

PALMER STATION MONTHLY SCIENCE REPORT

FEBRUARY 2015



ASC riggers install a remote weather station tower in the Joubin Islands.

(Image Credit: Michiel Gitzels)

NEWS FROM THE LAB

Carolyn Lipke, Summer Laboratory Supervisor

As we wrap up February we can really feel the seasons starting to change here again at Palmer Station. This month the Adélie penguin chicks fledged, leaving Torgersen Island vacant. Fur seals have returned and seem to be everywhere. Snow began to fly and linger again, and dark nights have returned as the days grow shorter.

Work in the lab continues at a steady pace, with six science groups still on station. A construction crew was also on site this month to build a platform in the backyard for the new Moore group (A-109-P) Extremely Low Frequency (ELF) antenna.

On February 25th we celebrated the 50 year anniversary of the building of “Old Palmer” over on what is now Amstler Island. It’s exciting to think of what the next 50 years of Palmer Station science might bring. For those interested in taking a trip down Palmer science memory lane, the LTER maintains a database of past monthly science reports, going back to 1991, on their website: <http://pal.lternet.edu/publications/station-cruise-reports>

FEBRUARY 2015 WEATHER

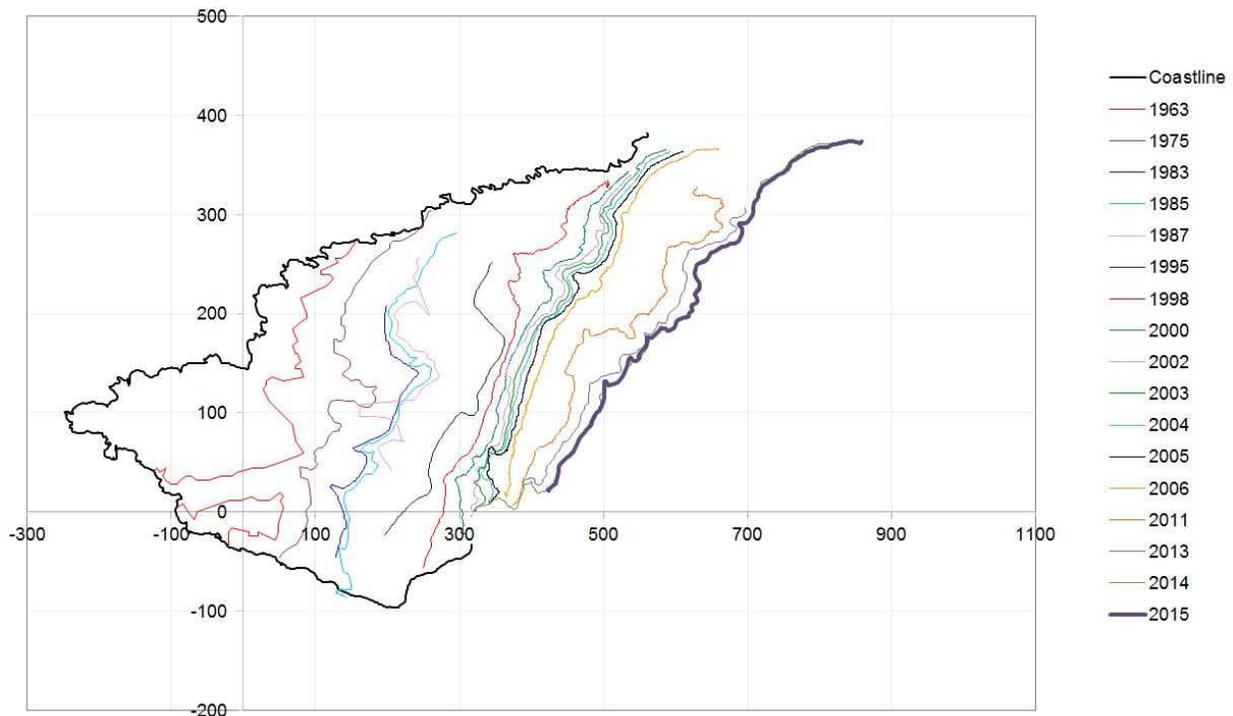
Mark Dalberth, Research Associate

The month of February was characterized by cloudy and stormy conditions brought by a series of low pressure systems that moved through the region. We had some foggy mornings and saw very little sun throughout the month. The maximum temperature was 6.9 C (44 F) and the minimum was -3.2 C (26 F). The average wind speed was 10 knots while the highest five second gust was 67 knots recorded on the 24th. The 26 year average maximum temperature for the month of February is 9.8 C (49.6 F) and the average minimum is -3.6 C (25.5 F). The 26 year average wind speed is 9.1 knots.

