PALMER STATION MONTHLY SCIENCE REPORT

JANUARY 2018

Midnight moonrise (31 Jan) with Arthur Harbor full of brash ice. *Image Credit: Randy Jones*

NEWS FROM THE LAB
Randy Jones, Summer Laboratory Supervisor

The start of the month saw the arrival of the ARSV *Laurence M. Gould* for the annual LTER month-long cruise along the Peninsula. The ship brought a few more additions to the science community, including the Friedlaender (C-024-P) whale research team. That brought our number of science groups up to six from five. The six presented their research work during a Laboratory Open House at the end of the month to the wider Palmer community, which was attended by a crowd of ASC staff and fellow grantees. Those six groups have been very busy with field excursions across the standard boating area waters and islands, including extended trips to the

Palmer Canyon area, the Joubin Islands, Dream and Biscoe Islands, and areas slightly to the west and east of the standard boating limits. Much of the work has been supported by the two RHIBs (RHIBs *Rigil* and *Hadar*) with superb efforts and support provided by the Marine Technicians.

The increased presence of icebergs, growlers, and strands of brash ice signals the height of the summer season, as warm temperatures heighten glacier calving activity in the region. The month overall was a stormy one, with increased precipitation and wind speeds. The occasional blue-sky sunny day was well received on Station with grantees taking advantage of the fair weather windows. By the end of the month, we were starting to observe some dark sky conditions again late in the night (clouds seem to have obscured the stars generally).

JANUARY 2018 WEATHER
Marissa Goerke, Research Associate

Palmer Monthly Met summary for January, 2018

Temperature
Average: 1.8 °C / 35.2 °F
Maximum: 6.6 °C / 43.88 °F on 8 Jan 17:35
Minimum: -2.2 °C / 28.04 °F on 5 Jan 03:45
Air Pressure
Average: 981.6 mb
Maximum: 997.2 mb on 8 Jan 09:30
Minimum: 965.8 mb on 21 Jan 12:39
Wind
Average: 6.4 knots / 7.4 mph
Peak (5 Sec Gust): 50 knots / 58 mph on 24 Jan 16:09 from NNE (13 deg)
Prevailing Direction for Month: ESE
Surface
Total Rainfall: 55.1 mm / 2.17 in
Total Snowfall: 0 cm / 0 in
Greatest Depth at Snow Stake: 5.8 cm / 2.3 in
WMO Sea Ice Observation: Only ice of land origin is visible, 1-5 bergs with growlers and bergy bits.
Average Sea Surface Temperature: 1.24 °C / 34.2 °F

Winds peaked at 50 mph on the 24th and the average speed for the month was 6.4 mph. The prevailing wind direction for the month was from the east south east. Temperatures warmed to a peak of 43 °F and reached a low of 28 °F. Snow pack diminished by 3 cm (1.2 inches) leaving no measurable snow remaining. The glacier has been actively calving and only ice of land origin remains in the area.

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, Ben Philip, Leslie Potts, Nick Teets, and Yuta Kawarasaki

Nick Teets, Yuta Kawarasaki, and Ben Philip joined J.D. Gantz and Leslie Potts at Palmer Station on January 3, 2018. We had many successful days of field collections this month and have been using these specimens for a variety of different projects, including an ecological assessment of how habitat affects midge abundance and physiological assays to determine how short-term exposure to environmental stresses affects overall stress tolerance. These experiments, in addition to the samples we are sending home for genetic analysis, will complement our previous studies of population structure and gene flow among islands and adaptive genetic variation in diverse larval microhabitats.

Our team is continuing to use an educational outreach website called "A Fly on the Pole" (www.aflyonthepole.com), which was set up in January 2017 by Natalie Ylizarde. This website features an interactive blog, photo and video galleries, and a variety of educational resources for K-12 teachers. The website continues to be updated by the educator on our team, Leslie Potts.

We are grateful to station personnel for their continued support and helpfulness. Everyone here has been tremendous in supporting our needs. We would like to particularly thank Chuck Kimball for helping us with our communications needs and Mark Mican and KC Loosemore for keeping us well fed. We would also like to thank our volunteers who have helped us collect insects for our studies.

Lee (B-256-P) grantees collecting *Belgica* on Dream Island. *Image credit: Ross Nichols*

C-013-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCED PELAGIC ECOSYSTEM – APEX PREDATOR COMPONENT

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

Personnel on station: Ben Cook, Shawn Farry, Donna Fraser, Carrie McAtee

The arrival of Donna Fraser and LTER cruise participants Darren and Megan Roberts in early January briefly increased C-013 personnel at Palmer Station to six. However, on January 5th Darren Roberts and Megan Roberts departed on the annual LTER cruise leaving four birders at Palmer Station for the remainder of January.

Despite wet and windy weather conditions throughout most of January we were able to conduct boating field work on 28 days this month. Monitoring of Adélie, gentoo, and chinstrap penguin breeding chronology continued this month with indicator colony counts as well as an all-colony chick census on local islands as well as on Dream and Biscoe Islands. Adélie chick measurements also occurred in conjunction with our LTER cruise team's measurements on Avian Island. Foraging ecology studies of Adélie and gentoo penguins continued this month with the deployment of presence/absence radio transmitters, satellite transmitters, GPS tags, and dive depth recorders. In addition to tag deployments on Adélie penguins on Torgersen and Humble Islands and gentoo penguins on Biscoe Island, we deployed satellite tags, GPS tags, and dive depth recorders on gentoo penguins in the Joubin Islands. We also began diet sampling Adélie penguins on Torgersen Island, and gentoo penguins on Biscoe Island and in the Joubin Islands.

