PALMER STATION MONTHLY SCIENCE REPORT

FEBRUARY 2014

Peatlands dominated by *Sanionia* (two wetland basins on the center-left) and eroded moss peat banks dominated by *Polytrichum* (foreground) as observed and sampled by the G-094-P (Yu) team near Rasmussen Point on Mainland Antarctic Peninsula**.** *(Image Credit: Zicheng Yu)*

NEWS FROM THE LAB
By Carolyn Lipke, Assistant Supervisor of Laboratory Operations

The *ARSV Laurence M. Gould* (LMG) made several port calls at Palmer Station this month. The LMG14-02 cruise included an offshore sampling component of the O-176 (Corbett) project, as well as terrestrial sampling for the G-094 (Yu) group. The glacier face in Arthur Harbor has been frequently calving this month, and we think a new island near Amsler Island is getting very close to separating from Anvers Island. February also included visits from several cruise ships.

Adélie penguin chicks fledged this month, and we noticed an increase in fur seal numbers in the area. The nights here are again dark, and the weather has taken a down turn, reminding us that the end of the summer season is fast approaching.

FEBRUARY 2014 WEATHER
By Glenn Grant, Research Associate

The mild, dry weather of January turned into a wet, stormy February. The Peninsula was battered by storm systems throughout the month, with very little let-up. The average temperature was 0.9 C (34 F), more than a degree below the historical average of 2.0 C (36 F). The high temperature for the month was 4.9 C (41 F), and the low was -3.6 (26 F). The low temperature set a new record low for February (the previous low was -3.3 C), and continues the generally cooler temperatures seen during the past year.

The average wind speed was 9 knots. The strongest gust was 58 knots on the 13th, however gusts around 50 knots occurred on several other dates. Precipitation was fairly typical for February, most of it falling (or blowing sideways) as rain mixed with snow. Total melted precipitation was a soggy 54.1 mm, with 12 cm of new snowfall, and a maximum accumulated depth at the snow stake of 5 cm, all of which melted off within a few hours.

No sea ice was observed. Ice of land origin, swaths of brash ice and bergy bits, and the occasional ice berg, were a constant throughout the month. Sea water temperatures, measured at Palmer's pier, mostly ranged between 0 and 2 C.

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

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

Personnel on station: Kim Bernard, Josh Kohut, Dominique Paxton, and Hank Statscewich

During February our research focused on the 50 km acoustic survey for krill. We were able to complete 7 full surveys during this period, capturing two semi-diurnal tides and one diurnal tide. Unfortunately, bad weather conditions prevalent towards the end of February prevented us from surveying during the second diurnal tide. Interestingly, whereas krill biomass was elevated during January (see Figure 1A below), there was a marked decline in biomass in early February (Figure 1B). This coincided with a decrease in the number of foraging top predators observed during our surveys. The lowest krill biomass we have recorded to date (including the last two summer seasons) was observed in February (see Figure 2).

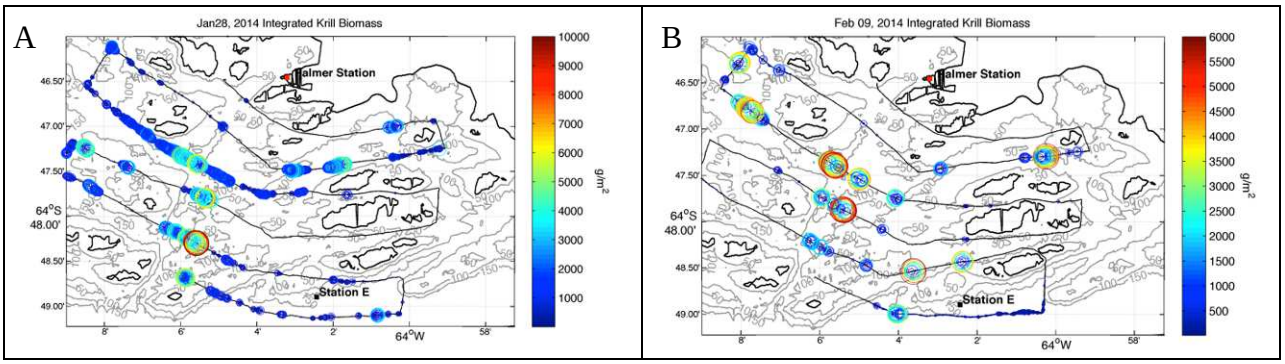


Figure 1. *Integrated krill biomass during two diurnal tides, A) January 28 and B) February 09. Note the range on the color scale bar is different for each figure, indicating the decrease in maximum biomass on February 09. Color and size of the symbol (open circle) indicate krill biomass.*

