PALMER STATION MONTHLY SCIENCE REPORT

FEBRUARY 2017

Various grasses, mosses, and lichens on Lipps Island. *Image Credit: Randy Jones*

NEWS FROM THE LAB

Randy Jones, Summer Laboratory Supervisor

After the LTER cruise completed another successful month-long grid occupation, the science groups on station settled into the rhythms of the height of the season. Soon after the LTER cruise, the MV *Alucia* brought our first chemical ecologist diver Margaret Amsler (B-022-P) ashore, who was followed up by the remainder of the diving team from the University of Alabama at Birmingham on LMG17-02SB. Early in the month also saw a shift from the calm, clear weather we had come to expect throughout most of January to the more typical wetter, cloudier, windier weather of summer. While this has slowed some collecting schedules, the overall success of field work has been quite positive.

The Palmer area ecosystem as a whole has seen a shift as well. Milky glacial meltwater heavily influenced surface waters for most of the month, though melt has been trailing off towards the last week of the month as snow cover has reached its lowest levels. This resulted in a temperature inversion with colder, fresher meltwater-influence near the surface at or slightly below 0 degrees Celsius, and relatively warmer, saltier water was present at greater depth. The divers have definitely noted the visibility differences between the upper 10 m and below 10 m depth. The organisms have also begun to shift to a late summer lineup. Elephant seals have reduced in number as fur seals have greatly increased on most islands with an increase in leopard seals in the water. Adélie penguins fledged between about Feb 6-15, though some remain in the area at the end of the month waiting for their molts to finish. Skua, kelp gull, and giant petrels are all nearing fledging. It has been fascinating to watch it all change over the month!

FEBRUARY 2017 WEATHER
Liz Widen, Research Associate

Palmer Monthly Met summary for February, 2017

Temperature
Average: 2.7 °C / 36.8 °F
Maximum: 8.1 °C / 46.58 °F on 13 Feb 19:08
Minimum: -2.4 °C / 27.68 °F on 19 Feb 03:43
Air Pressure
Average: 990 mb
Maximum: 1010.2 mb on 6 Feb 15:01
Minimum: 970.9 mb on 26 Feb 04:53
Wind
Average: 8.4 knots / 9.7 mph
Peak (5 Sec Gust): 46 knots / 53 mph on 10 Feb 15:48 from NNE (25 deg)
Prevailing Direction for Month: N
Surface
Total Rainfall: 27.7 mm / 1.09 in
Total Snowfall: 0 cm / 0 in
Greatest Depth at Snow Stake: 0 cm / 0 in
WMO Sea Ice Observation: No Sea Ice in sight, only ice of land origin, 11-20 bergs, with growlers and bergy bits.
Average Sea Surface Temperature: 1.92 °C / 35.5 °F

The following two plots (Figs. 1 and 2) show the month's average temperature and wind speed plotted against the historical average (where the historical average goes back to November 30, 2001). Both temperature and wind speed were mostly consistent with historical averages. There

were a few days with temperatures above average in the middle of the month. Arthur Harbor and Hero Inlet have been clear of sea ice, but have been occasionally filled with growlers and bergy bits from local glacier calving.

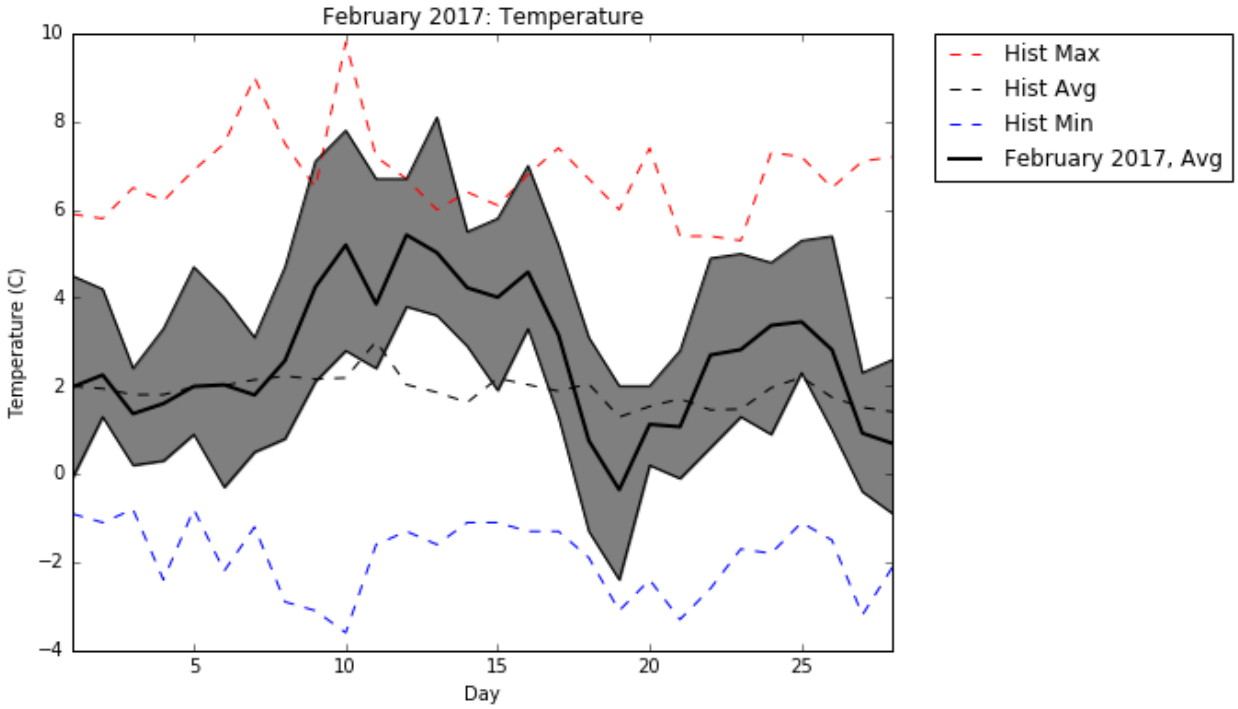


Fig. 1 – Plot of daily temperature in February 2017. Shown in black/shaded gray are the daily average, the minimum, and the maximum for this year. The dotted lines on the graph indicate average, minimum, and maximum values for "historical values" for 2002 to 2016. (We thank Liz Widen for providing this data and the figure.)