Adélie penguin pair with chicks (adult on right with satellite tag). *Image credit: Fraser group*

Skua work continued this month documenting hatches and monitoring chick growth of brown skuas on local islands as well as on Dream and Biscoe Islands, and south polar skuas on Shortcut Island. Monitoring of the blue-eyed shag colony on Cormorant Island also continued this month. In January we also began deploying GPS tags on giant petrels (Fig. 1) and completed our local island giant petrel census and banding project that was initiated in December. Our annual Humble Island giant petrel study also began in January which closely records petrel chick survival and growth from hatching through fledging.

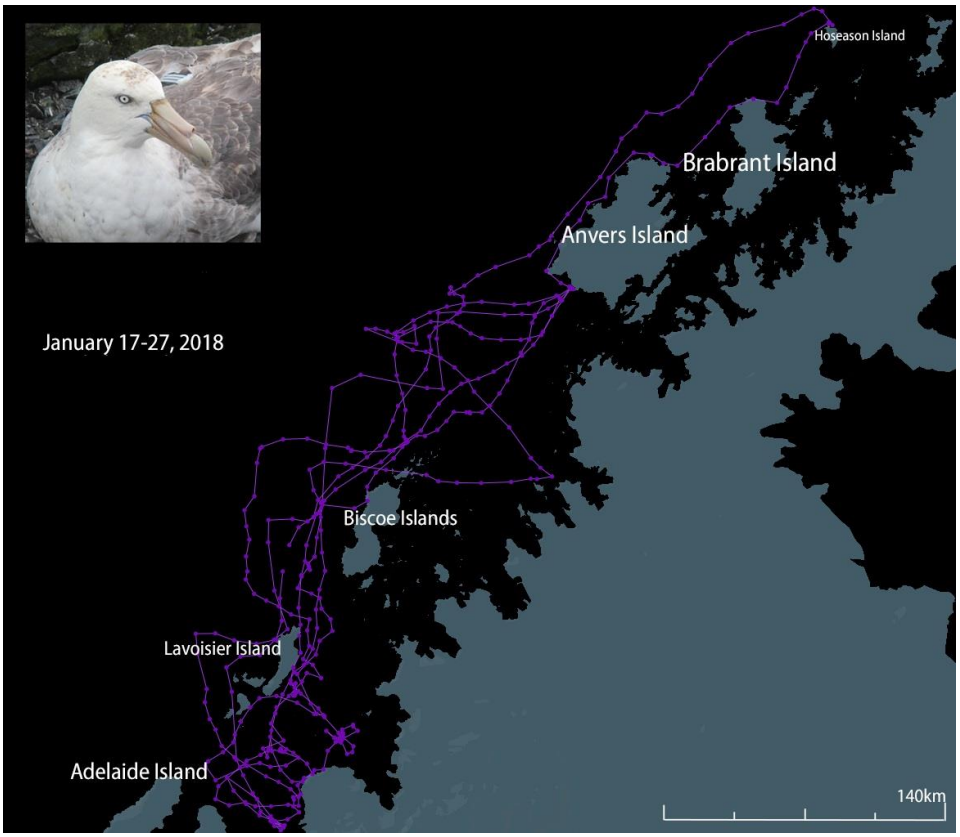


Fig. 1 – GPS tag track of 10-day giant petrel foraging trip (purple line).

Brown Skua chicks

Giant Petrel adult and chick *Image Credits: Fraser group*

Monitoring of marine mammals continued in January with increasing numbers of molting elephant seals as well as the return of Antarctic fur seals to the Palmer area. Lab work this month was dominated by penguin diet sample processing.

January was a busy month for C-013 and our field work was only possible due to the efforts and dedication of ASC personnel. Special thanks to Palmer Station Marine Technicians Dave Moore, Jakob Bueche, and Michael Burns for keeping us the water.

C-019-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCED 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: Frank McQuarrie and Schuyler Nardelli

The Schofield lab had a very productive January! Biweekly sampling continued successfully through the month. Both chlorophyll and primary production values remained low compared to previous months this season (Fig. 2), and decreased over the course of January. From the first half to the second half of the month, chlorophyll decreased from an average of 1.5 mg m^{-3} to 0.7 mg m^{-3}, and primary production decreased from an average of 23 mg C m^{-2} day^{-1} to 15 C m^{-2} day^{-1}.