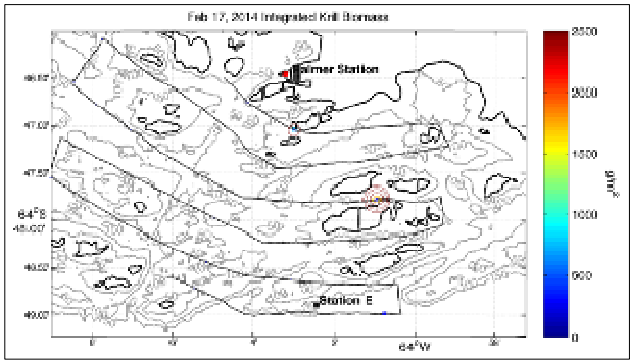


Figure 2. *Lowest integrated krill biomass was recorded on February 17, during a semi-diurnal tide. Only two small aggregations were encountered, one between Shortcut and Eichorst Islands and another between Hermit and Christine Islands.*

During this summer season, the majority of krill aggregations were deep (>50 m) and often lying < 1 m above the sea floor. This meant that collecting krill samples for length frequency measurements was not possible. In the previous two summers, krill aggregations were typically within the top 20 m of the water column and were easy to catch from the zodiac with a plankton net. Fortunately, we have been able to use krill length frequency measurements collected in the vicinity of the Palmer Deep canyon from the *ARSV Laurence M. Gould* during the annual Palmer LTER cruise. However, a better method of catching krill in the nearshore from a zodiac would be preferential, as it would allow us to determine length frequencies of krill locally.

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

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

Personnel on station: Bill Fraser, Shawn Farry, Ben Cook, Carrie McAtee, Madison McConnell, Brett Pickering

On February 3rd the *ARSV Laurence M. Gould* (LMG) returned to Palmer Station with B-013 team members Brett Pickering and Carrie McAtee at the conclusion of the LTER cruise. On February 4th, Bill Fraser and Brett Pickering departed Palmer Station for the season aboard the LMG.

Adélie penguin studies were completed this month with beach counts and measurements of Adélie fledglings. Penguin foraging ecology studies were also concluded in February with the

completion of our Adélie penguin radio transmitter study on Humble Island and gentoo penguin satellite tag deployments and diet sampling on Biscoe Island.

Skua work continued with monitoring and banding of brown skua chicks on local islands as well as on Dream and Biscoe. South polar skua nesting peaked this month on Shortcut Island and in addition to adult band resighting and diet sample collections we began egg and chick monitoring and measurements. Monitoring of the blue-eyed shag colony on Cormorant Island concluded at the end of the month with the fledging of all chicks. Kelp Gull surveys and chick counts were also completed for local islands. Giant petrel chick banding began mid-month on all local islands 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 annual increases in fur seal numbers on many of the area islands and decreases in elephant seal numbers following the completion of molt.

ASC continued to provide great support this month with special thanks to Carolyn Lipke for coordinating the birder volunteer schedule and to the birder volunteers who helped us weigh and measure Adélie chicks during the fledging period.

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

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

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

In the first week of the month I spent some time breaking down the labs and putting away the supplies that were used onboard the *ARSV Laurence M. Gould* (LMG) by the two groups that processed samples for my project during the annual LTER cruise. Members of Hugh Ducklow's B-045-L group (Jamie Collins and Naomi Shelton) collected and filtered water for DNA at six stations across the LTER grid, as well as running ran additional flow cytometry at those stations. Oliver Ho, with Oscar Schofield's B-019 group, processed samples for microscopy at the same six stations, as well as some of the process stations. All LTER cruise samples will be shipped home with my Palmer Station samples for further processing and analysis.