We saw 42.4 mm of melted precipitation which includes 14 cm of snow. All the snow melted and did not accumulate. Over the last 26 years, the average melted precipitation for February has been 67.7 mm. This is almost exactly an inch more than we saw this month. No sea ice was observed in the area. We did have some brash ice in the harbor, but not enough to affect boating operations. The tide gauge on the pier measured on average sea surface temperature of 0.5 C (32.9 F). The minimum sea temperature recorded was -1.1 C (30 F) on February 26. The maximum was 1.4 C (34.5 F) which was observed on two days – February 3 at 7:09 pm and February 13 at 8:51 pm.

Another ongoing, informal, project for the Palmer Research Associate is tracking the edge of the glacier terminus in the backyard. A new line for 2015 was measured this month. Plotted with past measurements you can see the retreat of our glacier since 1963 in the below figure.

Glacier Terminus -- The Glacier Edge Over Time
Distances in meters from the CORS/GPS reference point



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; Chris Linder, Co-PI; Dr. Matt Oliver, Co-PI, University of Delaware; Hank Statscewich, Co-PI, University of Alaska Fairbanks; Dr. Peter Winsor, Co-PI, University of Alaska Fairbanks

Personnel on Station: Kim Bernard, Megan Cimino, and Shenandoah Raycroft

As we wrap up our field season, we find ourselves contemplating what we have been able to get done, and whether or not we would consider the season successful. This was an incredibly ambitious project, requiring substantial logistical coordination, dedicated effort, and, of course, good weather windows. Here's a list of what we achieved this season:

Mooring: Retrieval, data download, and subsequent redeployment (November 2014). We will retrieve the mooring on our northbound trip (LMG1502) in early March.

CODAR: Sites installed at Palmer, the Joubins and the Wauwermans, with RPMs (Remote Power Modules) installed on the Joubins and Wauwermans (November 2014).

Gliders: We had a very successful glider season. In collaboration with the Palmer LTER, 5 gliders deployed (RU05, RU24, RU26, UAF191 and UD134) with a total of 192 days out sampling and 2773 km covered (see Figure 1). RU26 sprung a leak and was retrieved by the LMG in late January. The remaining four gliders (RU05, RU24, UD134, UAF191) were safely recovered this month. The vehicles took oceanographic measurements mostly within the range of CODAR surface current measurements and penguin foraging locations.

Small Boat Acoustic Surveys: We completed 16 full grid acoustic surveys and 7 partial grid or targeted surveys this season. Weather permitting, we plan to complete at least one more full grid survey before leaving. In total, we covered 707.5 km with a total acoustic run time of 118 hours. Compared to previous seasons (within the last 4 years), krill biomass was relatively low and was dominated by larger (40-45 mm) individuals.

Penguin Tagging: In collaboration with the Palmer LTER, 15 Adélie penguins and 7 gentoo penguins were tagged this season. The mean Adélie dive depth was 18 m (maximum = 83 m), while the mean gentoo dive depth was 54 m (maximum = 150 m).

In all, this was a highly successful field season for our project. We are extremely grateful for all of the support and assistance we received from ASC personnel at Palmer; our research would not have been possible without them.

Broader Impacts: The broader impacts team published 28 posts. These posts feature 227 photos and just over 30,000 words (see coseenow.net/converge). The blog has had over 500 comments, including both questions and the answers we provided. The blog has received over 43,000

views. 3000 middle and high school students following the blogs interacted directly with the scientists through eight 30-minute blackboard session VTCs. We also conducted two 1-hour VTCs with the general public via the Cornell Lab of Ornithology. These attracted over 5,000 total views so far (view count is growing because people are viewing archived videos of the sessions).