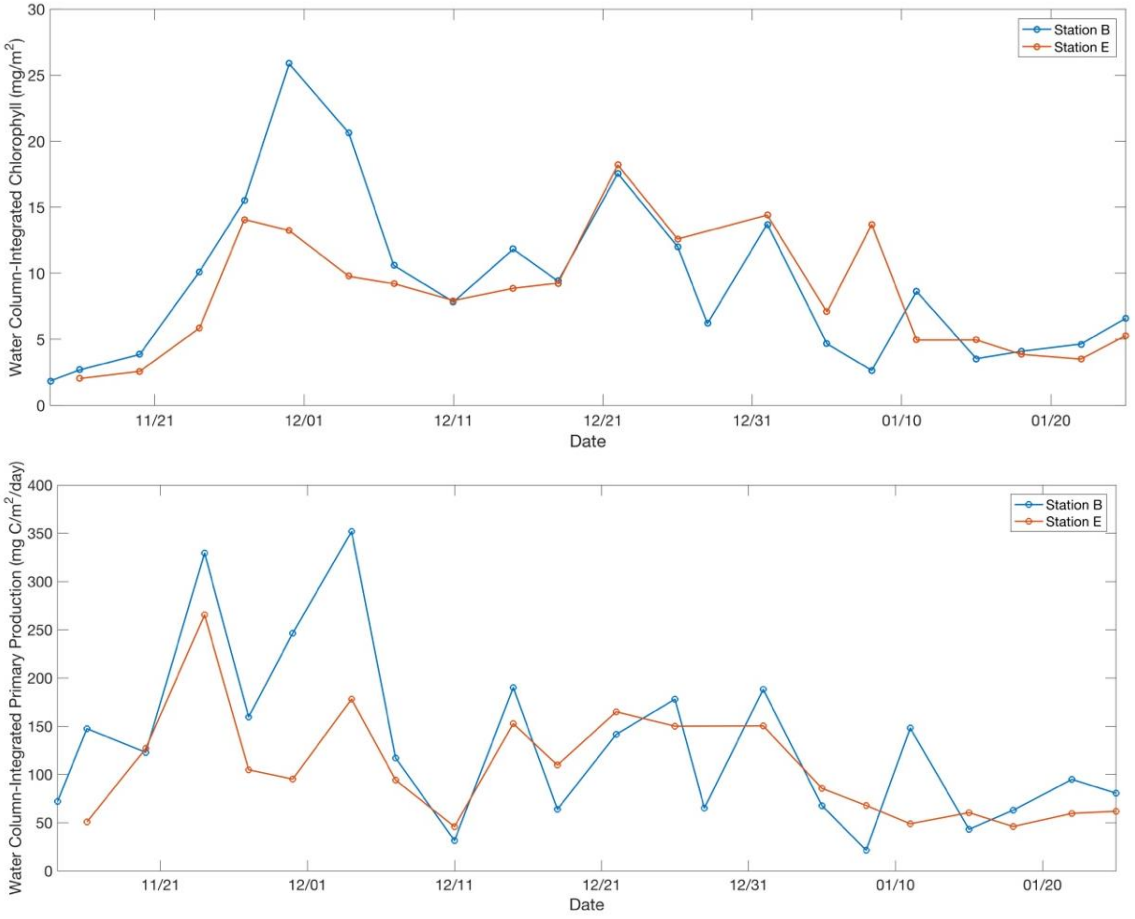


Fig. 2 – Water column-integrated chlorophyll (mg m^{-2}; top) and primary productivity (mg C m^{-2} day^{-1}; bottom), sampled biweekly at Station B (blue line) and Station E (orange line) from November 14, 2017 to January 25, 2018.

The two gliders deployed in December, RU25 and RU26, both completed successful missions this month. RU25 traveled south to the British Rothera Research Station, where it was retrieved on January 19th by members of our lab aboard the ARSV *Laurence M. Gould* for the annual January Palmer Long Term Ecological Research (LTER) research cruise. RU26 traveled north to

the South Shetland Islands, then circled back and returned to Palmer Station where it was recovered on January 29th. Both were equipped with instruments measuring depth, temperature (Fig. 3), salinity, chlorophyll, backscatter, and colored dissolved organic matter (CDOM). The Schofield lab will use the data collected by these two gliders to increase our understanding of phytoplankton dynamics over the entire Western Antarctic Peninsula.