Here on station, I had a very productive month and sampled twice weekly every week. Overall, I collected and processed 8 samples during the month, all from station B. I carried out my standard processing of each sample including filtering replicates for RNA and DNA, as well as preparation of samples for microscopy and flow cytometry (run by the B-045-P group). As mentioned in last month's report, Joanne Feldman (ASC support staff) has continued to provide invaluable support for the boating needs of my sampling activities.

I noticed less visible biomass on my filters, and more rapid filtration, suggesting the phytoplankton bloom observed from late December through most of January tapered off quite rapidly into February. However, we may be seeing a smaller, secondary bloom ramping up towards the end of the month. My samples are taking longer to filter, and my filters are darker in color. These observations are supported by CTD data from the B-019-P group (thanks to Nicole

Couto) that has shown chlorophyll maximum values doubling in the last week of the month, although not nearly to the levels seen in January. It will be interesting to see if the bloom can be sustained as the fall weather is moving in, and the daylight hours are rapidly dwindling.

As a break from my usual activities, I spent a day volunteering with the birders (B-013-P) to help weigh Adélie penguin fledglings on Humble Island. However, it just so happened that there were no fledglings to be found that day. Like a number of other things this season, this was an unexpected and unprecedented observation.

Near the end of the month, I presented a science lecture to those on station as well as people from the LMG that was docked at the time. This provided the motivation and opportunity to process some LTER data from this season for comparison to last season. It also inspired me to check some of my microscopy samples to determine that the dominant species in the phytoplankton bloom from this year appeared quite different to last year (see images below). This was not unexpected, because the physical conditions have been quite different, and microbial community indicators (e.g. primary production and bacterial production) are showing differing patterns between the two years. Because the two years have been so different, it will be very interesting to contrast the molecular data generated from this year's samples to the sequence data from last year.

Figure 1. *Microscopic images of the phytoplankton bloom from last season (Nov/Dec 2012). The bloom was dominated by very large diatoms, including abundant and diverse representatives of both pennate and centric species, with a higher abundance of centric-type cells.*

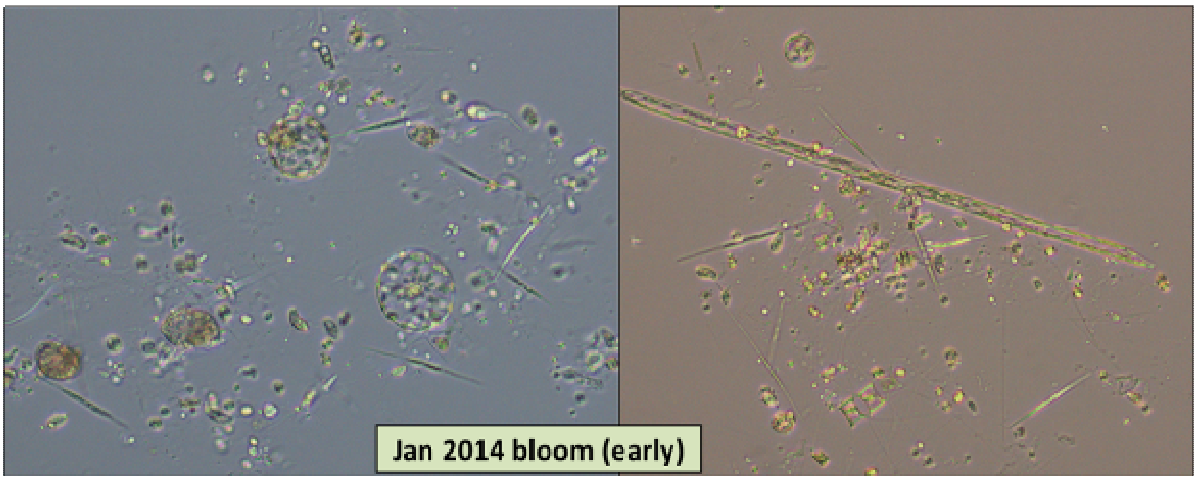


Figure 2. *Microscopic images of the early stages of the phytoplankton bloom from this season (early January 2014). The bloom contained relatively few large diatoms, with flagellate species being visibly more numerous. In addition, among diatoms, pennate species (especially the very small needle-like cells) significantly outnumbered the centric species.*