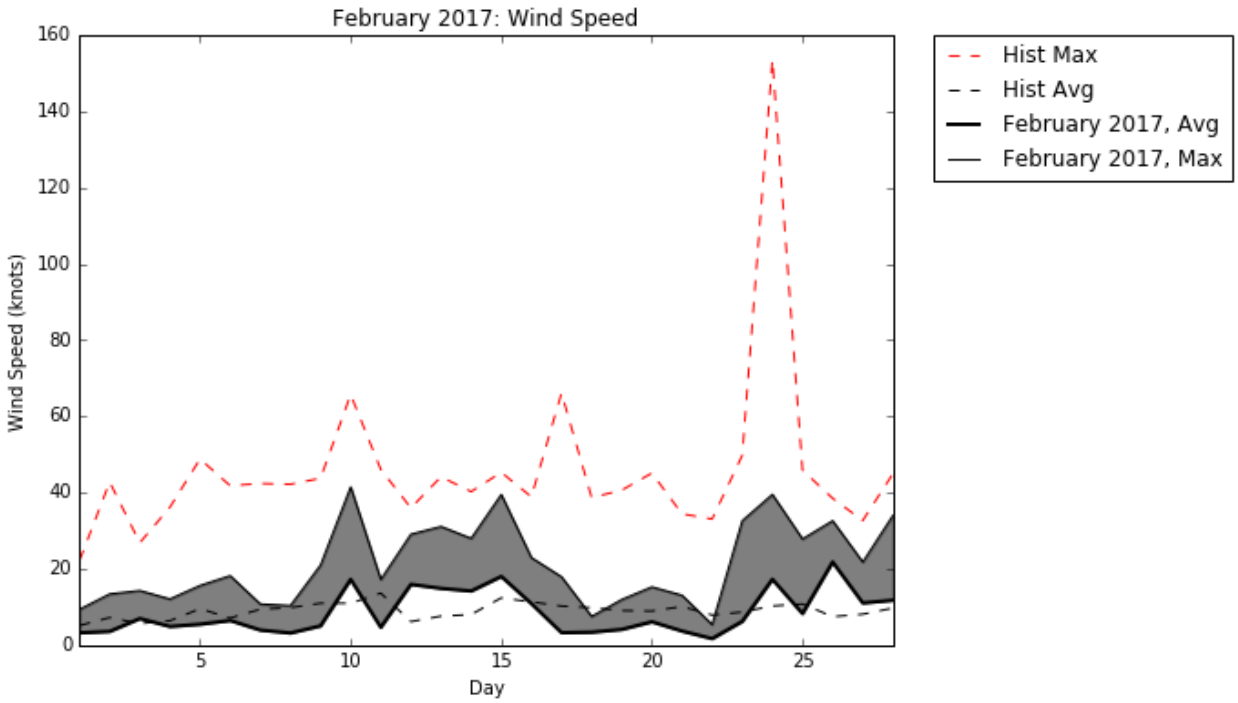


Fig. 2 – Plot of daily wind speed in February 2017. The daily averages are shown in black with grey shading indicating gusts. The dotted lines on the graph indicate average and maximum values for "historical values" for 2002 to 2016. (We thank Liz Widen for providing this data and the figure.)

B-022-P: THE CHEMICAL ECOLOGY OF SHALLOW-WATER MARINE MACROALGAE AND INVERTEBRATES ON THE ANTARCTIC PENINSULA

Dr. Charles Amsler and Dr. James McClintock, Principal Investigators, University of Alabama at Birmingham; Dr. Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Charles Amsler, Margaret Amsler, Sabrina Heiser, James McClintock, Leucas Miller, Andrew Shilling, and Santana Thomas

Most of B-022-P arrived at Palmer Station on 18 February with LMG16-02 to join Margaret Amsler who had been dropped off at Palmer by the MV *Alucia* late on the evening of 6 February. Initial efforts centered on setting up our lab space, dive locker, and our portion of the aquarium building as well as mandatory boat training.

Our field efforts commenced with checkout dives at the pier on 21 February and we completed 12 total dives in February, primarily to collect two of the focus organisms of this season's work, the red alga *Plocamium cartilagineum* and the amphipod *Paradexamine fissicauda*, which commonly associates with *P. cartilagineum*. Two of the dives targeted a third focus, the huge brown alga *Himantothallus grandifolius* and its associated gastropod fauna.

Based on collections made during our 2016 field season, spectroscopic analyses at USF found that *P. cartilagineum* individuals from 2016 fell into 12 distinct chemical groupings (chemogroups) based on their secondary metabolite (putative chemical defense) compound makeup. The initial focus of our laboratory efforts was setting up the station gas chromatograph, which we will use throughout to season to identify which chemogroup an individual alga represents. Initial efforts to that end have gone very well and by the very end of the month have allowed us to use that information to begin setting up the first of two experiments with *P. cartilagineum* that will last for the rest of our season.

We are grateful for the generous and professional assistance of numerous ASC staff in assisting with our activities. Randy Jones, Carly Quisenberry, Nikki Chatelain, Rosemary McGuire, and TR Tepper-Rasmussen deserve special thanks for facilitating our laboratory and field efforts.