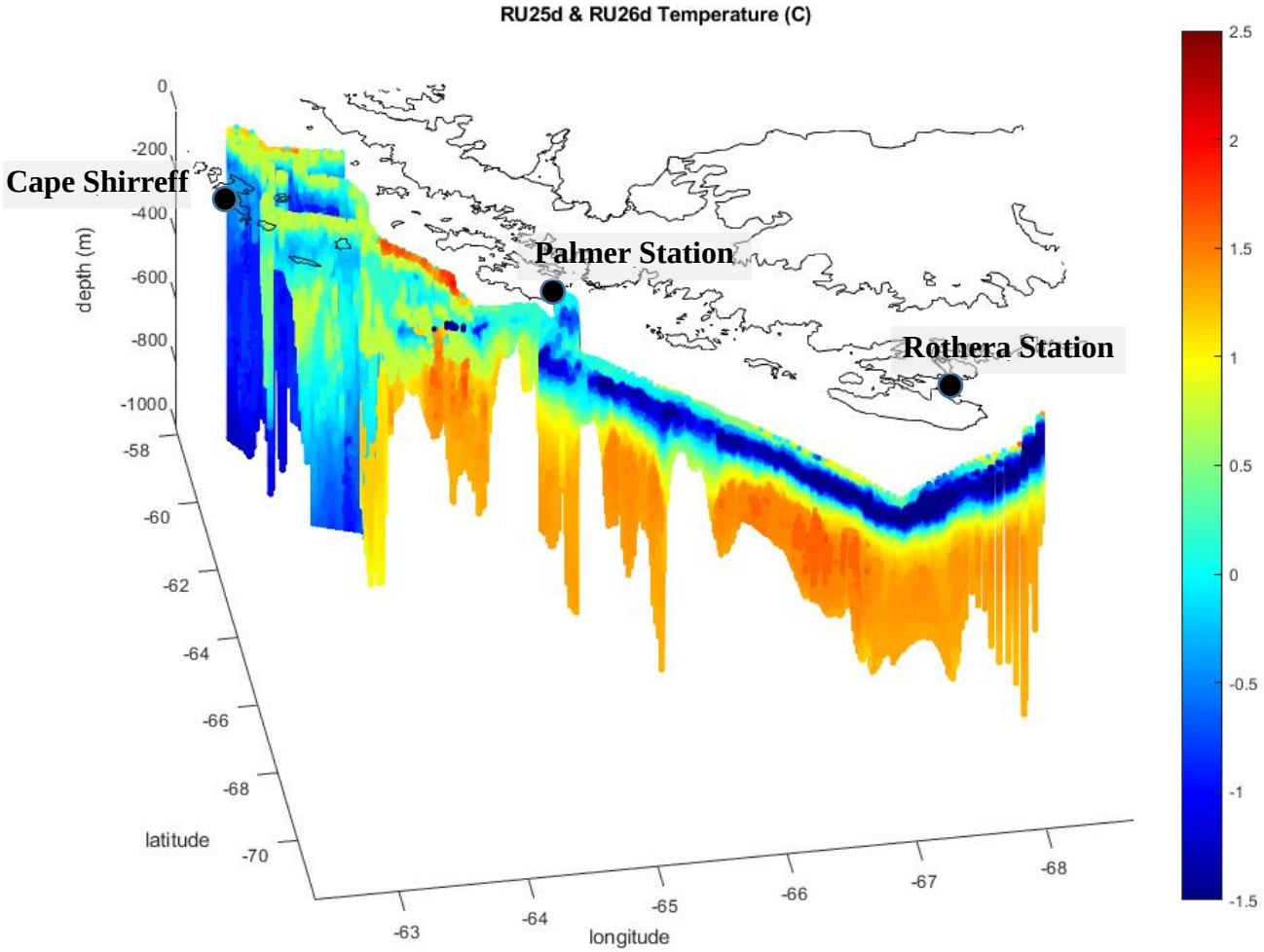


Fig. 3 – Temperature (°C) measurements taken by both gliders along their routes south to Rothera Research Station (RU25), and north to the South Shetland Islands (RU26; figure courtesy of Clinton Haldeman).

Schuyler Nardelli's transect studies also continued this month, with five more outings to collect acoustic and optical data. Additionally, the Schofield lab is collaborating with the Steinberg zooplankton lab (C-020-P), the Ducklow bacteria lab (C-045-P), and the Friedlander marine mammal lab (C-024-P) to study krill swarm ecological dynamics both in the Palmer boating limits and out into Palmer Deep Canyon. December 29th and January 4th were spent inside the boating limits aboard RHIB *Rigil*, mapping large krill swarms with an EK80 echosounder, collecting net tows to characterize krill size and abundance, and collecting water inside and outside of krill swarms to distinguish differences in phytoplankton biomass, phytoplankton species composition, phytosynthetic efficiency, and bacterial production. On January 19th, thanks to the extended ranges available with the new RHIBs, the four groups traveled out to the head of the Palmer Deep Canyon to conduct the same study on a larger scale. For more information, see C-020-P's write-up below.

Thank you to ASC for all their support this month. A special thank you to the marine technicians for continually going above and beyond to facilitate our sampling aboard the new RHIBs, and to the few volunteers that have sacrificed their time to come help us out in the field!

C-020-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCED PELAGIC ECOSYSTEM – ZOOPLANKTON COMPONENT

Dr. Deborah Steinberg, Principal Investigator, Virginia Institute of Marine Science, College of William & Mary

Field personnel: Jack Conroy and Leigh West

We have continued biweekly net sampling at LTER Stations B and E. Copepods from the family Clausocalanidae have replaced *Calanoides acutus* and *Rhincalanus gigas* as the most abundant large copepods. The Antarctic krill *Euphausia superba* and the sea snail *Limacina helicina* continue to dominate the macrozooplankton community. Shifts in their length distributions throughout the season suggest growth by *L. helicina* and *E. superba* individuals (Fig. 4). The addition of a second transducer to RHIB *Rigil*'s hull-mounted echosounder system is providing

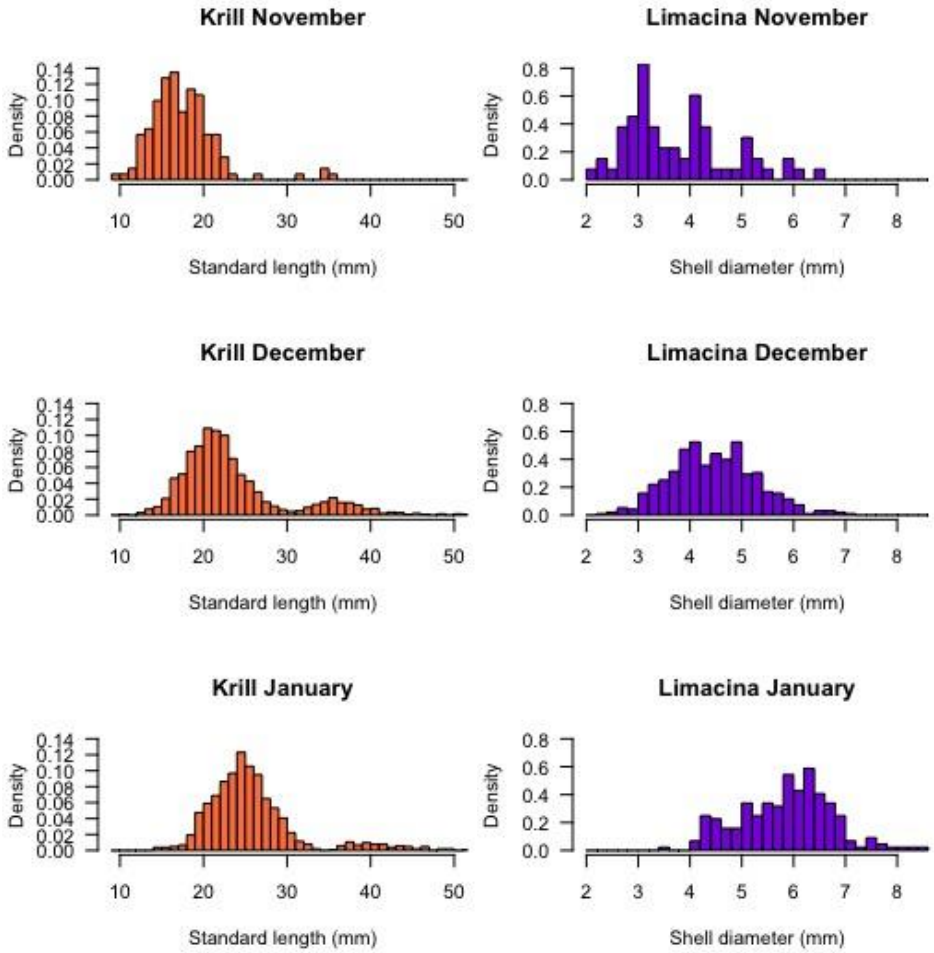


Fig. 4 – Histograms of *E. superba* standard length (mm; left column) and *L. helicina* shell diameter (mm; right column) by month.

information on the structure and composition of plankton patches. Thanks to Friedlaender (C-024-P) for collaborating on this work.