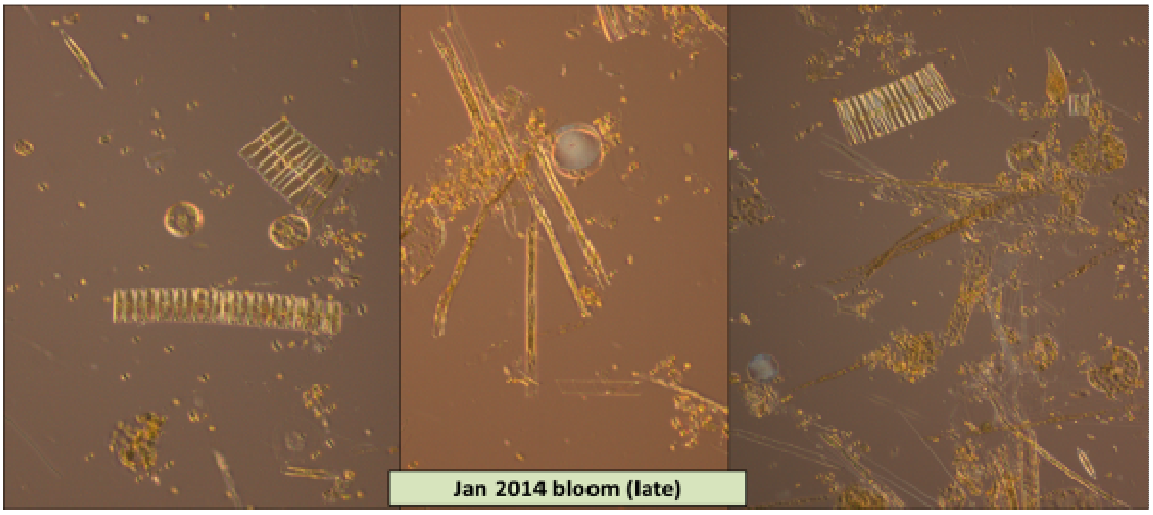


Figure 3. *Microscopic images of the later stages of the phytoplankton bloom from this season (mid-January 2014). The bloom still contained few large diatoms, and pennate species continued to dominate the diatom population. The small flagellate species have become even more numerous, and can be seen in both clumps (probably a sample preparation artifact) and as single cells throughout the fields of all three images.*

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

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

Personnel on station: Nicole Couto, Christina Haskins, and Austin Melillo

After the LTER cruise ended and returned to Palmer Station early in February, we bid farewell to Tina and Austin as they headed north with the *ARSV Laurence M. Gould* (LMG). Nicole moved onto station to finish up the rest of the sampling season.

February has seen an increase in the number of days with winds high enough to prevent boating, but the joint B-019 and B-045 team was able to get out to station B twice a week this month, and almost as often to station E. The strong winds this month were associated with a deepening pycnocline at station B, as seen in density data collected from the CTD (Fig. 1). During January, the water column had been getting more stratified, and discrete chlorophyll measurements showed high chlorophyll densities confined to the shrinking upper mixed layer. Chlorophyll measurements have been low this month; the last of the January bloom disappeared just as the winds picked up in the first week of February and deepened the pycnocline.