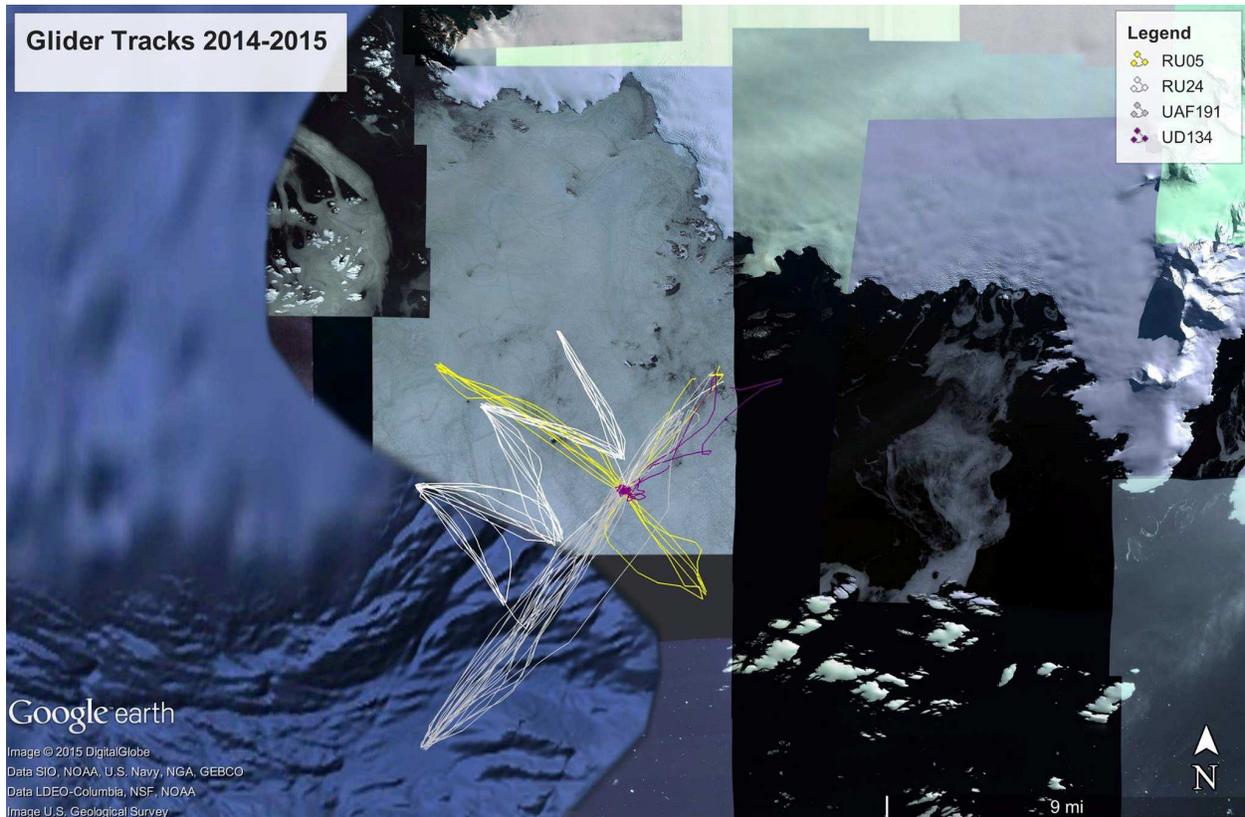


Figure 1. Sampling tracks of 3 of the CONVERGE gliders (RU05, UAF191 and UD134) and 1 LTER glider (RU24).

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: Chris Grant

Members of the C-045 group processed samples for my project on 3 days prior to Chris arriving on station on February 18th. At that point, he became responsible for collecting and processing samples. After only one day of orientations, he had his first sampling day on the 19th, since that was when the LTER groups were sampling. For all sample days during the month, processing included preparing water for RNA and DNA, as well as microscopy and flow cytometry. After his arrival, Chris collected and processed samples on an additional 3 days in February. So, for the month, there were a total of 6 samples collected and processed for the B-018 project.

ASC staff and volunteers from other science groups have continued to provide valuable assistance with the boating and sample collecting throughout the month, and C-045 team members provided support while Chris was coming up to speed on the sample processing protocols.

In addition to the samples collected and processed for the B-018 project, Chris ran an experiment for a collaborator at Lawrence Livermore National Laboratory (LLNL). The collaborator's Moore Foundation funded project is examining carbon and nitrogen uptake by marine microbial communities to better understand nutrient cycling in the oceans. The samples collected by Chris, when further processed at LLNL, will provide valuable data from a Southern Ocean ecosystem. This will add to the collaborator's previously collected temperate samples and help provide a more accurate global picture of marine nutrient cycling.