B-256-P: COLLABORATIVE RESEARCH: WINTER SURVIVAL MECHANISMS AND ADAPTIVE GENETIC VARIATION IN AN ANTARCTIC INSECT

Dr. Richard E. Lee, Jr. and Dr. David L. Denlinger, Principal Investigators, Miami University, Oxford, Ohio and Ohio State University, Columbus, Ohio.

Personnel on Station: J.D. Gantz and Drew Spacht

Survival of terrestrial polar organisms depends on a coordinated transition from feeding, growth, and reproduction during short summers to an energy-conserving state coupled with enhanced resistance to environmental extremes during long, severe winters. Our recent work detailed molecular and physiological mechanisms that enable the midge, *Belgica antarctica*, to survive seasonal changes in temperature, dehydration, and osmotic stress. Combined with our recent sequencing of the midge's genome, these data provide a firm foundation for our current project that focuses in three areas: 1) the role of aquaporin water channels during dehydration and

freezing; 2) metabolic depression and survival during an extended winter dormancy; and 3) population structure, gene flow, and adaptive genetic variation in diverse larval microhabitats.

During February we made numerous collecting trips for larvae to create a seasonal profile of larval metabolism and stress tolerance, and for a comparative study of genetic and physiological variation among different microhabitats used by the larvae. Larvae are found in diverse terrestrial microhabitats ranging from moss beds to grass to mats of terrestrial algae (*Prasiola crispa*) to guano-rich sites adjacent to penguin rookeries. Additionally, we retrieved temperature loggers deployed at the start of last season that will help us to parse out environmental variables that contribute to genetic and physiological differences between microhabitats.

Our outreach efforts seek to connect the science activities of our team and other research projects on station with teachers and their students. Spearheaded by Natalie Ylizarde, A Fly on the Pole (http://aflyonthepole.com/) is the official outreach program for the 2017 Antarctic research expedition. Prior to leaving at the beginning of February, Natalie connected PreK-16 schools, informal educators, and the general public with Palmer Station by using video and teleconferencing, blogging, and various social media outlets. As part of the NSF-MADE-CLEAR grant (NSF DUE 1043262) she led an exploratory study using real-time polar research at Palmer Station as a vehicle to teach climate change in classrooms, grades 4-12.

A second website (http://www.units.miamioh.edu/cryolab/) at Miami University provides K-12 classroom activities based on national and state standards. Natalie communicated via Skype with 200 students and staff at a high school using a combination of prerecorded video and real-time discussions. Children were able to ask questions during this live interactive session.

We are grateful to station personnel for their support and helpfulness during our second field season on this project. Randy Jones and Carly Quisenberry provided efficient and prompt assistance in support of research. Rosemary McGuire and TR Tepper-Rasmussen were especially helpful supporting our boating needs. We also thank our volunteers in the field who helped with our major collecting days after Rick, Josh, and Natalie headed north.

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

On February 5th, the ARSV *Laurence M. Gould* concluded its successful LTER cruise and made a brief one day visit to Palmer Station with C-013-L team members Darren Roberts and Megan Roberts aboard. In addition to a week of intense data collection while camped on Avian Island, the C-013-L cruise team also succeeded in reaching the Adélie penguin colony on Charcot Island. Due to perpetual ice at this latitude, Charcot is difficult to reach in the best of years and C-013-L personnel had not successfully assessed these colonies since January 2013. On February 18th, the *Gould* returned to Palmer station and delivered Donna Patterson-Fraser just in time for giant petrel chick banding. Welcome back Donna.

Back in the Palmer Station area, Adélie penguin studies concluded 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, fledgling measurements, and diet studies on Biscoe Island and in the Joubin Islands were conducted in February and will continue through March.

Adélie penguin fledglings preparing to depart Humble Island. *Image Credit: Fraser Group*

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 continued throughout February as did the monitoring of the blue-eyed shag colony on Cormorant Island. Kelp Gull surveys and chick counts were also completed for local islands. In addition to our typical ARGOS satellite tag deployments on giant petrels, we also began deployment of archival GPS tags. Initial results were very encouraging and we will continue deployments into March. Growth measurements of giant petrel chicks on Humble Island continued every other day during February and will continue until chick fledging.

As always, ASC provided outstanding science support this month. Special thanks to all the ASC and grantee field volunteers that assisted with Adélie fledgling measurements; to Lab Supervisor Randy Jones for coordinating the volunteer schedule; to all those involved with making our Joubin Island trips safe and successful and once again a special thanks to Resident Marine Technicians Michael Tepper-Rasmussen and Rosemary McGuire Rosemary for all the boating assistance.

C-019-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCES PELAGIC ECOSYSTEM, PHYTOPLANKTON COMPONENT

Dr. Oscar Schofield, Principal Investigator, Rutgers University, Institute for Earth, Ocean, and Atmospheric Sciences, Department of Marine and Coastal Sciences

Personnel on station: Mike Brown, Colette Feehan, and Schuyler Nardelli

This month we welcomed on station Schuyler Nardelli, a PhD student at Rutgers University supervised by Dr. Oscar Schofield, who replaced Nicole Waite.

Our bi-weekly sampling continued successfully throughout the month. At Station B, depth integrated chlorophyll concentrations peaked on February 9th, almost tripling the values seen in earlier months, before declining back to low levels (~1 mg m^{-3}) for the remainder of the month (Fig. 3a). This pattern was matched for depth integrated primary production (Fig. 4b). At Station E, depth integrated chlorophyll concentrations remained steady around 1.25 mg m^{-3}, similar to what was observed during January (Fig. 3b). Depth integrated primary production reached its seasonal peak of ~70 mg C m^{-2} day^{-1} in early February, then slowly declined to nearly zero by the end of the month (Fig. 4b). Sampling for HPLC pigment analysis also occurred regularly. In addition, we were kept busy this month processing the 450 chlorophyll samples from the January 2017 LTER cruise.