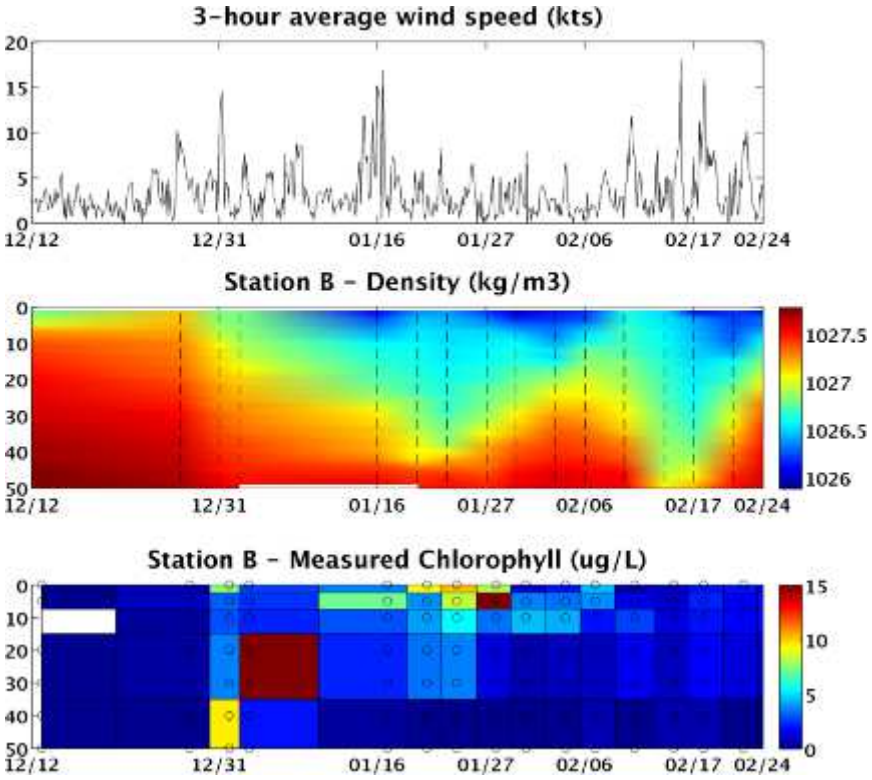


Figure 1. *Palmer Station wind speed, station B density and chlorophyll. Dotted lines and open circles denote dates and depths where samples were collected.*

We also deployed our shallow glider, RU01, for its third and final mission this season. The glider stayed out for a little over a week sampling the head of Palmer Deep Canyon (Fig. 2).

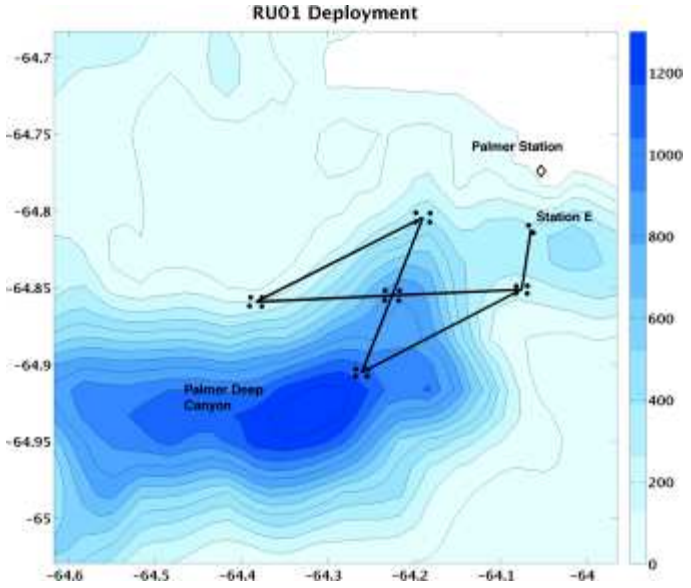


Figure 2. *Shallow glider track covered between Feb. 17th and Feb. 25th.*

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

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

Personnel on station: Fiona Jevon and Sebastian Vivancos

Collecting water at station E for B-045 and B-019. Water will be analyzed for chlorophyll, bacterial production, POC, DOC, nutrients, and flow cytometry.

February was another successful month of sampling for our group. It began with the return of the *ARSV Laurence M. Gould* (LMG) concluding the annual austral summer LTER cruise, and some exciting news: bacterial production rates in the water column over the LTER sampling grid were observed at levels higher than previously recorded in the past decade. Our preliminary analysis of the bacterial production this month indicates a decline following January's peak productivity bloom (Fig. 1).

This dataset supports the current logic that a late sea ice retreat will lead to a larger phytoplankton bloom accompanied by enhanced bacterial activity. We look forward to seeing how the carbon and nutrient cycles, namely dissolved and particulate organic carbon and nutrient concentrations, were affected by this intense bloom once the samples are analyzed back at Lamont-Doherty Earth Observatory in

the fall. Our sampling efforts with B-019-P will continue for another month until we move into fall here at Palmer Station and head home.

In addition to our regular sampling, we continue to collect additional water to filter for DNA analysis at 10m depth at station B each week, and collect water at both stations for $\delta^{18}O$ analysis by Dr. Mike Meredith of the British Antarctic Survey. We will be handing off these samples in early March. After receiving the flow cytometer from the LMG at the beginning of February, we were able to analyze the samples we had taken from stations B and E during the previous month. Preliminary analysis of this data shows similar patterns as the bacterial production data, and a more in-depth analysis will illuminate the community structure of the bacteria and phytoplankton in the water column.