Our net tows serendipitously sampled abundant krill fecal pellets in January. These fecal pellets are known to dominate vertical particle flux and carbon export locally and regionally. Fecal pellets were abundant in tows even when krill were absent.

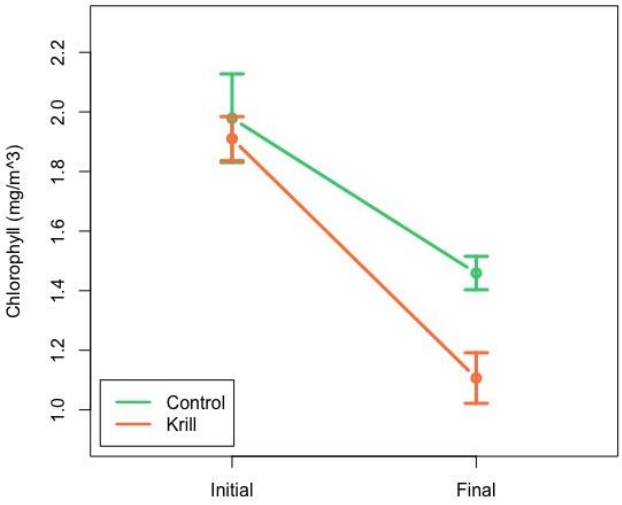


Fig. 5 – Mean +/- standard Error chlorophyll concentrations (control, green line; krill, orange line) from krill feeding experiment.

A feeding selectivity experiment early in the month, demonstrated *E. superba*'s grazing impact. Unlike in earlier experiments, the chlorophyll concentration also declined in our control treatment, suggesting high rates of microzooplankton grazing relative to phytoplankton growth (Fig. 5).

A second experiment late in the month was carried out to test the impact of ultraviolet radiation (UVR) on lipid peroxidation and to assess implications on krill feeding. This collaboration with Drs. Ben Van Mooy and Jamie Collins (B-032-P) began when they were at Palmer Station earlier in the field season. A rare sunny day provided the perfect opportunity for UVR-mediated lipid peroxidation (Fig. 6). Krill were then incubated in water that had been exposed to UVR and water that had been shielded from UVR. Subsequent lipidome analysis will reveal the impact of UVR-mediated lipid peroxidation on krill feeding efficiency.

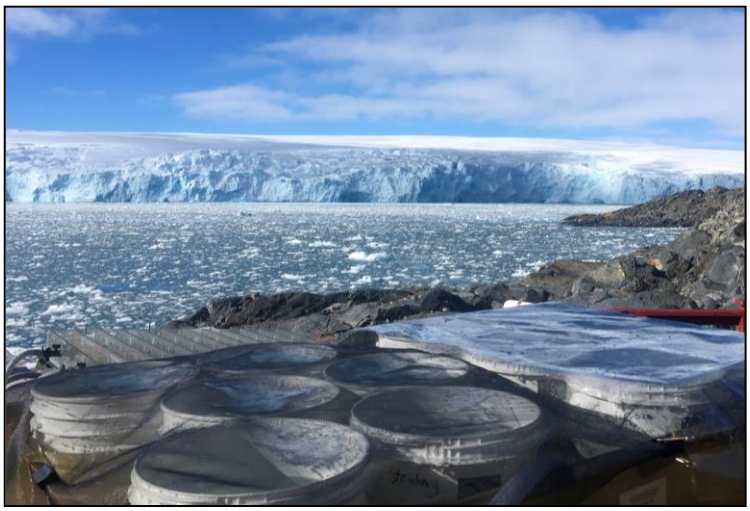


Fig. 6 – Buckets for UVR-mediated lipid peroxidation treatment study.

Two more days of surveying krill aggregations resulted from a collaboration among C-020, C-019, C-045, and C-024. Early in the month, we did our second trip within the Palmer boating area and successfully collected water in and out of three aggregations using the ECO rosette. All aggregations were mapped with the scientific echosounder and animals were collected to determine krill grazing rate. On January 19th, we took RHIB *Rigil* beyond the standard boating limits to conduct science operations in the head of the Palmer Deep Canyon for the first time. We surveyed a krill swarm that was over 1.5 miles long and 1 mile wide along the southern canyon wall (Fig. 7). This finding supports previous studies that have suggested elevated krill abundance in the Palmer Deep. Thank you to the Palmer Station marine, science, communications, and management staff who supported this exciting step in the LTER program's research!

Special thanks to Leigh West, who is heading home in early February. She is vital to our lab's success this first full season at Palmer, and it has been a joy working together.