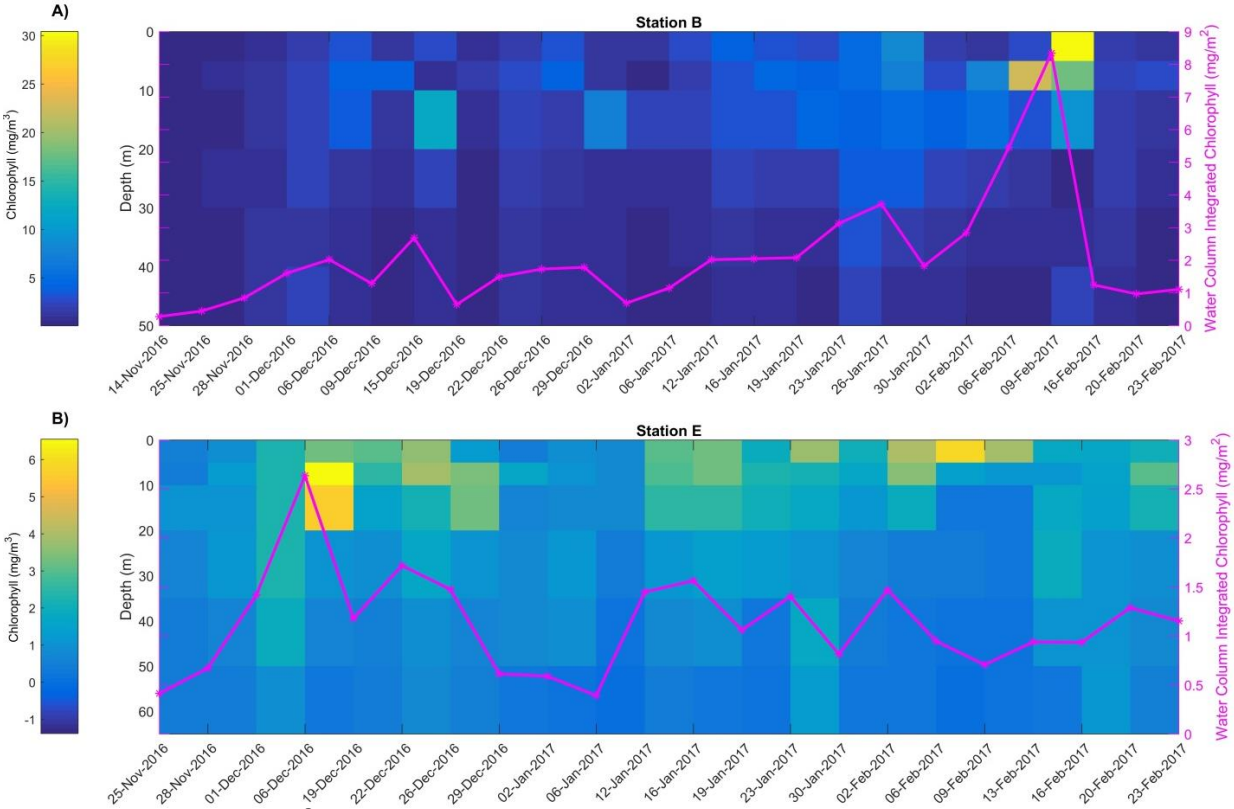


Fig. 3 – Chlorophyll (mg m^{-3}) at Stations B (a) and Station E (b) throughout the water column throughout the season from Nov 14, 2016 through Feb 23, 2017 are shown using a color bar (note color bar scales are different). Water-column integrated chlorophyll concentrations (mg m^{-3}) are shown as a pink line (note y-axis scales are different).