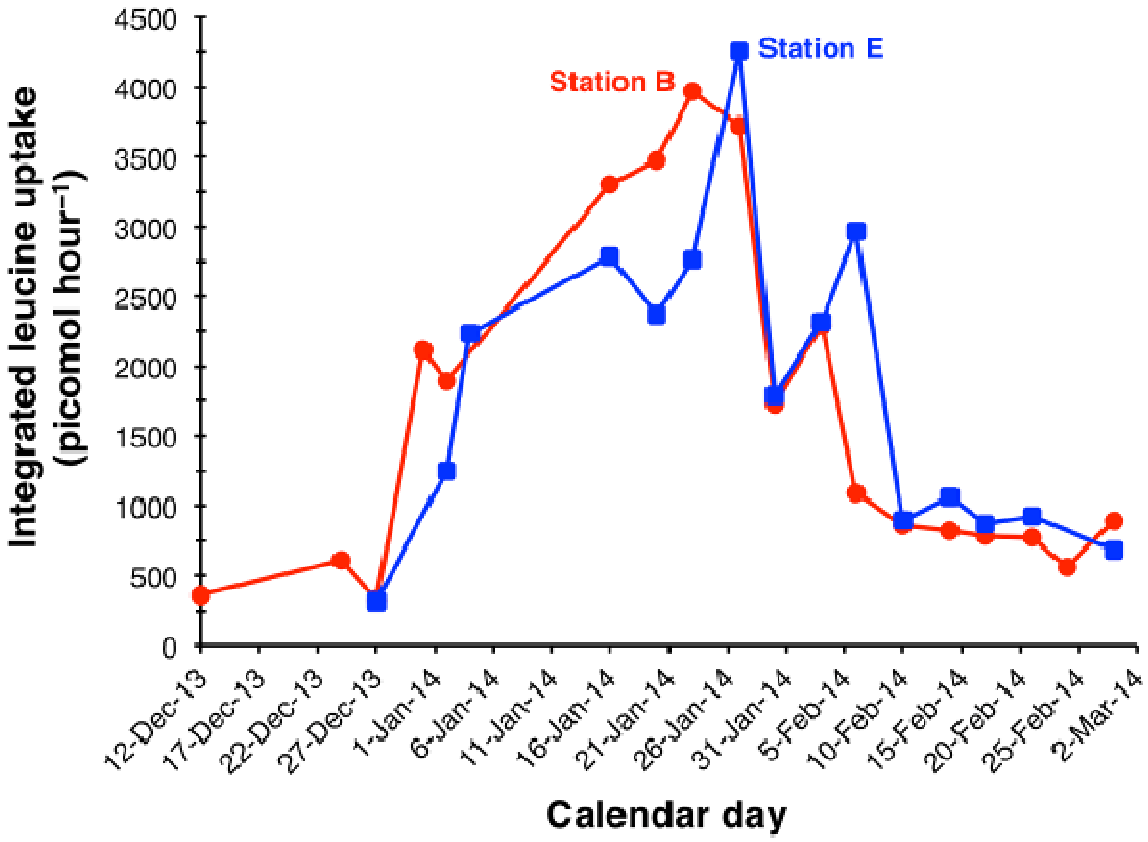


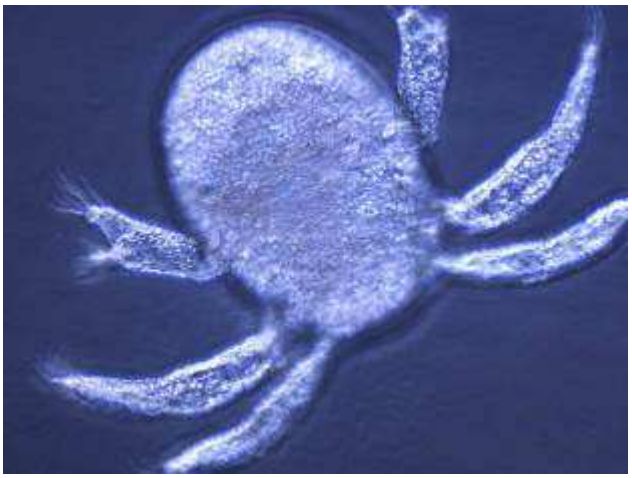
Fig. 1. *Integrated bacterial production at stations B (near-shore environment; red, circle) and E (off-shore environment; blue, square) for the 2013-2014 summer season.*