Towards the end of the month, a decrease in the color on the filters and in filtering time both suggest that the phytoplankton biomass is tapering off. This is supported by chlorophyll measurements and primary production data.

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: Tracy Shaw and Monisha Sugla

The ARSV *Laurence M. Gould* caught more krill (*Euphausia superba*) for us at the end of the LTER cruise in early February. We are grateful to them for their efforts on our behalf. There were still krill remaining from those that they brought us at the beginning of the LTER cruise as well so we had plenty of krill to work with this month. The euphausiid growth experiment that we started in January continued into early February when the last krill in the experiment molted. Shortly after that experiment ended we started an ambitious new experiment combining krill growth and testing whether there is a pH threshold value below which krill will not survive. We tested pHs of 8.0, 7.5, and 7.1 at two temperatures (0°C and 3°C). To combine this with krill growth, we held the krill in individual jars until they molted and then assigned them to a pH and temperature treatment. The date when the krill was transferred to treatment water was considered the experiment start date for that individual animal. This makes for a lot of detailed recordkeeping but is yielding a unique and interesting data set of individual krill at a known stage in their molt cycle that have been exposed to the various pH and temperature combinations for different periods of time. Mortality has been essentially zero in the pH treatments and the krill look healthy and are actively swimming in all treatments at both temperatures. After about two weeks, krill in the 3°C treatment started molting for a second time. The molting process is slower in colder water so there may not be enough time left in this experiment for the animals in the cold temperature treatment to molt again before we end the experiment in early March in preparation to depart Palmer Station on March 11. Monisha Sugla has been collecting alkalinity

samples throughout the course of this experiment and hopes to process many of them before our departure.

C-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: Ben Cook, Shawn Farry, Donna Fraser, and Carrie McAtee

On February 2nd the *ARSV Laurence M. Gould* (LMG) returned to Palmer Station with C-013 team members Carrie McAtee and Ben Cook at the conclusion of the LTER cruise. On February 3rd, Kirstie Yeager and Erin Pickett departed Palmer Station for the season aboard the LMG.

Adélie penguin studies were completed this month with beach counts and measurements of Adélie fledglings. Adélie penguin foraging ecology studies were also concluded in February with the completion of our radio transmitter study on Humble Island. Gentoo penguin satellite tag deployments on Biscoe Island also ended in February, however gentoo diet studies and fledgling counts and measurements will continue into March.

Skua work continued with monitoring and banding of brown skua chicks on local islands as well as on Dream and Biscoe Islands. South polar skua reproductive monitoring on Shortcut Island came to an end this month after the failure of all study area nests. Monitoring of the blue-eyed shag colony on Cormorant Island also concluded at the end of February with the fledging of all chicks. Kelp Gull surveys and chick counts were also completed for local islands. Giant petrel chick banding began in late February and should be completed by early March. Growth measurements of giant petrel chicks on Humble Island will continue through the end of the season. Monitoring of marine mammals continued in February with expected increases in fur seal number and decreases in elephant seal numbers.

ASC continued to provide great support this month with special thanks to Jason O'Brien for keeping our Humble Island penguin presence/absence receiver functioning, Carolyn Lipke for once again coordinating the birder volunteer schedule, and to the birder volunteers who helped us weigh and measure Adélie chicks during the fledging period.

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: Jim Fiorendino

The Schofield group has been hard at work during the month of February, logging a total of 7 successful sampling events. We continued our collection of data and water samples at stations E and B as well as filtering water for Chl-a and HPLC analysis. Additionally, Nicole Waite departed Palmer Station and Jim Fiorendino has taken over as lab manager. With only one person on staff, the Schofield group has been assisted by Conor Sullivan of the Ducklow group. Conor assists us with water sampling and Chl-a analysis and we are very grateful for all of his help. The Schofield group has also assisted the birders with their efforts collecting data on fledgling penguins and giant petrel chicks and has helped on a number of successful glider recovery efforts.