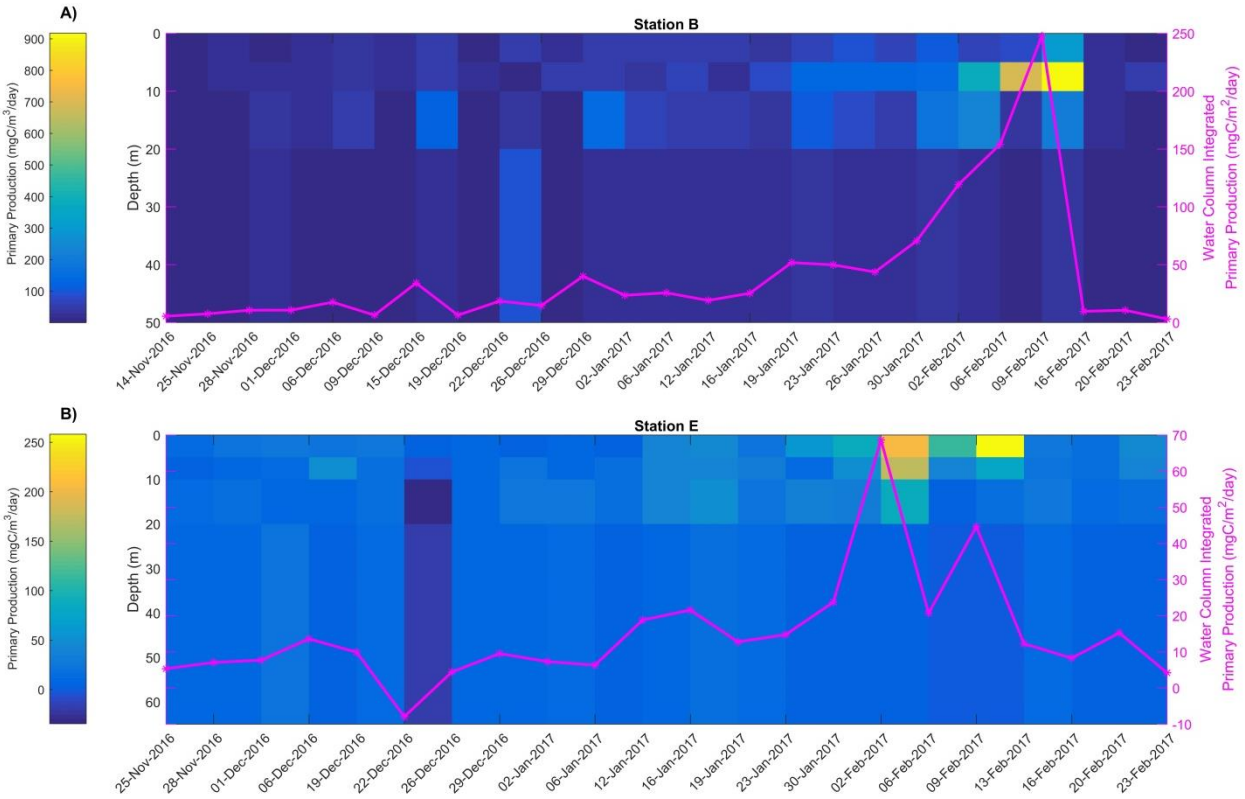


Fig. 4 – Primary Production (mg C m^{-3} day^{-1}) at Stations B (a) and Station E (b) throughout the water column throughout the season from Nov 14, 2016 through Feb 23, 2017 are shown using a color bar (note color bar scales are different). Water-column integrated primary production values (mg C m^{-2} day^{-1}) are shown as a pink line (note y-axis scales are different).

Additional work this month included a second successful run of Mike's incubation experiment examining the impact of glacial meltwater on phytoplankton community composition (Figs. 5 and 6).

Fig. 5 – Incubation experiment setup in a large, round, outside aquarium tank.

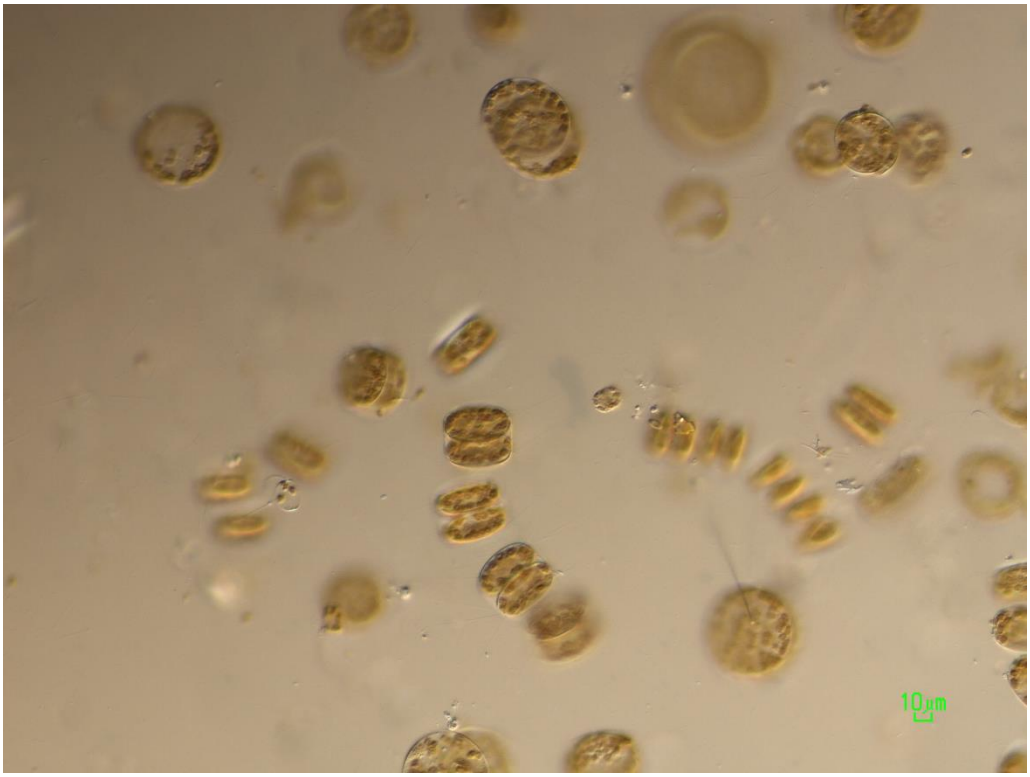


Fig. 6 – Microscope image of healthy diatoms from the incubation experiment (credit: Colette Feehan).

Many thanks to ASC and science members who made running the incubation experiment possible! We are also grateful to the ASC staff for fixing technical difficulties allowing our bi-weekly sampling to proceed smoothly.

C-024-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT, WHALE COMPONENT

Dr. Ari Friedlaender, Principal Investigator, Oregon State University, Newport, OR

Personnel on Station: Logan Pallin and James Fahlbusch

For the month of February, the 'Whale Researchers' (James Fahlbusch and Logan Pallin) stationed at Palmer as part of the LTER project have continued our two primary projects that involve humpback whale photo ID/biopsy sampling and acoustic-based prey mapping. Our two additional whalers on the ARSV *Laurence M. Gould* (Dr. Dave Johnston and Julian Dale), completed their research missions aboard the *Gould* and departed back to the US in early February. In total they collected some 7,000 images from their Unmanned Aircraft System (UAS) flights that now await processing. This month we have spent a total of ~210 hours on the water surveying and to date, James and Logan have collected 77 skin blubber biopsy samples, of which 72 are humpback and 5 are minke whales. Never before has our group encountered so many minke whales at Palmer Station; a total of 11 this month. These samples will be used for genetic and hormone analyses to assess changes in baleen whale population demography. Of these 72 humpback whales, we have been able to collect 59 high quality fluke photos that will be used for further photo identification (Fig. 7). As you can see from the fluke image in Fig. 7, the pigmentation of these flukes can often change due to anthropogenic or predatory interactions, making further identification challenging. The linear parallel scars on the left fluke blade are signs of killer whale predation, or what we call "rake marks." Additionally, we can also do photo