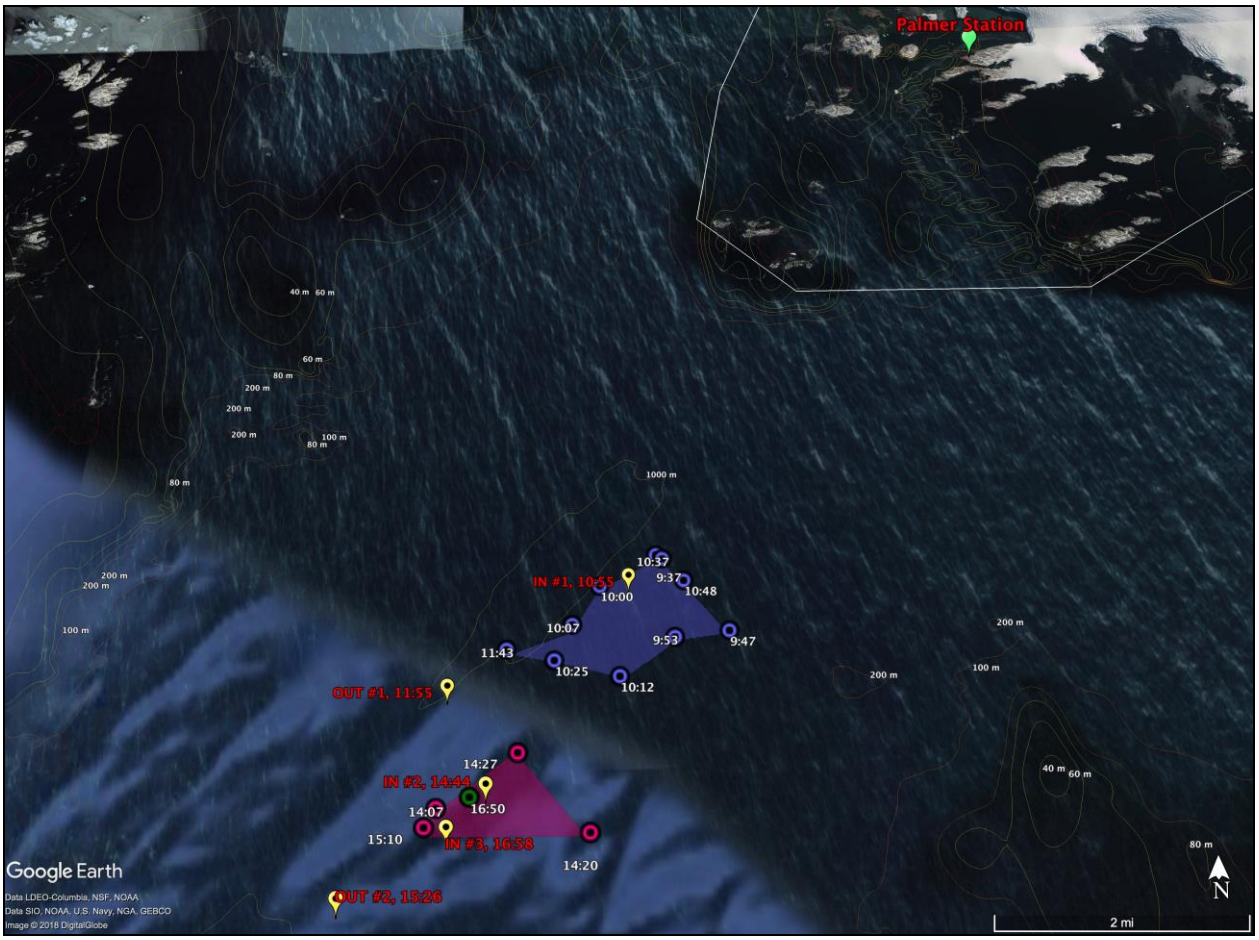


Fig. 7 – Blue polygon is the first survey of the krill swarm. Red polygon is a second, less comprehensive survey as the swarm moved southwest. Yellow markers represent locations of CTD casts. Note Palmer Station in top-right and local islands for scale.

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: Greg Larsen and Ross Nichols

For the month of January, the whale researchers (Greg Larsen and Ross Nichols) stationed at Palmer as part of the LTER, have continued our two primary projects that involve humpback and minke whale photo identification, biopsy sampling, and sonar prey mapping. Our two additional whalers on the ARSV *Laurence M. Gould* (Drs. Doug Nowacek and Julian Dale; C-024-L), have also been collecting biopsy samples, as well as using unmanned aerial vehicles (UAVs) to image whales from above to assess body condition. Compared to previous years, we have seen higher numbers of whales than were seen in 2017 and in 2016. Additionally, we have generally noted variable periods of krill biomass from our prey-mapping surveys between days, fluctuating in concentration and depth. These seasonal differences might reflect actual changes to the distributions and habitat uses of both whale species—a potential result of variable annual sea ice

conditions. This month we have spent a total of 110 hours on the water surveying and to date, Greg Larsen and Ross Nichols have surveyed a total of 70 humpback whales. We have been able to collect high quality fluke photos for 62 of these that will be used for further photo identification. Of those 62 humpback whales, 10 skin blubber biopsy samples have been collected that will be used for genetic and hormone analyses to assess changes in humpback whale population demography. Of these 62 whales, so far, we have been able to identify one individual that was sampled last year (Mn18_008A-P and Mn17_030A_P). This individual was identified using our fluke/dorsal photo identification database by matching scar patterns, coloration, shape, and other distinguishable characteristics of the fluke and dorsal fins. A skin and blubber biopsy was taken from this individual, allowing for hormonal analysis across the resample timespan (Fig. 8).

Fig. 8 – Resighted humpback whale seen and sampled on Jan. 30, 2017 (left; Mn17_00A-P) and resighted/resampled on Jan. 8, 2018 (right; Mn18_008A_P), identified using our fluke photo identification catalog.