Filtration of water for Chl-a and HPLC analysis continues, as well as efforts to analyze Chl-a samples taken during *ARSV Laurence M. Gould* LTER cruise in the month of January. Primary production experiments involving the incubation of sea water spiked with ^{14}C continue, as well. With the return of the FiRe fluorometer, we have begun running discrete samples examining the fluorescence of water samples taken at various depths at different wavelengths. A look at some of the results of our Chl-a analyses show that chlorophyll concentrations have declined since peaking in mid-January, particularly in waters near the surface.

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

February was a busy month for the Microbial group, with personnel changes and weather conditions that allowed for near-maximum sampling. Naomi Shelton departed the *ARSV Laurence M. Gould* (LMG) at the beginning of February for a two-month stay at Palmer with C-045-P; it was a smooth transition as she has been lab manager for Ducklow's lab since September 2013. This is her first extended stay at Palmer and everyone on station has made her feel welcome. With Naomi's arrival, Conor shifted to spending most of his time in the C-019-P lab.

The LMG delivered not only Naomi but also our flow cytometer, allowing us to run preserved samples from the month of January and obtain preliminary data on microbial abundance at stations B and E (see Figure 1). The bacterial abundance trends at both stations reflect higher levels for January and February as compared to previous seasons, which is interesting considering the overall low-production summer we've had. From this month, we also see a late-summer bloom that seems to be coming to an end.

We sampled semiweekly almost the entire month of February, although we missed the first sampling day since the December ice-in, due to a week of high winds. The few calm sampling days we had, reminiscent of conditions earlier in the season, were welcome, as were a number of

memorable wildlife sightings. We saw humpbacks fluke at both stations B and E and breach off Janus Island, watched fur seals and leopard seals swim curiously around our boat, and even saw a tabular iceberg flip over (at a safe distance from our Zodiac). We've captured much of our February sampling (see the photo below) using the GoPro Hero4 cameras that were gifted to the Palmer science community by Abercrombie & Kent Tours. The photos and video of our sampling process will be helpful not only for training purposes in future seasons, but may be used as broader teaching tools as well. We look forward to using these new tools to further document the Microbial component of the LTER project.



Image 1. From left to right: Rachel Kaplan, Conor Sullivan, and Naomi Shelton sample at Station E on February 26, 2015. The winch is used to lower Go-Flo bottles into the water for collection at discrete depths, with the deepest sample at 65 meters.

