warming on development of the embryos of notothenioid fishes to determine whether they have the capacity to recruit to adult populations under this climate change scenario.

During October, Le François and Sheehan wrapped up our long-term incubations of *Notothenia coriiceps* embryos at control (-1°C) and experimental ($+4^{\circ}\text{C}$) temperatures and completed sampling of embryos for analysis at Northeastern University, the University of Massachusetts, Amherst, the University of Oregon, and the Biodôme de Montréal, Canada. The samples were packed for shipment to the U.S., and the incubation system was disassembled and packed for

northbound transport. In addition, Le François and Sheehan continued to draft manuscripts pertaining to this year's results.

We thank the ASC Palmer Station personnel, both summer and winter, and the Captain, crew, and ASC personnel of the *ARSV Laurence M. Gould* for their excellent support of our research program.



Track in the sea ice left by LMG14-09 as the last of the winter-overs head back to Punta Arenas. (Photo by Nicole Waite)

C-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: Frank McQuarrie and Nicole Waite

Let us start by introducing ourselves! Nicole is a recent Master of Science from the Rutgers Oceanography graduate program and the Field Team Lead for the C-019 group this season. Frank is an eager Rutgers undergraduate in Marine Science excited to gain research experience on the world's most awesome continent.

The 2014-2015 summer science season has been off to a good start for the C-019 group. We traveled down to Palmer Station on LMG 14-09 at the start of October. We had smooth sailing and calm seas across the Drake with gorgeous scenery, crystal blue icebergs, and lots of wildlife as we came into Antarctic waters. Being both of our first times to the ice, it was an unforgettable experience and we are looking forward to many more as the science season progresses.

Since arriving at Palmer, we have been steadily unpacking boxes, testing and troubleshooting instruments and getting Lab 10 set up and ready to go for the science we'll be doing the season. We'd like to thank everyone at Palmer and aboard the LMG for being so welcoming and helpful over the last month.

Continuing the long term ecological research, we will be studying the phytoplankton communities at 2 sites off of Anvers Island. Our work will consist of bio-optic and phytoplankton sampling through the deployment of a CTD, an AC9 (absorbancy and attenuation meter), a Spear (irradiance meter), and Go-Flo bottles to collect water at each station twice a week. We're able to monitor phytoplankton biomass, health, and production throughout the summer season from the water samples we collect and the instrument data. The data we collect are vital in tracking how the Antarctic ecosystem is changing with climate change.

The sea ice has been coming and going, teasing us with open water for most of the month. Fortunately, we were just able to get out for Boating II. We are anxiously awaiting our first trip out on our beloved zodiac named Bruiser, and have been formulating field sampling plans in conjunction with the C-045, Ducklow group. It's going to be a great summer season in Antarctica!



C-019 field team learning to prep boats during Boating II. (Photo courtesy of C-019)

C-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: MICROBIAL / BIOGEOCHEMICAL COMPONENT

Dr. Hugh Ducklow, Principal Investigator, Columbia University, Lamont Doherty Earth Observatory

Personnel on Station: Rachel Kaplan, Naomi Shelton, and Conor Sullivan

C-045-P is one component of the Palmer Long Term Ecological Research project, based at Palmer Station each summer season from October to April. The overall goal of Palmer LTER is to understand and document climatic and environmental controls on marine ecosystem structure and dynamics. The specific objective of C-045-P, the microbial biogeochemistry component, is to obtain key information on the ocean carbon cycle in the Palmer region at weekly to seasonal resolution, and to understand how ocean microbes, especially heterotrophic bacteria, drive carbon cycling. This is Palmer LTER's 24th season, and the 14th for the microbial project.

The C-045-P field season began this October, when, after a smooth trip from Punta Arenas, we (Rachel Kaplan and Conor Sullivan) arrived at Palmer October 9th, excited to work as field technicians for the 2014-2015 season. With the help of Naomi Shelton, we set up our laboratory space, were trained to drive the Zodiacs, and initiated biweekly sampling from the pump house seawater intake hose. When the sea ice moves out, we will be able to execute our intended sampling plan at stations B and E, furthering the long-term data set collected from these stations.

When we can't access stations B and E, we conducted a diel study. During one 24-hour period, we sampled from the pump house every two hours (a total of 13 times), in order to learn about diurnal rhythms in the local microbial community. We were joined in sampling by Schofield (C-019) and the Bench group (B-018-P). We look forward to putting all our results together into a comprehensive picture of that day.

**PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT
OCTOBER 2014**

Mark Dalberth and Graham Tilbury

This month Research Associate duties were transferred to the incoming summer RA. The data collection systems in Terra Lab have been operating well throughout the month. There was a planned power outage in the middle of the month which had minimal impact on the experiments.

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 seismograph station operated without any problems for the entire 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 system has operated well for the entire month. The VLF antenna was inspected and found to be securely anchored to the bedrock in the backyard.

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 throughout the month. The FTP of DATA files, conducted bi-weekly, was successfully completed.

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 the Terra Lab.

Air samples were collected every two weeks, as scheduled.

**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 air samples were collected as scheduled.

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.

The system was down for a day due to problems associated with updating the control PC. This was quickly rectified remotely by the NOAA group in Boulder. The bi-weekly absolute calibration scans were completed as scheduled.

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.

Daily quality checks of the downloaded data were performed as scheduled. The system operated normally throughout the month.

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 system operated normally throughout the month.

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.

Kevin Bliss came down on LMG14-09. He performed maintenance on the computer in Terra Lab and also on the dish outside. The system has been operating well throughout the month.

A-357-P: EXTENDING THE SOUTH AMERICAN MERIDIONAL B-FIELD ARRAY (SAMBA) TO AURORAL LATITUDES IN ANTARCTICA

Eftyhia Zesta, Principal Investigator, University of California Los Angeles

The three-axis fluxgate magnetometer is one in a chain of longitudinal, ground-based magnetometers extending down through South America and into Antarctica. The primary scientific goals are the study of ULF (Ultra Low Frequency) waves and the remote sensing of mass density in the inner magnetosphere during geomagnetically active periods. The Research Associate maintains the on-site system.

The magnetometer lost communication to the outside world for a few days at the end of the month. The group was notified and the system is sending data again.

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

Deneb Karentz, Joe Grzyski, 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.

Daily instrument checks, weekly cleaning and data downloads were performed as scheduled.

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.

Daily filter samples were processed and packaged for shipping. The system continued operating normally throughout 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 tide gauge was brought back on line on October 21st. It has been operating well since then.

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 operated normally during the month.