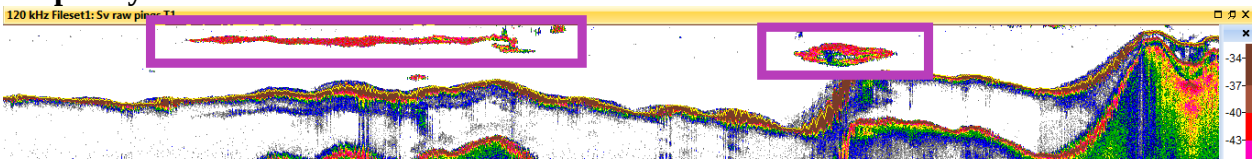
The whaler researchers have encountered 3 minke whales this season, and have collected a single biopsy sample with an associated dorsal fin identification photo. This data will contribute genetic and hormone analysis to the Antarctic minke whale population around the Western Antarctic Peninsula. Other research teams at Palmer Station have reported 2 additional sightings of minke whales, though each encounter has been brief. Minke whales are known for their ability to maneuver and swim underneath the ice, and demonstrate illusive and highly variable swimming behaviors, making them difficult to survey and sample.

We have encountered humpback whales of all major demographic classes, with the most common age-class being adults, followed by seven mother–calf pairs, and at least one solitary juvenile. Most whales have been observed foraging on krill patches. We have also observed whales transiting, resting, and/or playing in-place. These behaviors are distinguishable by the pace of the whale's movements (slowest when resting), and the consistency of direction during movement (straighter when transiting, more variable during foraging). So far we have found mostly solitary and paired whales, although we just recently encountered our largest group of four whales. We expect to encounter larger congregations more commonly in the late summer months. Our group has benefitted from whale sighting reports from the other field teams at Palmer, and we have incorporated into our dataset high-quality fluke photos that other researchers have collected during whale encounters in our absence.

In addition to whale surveys, we completed ten active acoustic surveys this month to understand krill variability over time in the Palmer area, as well as an additional three opportunistic surveys around groups of feeding whales. Opportunistic surveys around feeding whales are important as we are able to assess the field (quantity and biomass of prey) that the whales are utilizing which

becomes significant when we begin to look at presence and absence of these animals over time. Overall we found that krill patches were sparsely distributed. We have mostly observed krill aggregations occurring between 50 and 100 meters, or at the surface in the first 25m. When we found krill aggregated at the surface, whales tended to engage in surface lunge or bubble net feeding, something first observed last year. While conducting our opportunistic krill surveys, we were able to prey map within these feeding groups and pick up the concentrated biomass of krill on the echograms (Fig. 9).

Deep Prey Patches:



Shallow Prey Patch:

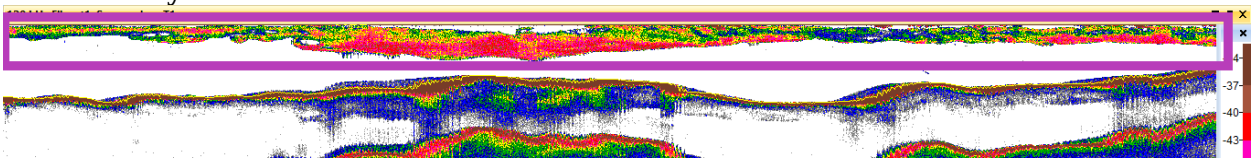


Fig. 9 – Example outputs from 120 kHz echosounder surveys. Rectangular purple boxes indicate krill aggregations (deep prey patches, upper panel; shallow prey patches, lower panel) found at varying depths as measured on the 120 kHz transducer.

This year we have also begun collecting sets of potential identification photographs of leopard seals as they are found hauled out in the boating area. These photograph sets are collected as we boat in a circular orbit around the hauled out seal, photographing the animal from all possible angles. From the visible surfaces of the seal, we are able to note distinctive scars and spot patterns (Fig. 10) that can be used to match the individual to future photograph sets. Such identification can inform our understanding of leopard seal population size, behavior and habitat use near Palmer Station, and provides infrastructure for future research that might involve these individuals.

Fig. 10 – Example catalog photograph for leopard seal photo identification. Unique freckling, (here, at sinistral neck and shoulder), and distinctive scars (here, at sinistral and dorsal abdomen) can facilitate future identification and potential resighting of this individual at Palmer Station and other Antarctic study sites.

C-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCED PELAGIC ECOSYSTEM – MICROBIAL / BIOGEOCHEMICAL COMPONENT

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

Personnel on Station: Anna Wright and Marie Zahn

January started off with the arrival of the ARSV *Laurence M. Gould* for the annual LTER cruise. Our cruise counterparts aboard the *Gould* are utilizing the flow cytometer, so for the duration of the cruise we have been preserving samples from Stations B and E with 10% paraformaldehyde for later analysis. Other than this change, all other lab practices were standard.

Patterns observed in bacterial production rates with the ^{3}H-Leucine protocol are as expected for this time of year. There has been a slow rise in bacterial activity throughout the season with some higher values in January. Generally, values this year are lower than previous years. Similarly, the Schofield lab reported lower primary productivity (^{14}C) results, which could corroborate our lower bacterial activity results.

It was an exciting month for collaborative research by the LTER team at Palmer Station. The addition of the RHIBs this year has brought new opportunities for innovative projects. This month, a new project emerged from collaborative work with Jack Conroy (C-020-P) and Schuyler Nardelli (C-019-P) to look at bacterial production inside and around krill swarms in Palmer Canyon.