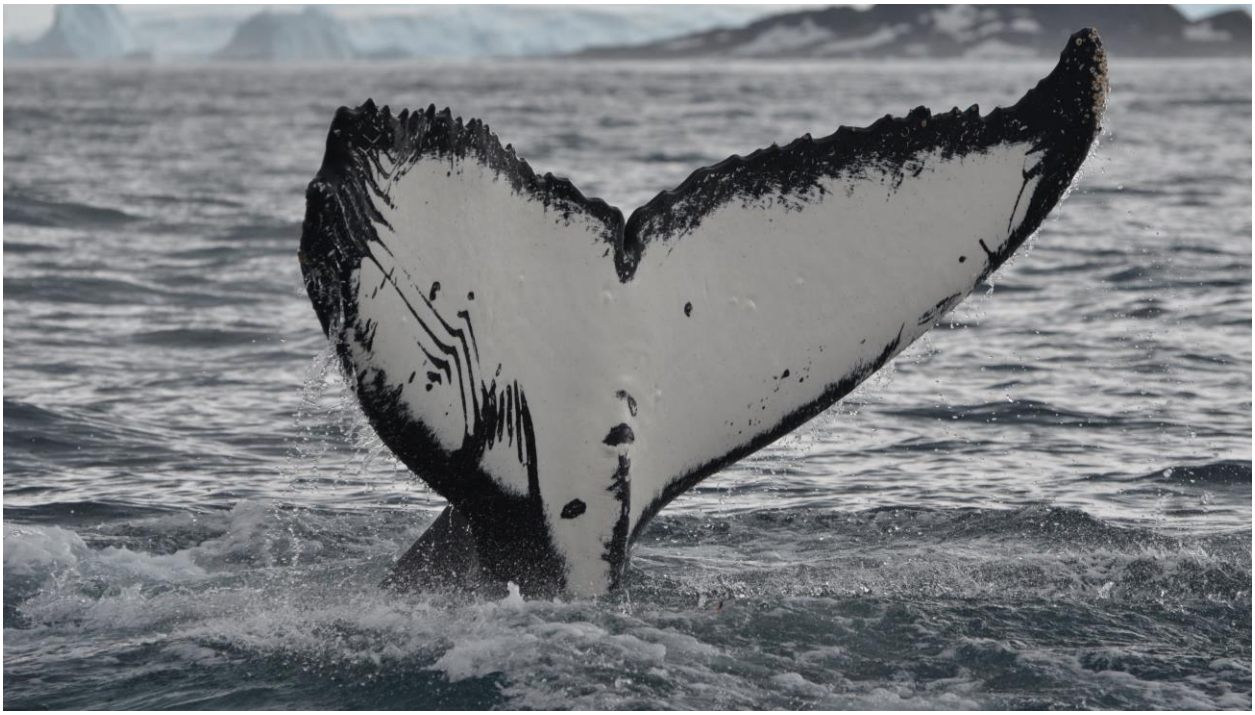


Fig. 7 – Fluke photo of humpback whale Mn17_044B-P.

identification for minke whales by assessing and comparing the geometric make up and scarring of the dorsal fins (Fig. 8). This process is often conducted in a computer program to make identification a lot more consistent.

Fig. 8 – Photo-identification image of Antarctic minke whale encountered near Shortcut Island.

The 'Whale Researchers' also encountered a group of 15-20 killer whales (ecotype little Bs), which resulted in around 200 photographs sent to colleagues at the Southwest Fisheries Science Center NOAA, in La Jolla, CA for identification purposes (Fig 9). Like the minke whales, we can identify killer whales using their dorsal fins, as well as the scarring and pigmentation on and around the saddle area near the base of the dorsal fin. Additionally, notice how sexually dimorphic the male's dorsal fin is compared to the other juvenile and female killer whales in Fig. 9. Research from our colleagues in La Jolla has documented at least 4 distinctly different-looking forms of killer whales, referred to as ecotypes A, B, C, and D. Interestingly enough, these several ecotypes appear to display distinct prey specialization on minke whales, ice seals, and fish.

Fig. 9 – Photo-identification images of ecotype little B killer whales encountered in the Palmer Station boating area. Notice the male in the background with the larger dorsal fin.

Fig. 10 – Surface lunge feeding events of humpback whales.

In addition to whale surveys, we completed 16 active acoustic surveys this month to understand krill variability over time in the Palmer area. Whale numbers have slowed down a bit over the last couple of weeks, as it appears the local krill biomass comes and goes roughly every 5-7 days. Again this month, we found that krill patches were sparsely distributed, but often extremely dense when encountered. We also observed several surface feeding events of humpbacks this month (Fig. 10). On a trip where we accompanied the Birders to Humble Island, we encountered a pair of Antarctic fur seals, one of which appeared to have developed leucism (Fig. 11). Leucism is a condition in which there is a loss in the pigmentation in an individual

Fig. 11 – Two Antarctic fur seals encountered on Humble Island.

resulting in a pale/white coloration of the hair. Finally, we both contributed to and benefitted from collaborative assistance with other LTER projects operating at Palmer; the collaboration between and among the projects was evident and helpful and we would like to thank all those who have helped guide us to whales in the area.

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: Adrian Jaycox and Leigh West

February marks the last full month of C-045-P's season, with only two sample days remaining in March – our shortest sampling season since 2008. The weather was great this month, and we didn't have to delay sampling due to winds or ice at all. Our instruments were less cooperative; our CTD (conductivity, temperature, and depth) ECO-Rosette malfunctioned midway through the month and we were unable to reprogram it properly. Palmer Station's all-star Instrument Technician and electrician, Carly Quisenberry and Mike Stevenson, were able to get it running again in less than a week, but this meant that the Schofield and Ducklow groups got a taste of sampling Bruiser-style with seven Go-Flo bottles hung on the winch line and triggered with messengers. A couple of weeks later, difficulties with a Landing Craft engine prevented us from sampling on the last day in February. As often happens in life, however, the bad was balanced by the good, and we were lucky enough to have two minke whales join us out at Station E (Fig. 12).