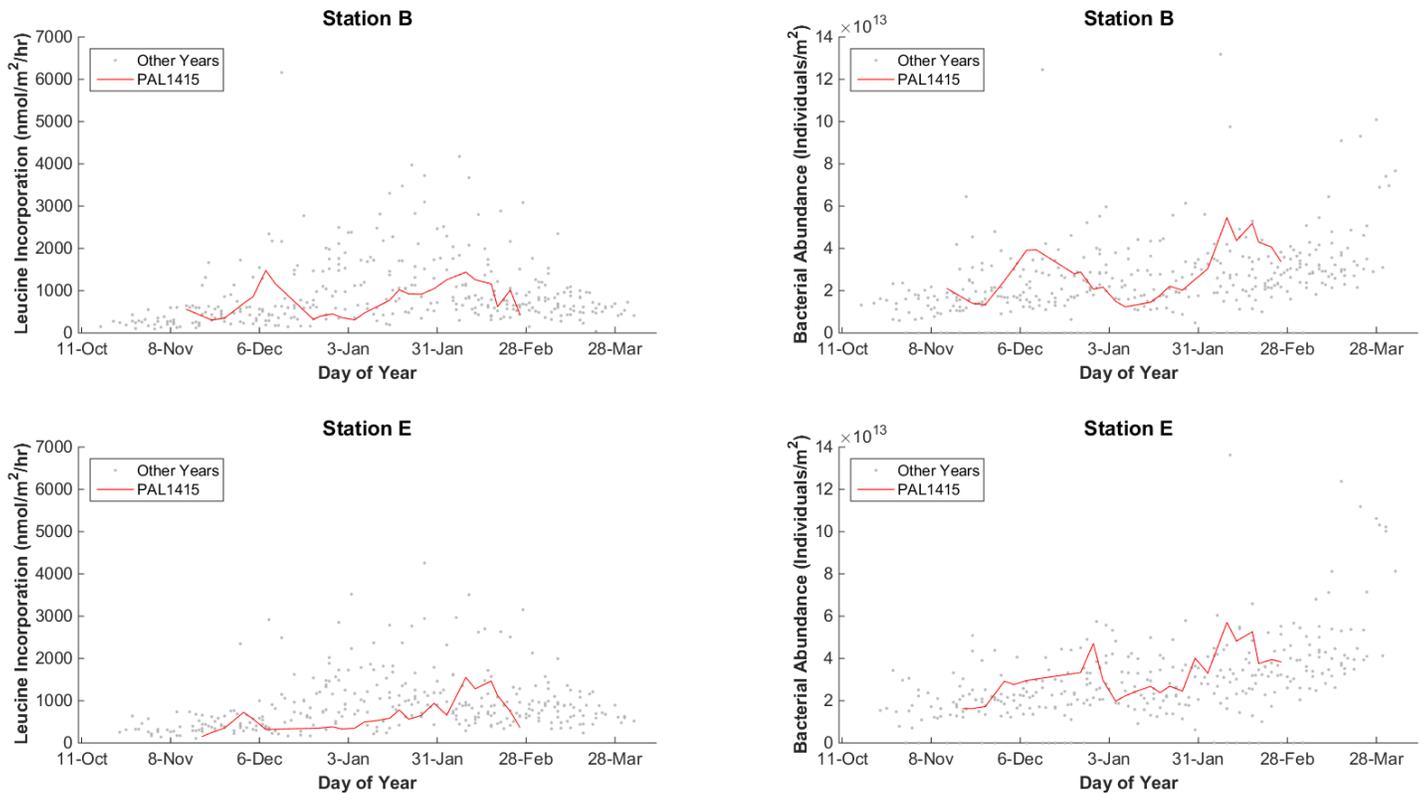


Figure 1. Integrated leucine incorporation data (nanomoles/m²/hr) from the last thirteen years of Palmer sampling at stations B and E. Both stations show bacterial abundance rates that are higher than previous seasons for the month of February.

**PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT
FEBRUARY 2015**

Mark Dalberth

**B-005-P: IMPACTS OF LOCAL OCEANOGRAPHIC PROCESSES ON ADELIE
PENGUIN FORAGING OVER PALMER DEEP: COASTAL OCEAN DYNAMICS
APPLICATIONS RADAR (CODAR)**

Josh Kohut, Principal Investigator, Rutgers University

The CODAR system consists of three transmitters/receivers located on Anvers Island, Wauwerman Island and on Howard Island in the Joubins. The data from all three transmitters is compiled on computers in Terra Lab and plots of the surface currents over the Palmer Deep are generated.

The CODAR system has been operating well since B-005-P left last month. Each CODAR installation has an associated meteorological station, and it has been useful to have access to the wind data from the Joubins and the Wauwermans.

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 operated without any problems this 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 functioned normally this month. I checked the antenna every two weeks. The installation of the foundation for the ELF antenna began after the construction team arrived on LMG15-02. A site was chosen and the project is currently in full-swing.

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. Weather data was transferred to servers at AMRC on the first and the sixteenth of the month.

O-264-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 Terra Lab.

Air samples were taken every two weeks. Three boxes of flasks were received on LMG15-02SB.

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 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.

Samples were collected for the carbon cycle and the halocarbon and trace species projects. A new crate of HATS sampling flasks as well as three crates of CC flasks arrived on the LMG15-02SB.

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.

A power supply used to power calibration lamps blew a fuse. The problem was quickly corrected after a phone call to the group. Equipment to be used for system maintenance arrived on station.

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 Antarctic Meteorological Research Center (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 throughout the month. Daily quality checks of the downloaded data were performed as scheduled.

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. I tested the Trimble mobile GPS by walking the glacier terminus. This has been an on-going measurement conducted by the Research Associate over the years. The measurement shows that the glacier has receded by 6-7 feet from its position on March 10, 2014.

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.

The system has operated normally 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 has functioned normally this month.

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.

The system operated normally throughout the month. I archived filters and prepared them for shipment. Material arrived for system maintenance that is scheduled for April.

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.

Daily observations of the ice around station were made. The new tide gauge has arrived on station. It has not yet been installed. An improvement to the data plotting software was made. This should make the plotting less susceptible to file read errors.

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.

PalMOS has operated normally. I changed the Matlab plotting software to improve the timing of data reads. I have also added error checking to the routines that read in the data from Gamage Point and Outcast Island. These problems used to stop weather chart generation from time to time. I think that there has been improvement although the changes haven't been tested for very long.