For sampling in a swarm, we used the backscatter from a RHIB hull-mounted EK80 echosounder to identify and find a center point in a potential krill swarm and select a depth (typically 20m) in the middle of its depth profile. Generally, the swarm was at a depth of about 10-30m. For outside–swarm controls, we tried to sample ahead of the swarm where it was traveling to as opposed to where it had been. We did five CTD-sampling casts inside and outside the swarm (Fig. 7). To see what it was like above and below the swarm, we sampled water from 5m, 20m, and 50m. After mapping out the region, we believe the two krill swarms we sampled were actually the same swarm that had moved southwest and it appeared to be at least 1.5 miles across, 1 mile long, and 15m thick (Fig. 7). As expected, bacterial growth rates appeared to be higher inside krill swarm and lower outside; the values were also lower above and below the swarm than in the swarm (Fig. 11). We hope to make another trip out to Palmer Canyon this season to collect more data and continue with this project.

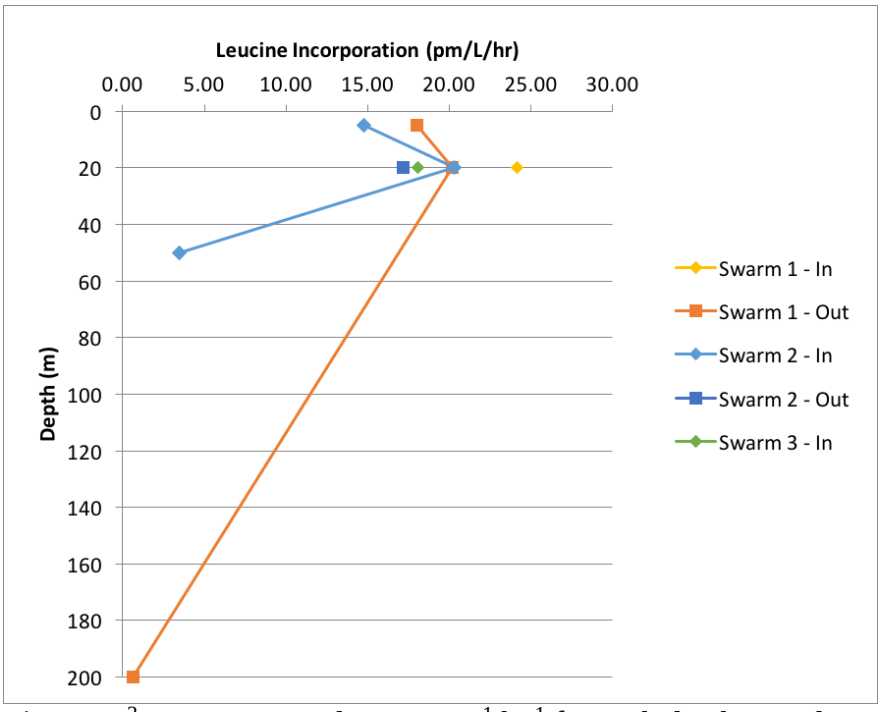


Fig. 11 – ^{3}H-Leucine results in pm L^{-1} hr^{-1} for each depth in and around krill swarms.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
January 2018
Marissa Goerke

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

Andrew Gerrard, Principal Investigator, New Jersey Institute of Technology

The ionosphere-thermosphere-magnetosphere (ITM) region of Earth's atmosphere, which is part of the larger geospace environment, is the portal through which the solar wind can enter and impact our planetary system. Though space weather research over the past decades has greatly increased our understanding of a wide variety of phenomena associated with ITM physics, the sum of these individual processes occurring in the geospace environment does not replicate the rich diversity and scope of this complex region. Thus, a more holistic approach to ITM research is necessary, one that integrates clustered instrumentation at multiple locations to simultaneously look at the interactions within the entire system. Using coordinated and collaborative instrumentation currently installed in Antarctica, researchers will study interrelated ITM phenomena observed at high latitudes. The goal of this research effort is a better understanding of the energy transfer and modulation of the geospace system.

The system operated normally throughout the month.

A-119-P: CONTINENTAL-SCALE STUDIES OF MESOSPHERIC DYNAMICS USING THE ANTARCTIC GRAVITY WAVE INSTRUMENT NETWORK (ANGWIN)

Michael Taylor, Principal Investigator, Utah State University

The Antarctic Gravity Wave Imaging Network (ANGWIN) is a cooperative effort of six international Antarctic programs to collect continent-wide gravity wave measurements. This network capitalizes on existing optical and radar measurement capabilities at McMurdo, Palmer, South Pole, and six other research stations: Halley (UK), Syowa (Japan), Davis (Australia), Rothera (UK), and Ferraz (Brazil). Infrared (IR) all-sky mesospheric OH (hydroxyl) imagers are installed at Davis, McMurdo, and Halley stations. The network quantifies the properties, variability, and momentum fluxes of short-period (less than one hour) mesospheric gravity waves and their dominant sources and effects over the Antarctic continent. An all-sky near-IR imager is also installed at Palmer Station to augment the existing instrumentation and create a capability for studying gravity wave properties at each site.

The IR camera has been shut down for the remainder of the summer season due to a lack of dark sky conditions.

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 instrument rack was efficiently relocated to make room for the new Terra Lab Uninterrupted Power Supply. The system was shut down for about 15 minutes and was brought back online smoothly.

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 operated normally until November 22, 2017 when the TeraScan system was upgraded and the two systems became incompatible. The AMRC data ingestor will remain down until further notice.

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.

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 once a week in favorable winds and HATS Air samples were taken every other week.

The Torgersen Island Adélie Penguin colony. *Image Credit: Randy Jones*

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 operated normally throughout the month. Bi-weekly calibrations were completed as necessary.

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.

The system operated normally 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.

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.

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 and emailed to the National Weather Service for entry into the Global Telecommunications System.

The local weather station (PAWS) is working well. The Joubins temperature sensor is down and preparations are being made to resolve the issue. The removal of the old system (Palmos) from Gamage Point is almost complete. Observations are archived on the AMRC website: ftp://amrc.ssec.wisc.edu/pub/palmer/.