Fig. 12 – A minke whale spyhopping near the landing craft as C-045-P and C-019-P members sample.

We continued to collect consistent bacterial production data. The production rate of bacterial populations at Stations B and E initially continued its upward trend, reaching its highest rate so far this season on February 9th, then decreased dramatically towards the end of February (Fig 13). It appears that bacteria and phytoplankton abundance followed similar trends to the bacterial production data, increasing over the course of the season and declining again during the last few sampling days. We regret not being able to follow these late season trends as in past sampling years.

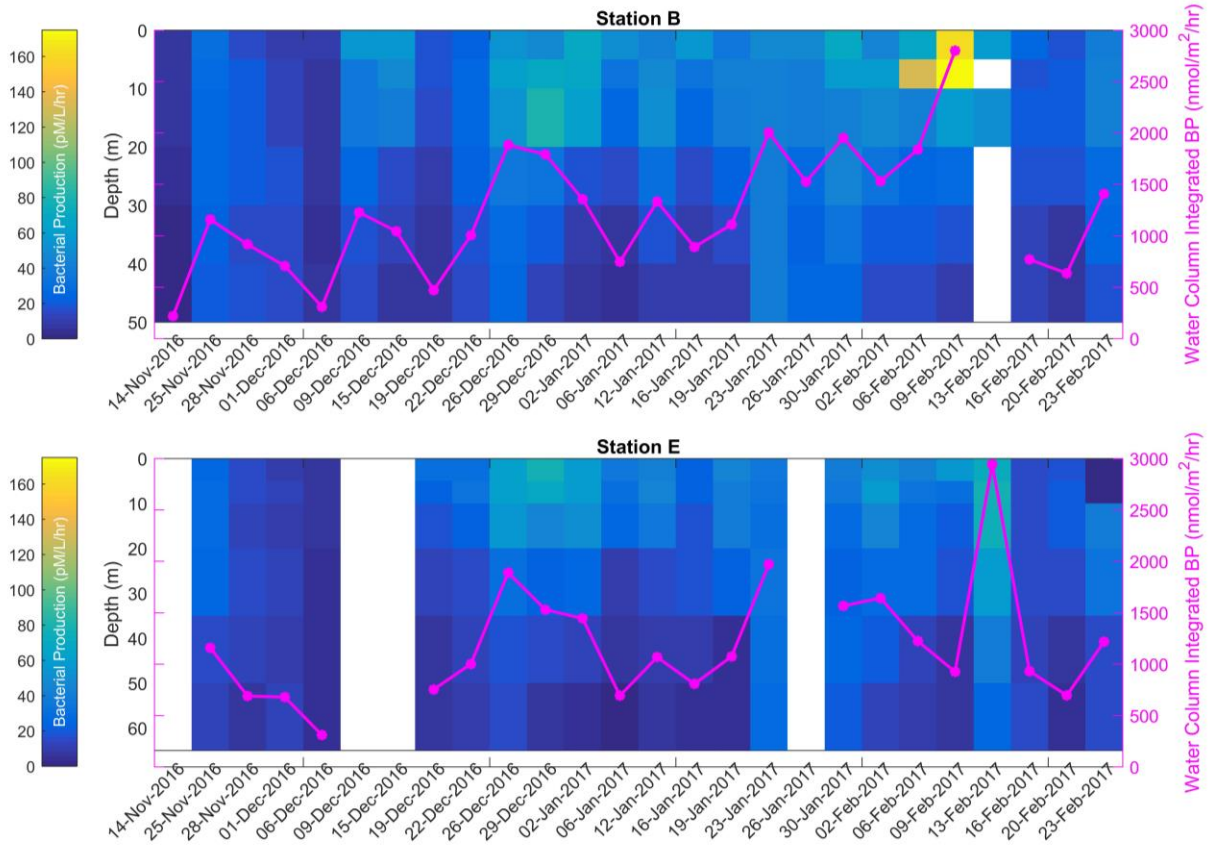
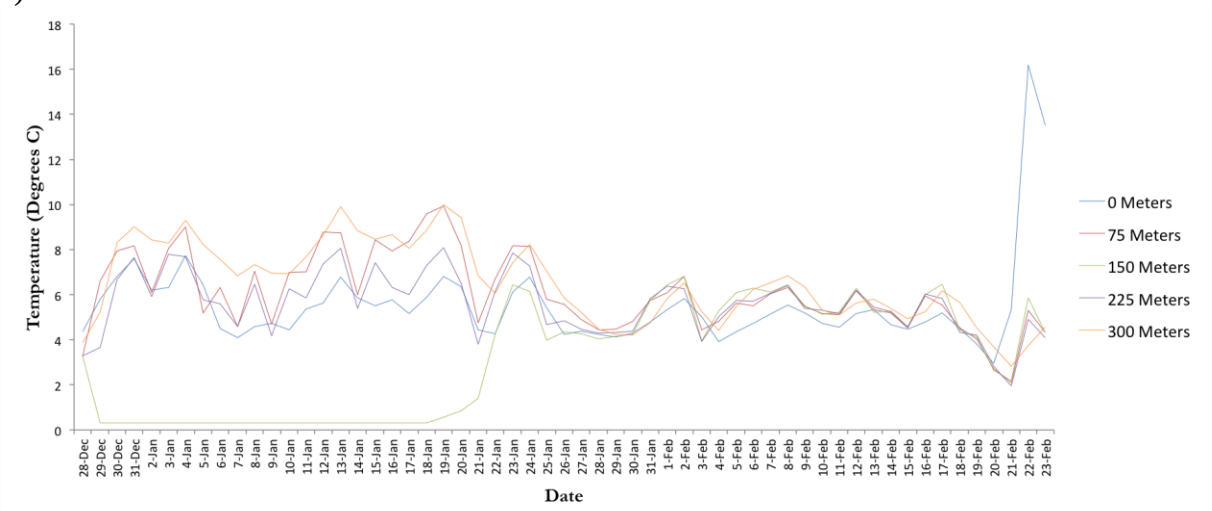


Fig. 13 – Bacterial production, as measured by leucine incorporation (pM L^{-1} hr^{-1}) as shown using a color bar and integrated across seven different depths (nmol m^{-2} hr^{-1}) as shown using a pink line at Stations B and E between November 14st, 2016 and February 23rd, 2017.

Towards the end of February, we uploaded data from the soil temperature loggers our group has deployed in Palmer's 'backyard' for the last couple of years. The loggers were buried in a few centimeters of soil at varying distances from the glacier. Temperatures fluctuated during the summer, generally decreasing between late December and late February (Fig. 14a). The soil temperatures also follow a clear diurnal cycle, peaking in mid to late afternoon (Fig. 14b).

a)



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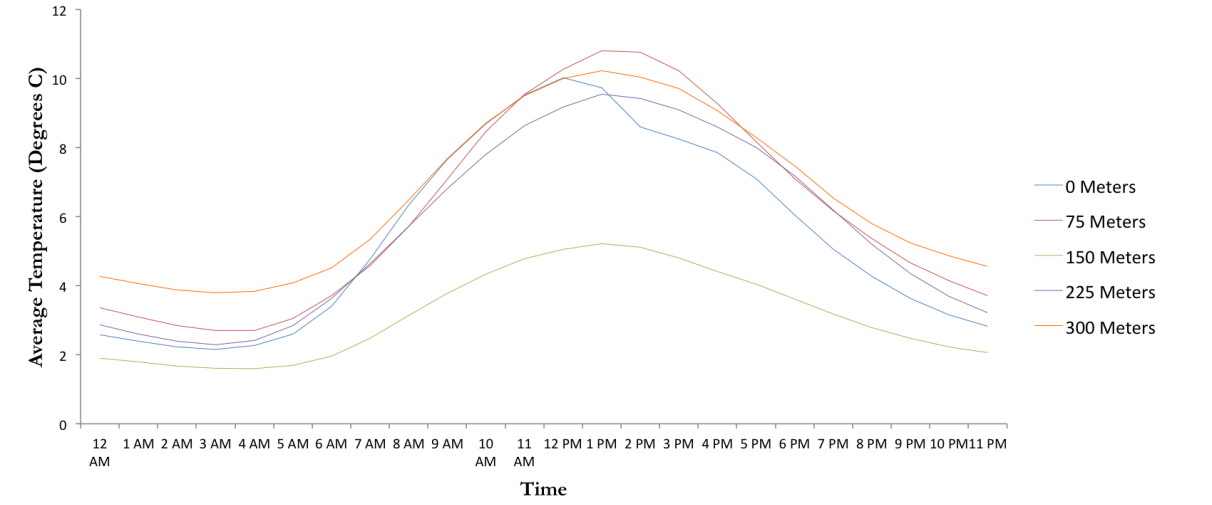

Fig. 14 – Data from the iButton soil temperature loggers deployed in Palmer's backyard at 0, 75, 150, 225, and 300 meters from the glacier toe, showing average daily temperature ((a); between 12/28/2016 and 2/23/2017) and average hourly temperature (b).

During the last few days of the month, we began preparation for the end of the season. We can't believe that our time at Palmer is drawing to a close. Thanks to everyone for a safe successful PAL field season!

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
February 2017
Liz Widen

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.

B-005-P's CODAR project has concluded. The group was on station to disassemble the Terra Lab computers and transmitters/receivers on the three islands. The removal went well and was very thorough.

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/ELF system has operated well throughout the month. Several hard drives were switched in and out as requested by the group.

A-119-P: DEVELOPMENT OF ANTARCTIC GRAVITY WAVE IMAGER

Michael Taylor, Principal Investigator, Utah State University

The Gravity Wave Imager takes images of the night sky in the near infrared, observing the dynamics of the upper atmosphere. The camera takes one 20-s exposure image every 30s of a very faint emission originating from a layer located at ~55 miles of altitude.

The system was started this month. It has successfully been running with the occasional minor glitch in the software.

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 though 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 was operational all month.

A-373-P: TROPOSPHERE-IONOSPHERE COUPLING VIA ATMOSPHERIC GRAVITY WAVES
Vadym Paznukhov, Principal Investigator, Boston College

The goal of this project is to enhance the comprehensive research understanding of troposphere-ionosphere coupling via Atmospheric Gravity Waves (AGWs) in the Antarctic region. Both experimental and modeling efforts will be used on the Antarctic Peninsula to investigate the efficiency and main characteristics of such coupling and will address several questions remaining in the current understanding of this coupling process.

The system operated well throughout the month. The group visited station and a new GPS antenna was installed.

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 computer system has been operating normally all month.

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 interannual 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 Research Associate collects samples fortnightly from Terra Lab.

Air samples were taken twice this month.

C-019-P members deploying the PRR as MT Rosemary McGuire operates the Landing Craft.
Image Credit: Ducklow Group

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.

CCGG samples were taken regularly and HATS air samples were taken twice this 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 290 nm up to 605 nm, 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 operated normally throughout the month.

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.

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 well 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.

The Terascan system worked well throughout the month.

T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE COMPREHENSIVE NUCLEAR TEST BAN TREATY ORGANIZATION (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. The annual changing of filter rolls, barcode tape, and sealing tape was completed.

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.

Observations of sea ice around station were made daily and the tide gauge worked well throughout the month. The Tide Prediction calculator was successfully updated and corrected.

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 once per 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 local weather station (PAWS) is working well.