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

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

Personnel on station: Abigail Bockus, Ryan Fantasia, Grace Saba, and Brad Seibel

The second delivery of krill from the *ARSV Laurence M. Gould* (LMG) came in on January 30th, and consisted of a wide variety of krill life stages. The first week in February was spent making plans for experiments during the remaining research season and maintaining our ongoing juvenile growth experiment. Dr. Saba and Dr. Seibel departed Palmer Station in early February aboard the LMG.



Krill nauplius from High Temperature Treatment

On February 6th we began experiments with gravid female krill to determine spawning frequency and fecundity under each of our experimental treatments (ambient CO2/pH, temperature; high CO2/low pH, ambient temperature; and high CO2/low pH, high temperature). For each batch of spawned eggs, total batch volume and diameter of a subsample of 50 eggs was measured. Incubations were scheduled to run for up to 30 days, during which each individual krill was to be observed for spawning events. More than half of the krill in the high CO_2, low pH, high temperature treatment spawned within the first two days of incubations, and krill in all treatments had spawned within the first week of the experiment. There seemed to be no major difference between treatments, potentially due to the short incubation times. A subsample of eggs was observed by phase contrast microscopy for each treatment.

On February 6th we also began a long term (21 day) incubation experiment with adult krill under the same treatments described above. When the long term incubation experiment concluded on February 27th, krill blood pH was measured immediately, and additional samples were frozen for analysis in the home lab. Our 30 day juvenile growth experiment was concluded on February 18th, with the molting of the final krill in the ambient treatment.

In all experiments, water changes were conducted every two days in order to maintain pH and food concentrations in experimental containers, except for long term experiment containers, where daily water changes were necessary to maintain these parameters. At each water change, carbonate chemistry parameters were analyzed and samples for phytoplankton abundance and community structure were taken.

In addition, we have also conducted five 24-hour time-course experiments, end-point respirometry experiments with juvenile, sub-adult, adult, and gravid female krill, and a second feeding and nutrient excretion experiment. We will continue to conduct these experiments throughout the first week of March, before Bockus and Fantasia depart on LMG 14-02.

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

Dr. Zicheng Yu, Principal Investigator, Lehigh University, Department of Earth and Environmental Sciences; Dr. David Beilman, Co-PI, University of Hawaii, Department of Geography

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

The overall science goal of Project G-094-P is to assess response of moss peatbanks (aerobic peat-forming ecosystems) and their carbon accumulation rates to climate changes in the last 1000 years in the Western Antarctic Peninsula (WAP). In particular, the results from the project will document the formation ages and temporal changes in these peat-forming ecosystems in response to climate warming and ice retreat in this ice-dominated region. The warm time intervals that they focus on include the most recent preindustrial warm period, the Medieval Warm Period at ~800 years ago, and the recent and ongoing warming interval over the last several decades. Their approach is to evaluate the outcomes of "natural climate warming experiments" that have occurred on the WAP to understand polar ecosystem responses to climate change in the past in order to better anticipate the future of the WAP's terrestrial realm. During the current 2013-2014 field season, the project is sampling moss peat-banks at several locations in the WAP region. Their priority sites are Litchfield Island near Palmer Station and Galindez Island near the Ukrainian Vernadsky Station. The team's field objectives are primarily to find thick and old moss banks and to drill small cores as archives of past climate and ecosystem changes.

The field team arrived at Palmer on February 17th. They first visited Litchfield Island on the 18th and recovered microclimate logger data and strategized sampling plan before heading to Vernadsky on the 19th. They sampled moss peatbanks on Galindez Island, Rasmussen Hut on the mainland WAP and Skua Island during their 6-day stay at Vernadsky. After returning to Palmer on the 25th, they sampled Litchfield and Hermit Islands and Bonaparte Point before heading to Stonington Island on March 1st to visit and sample moss peatbanks on Léonie and Petermann Islands.

So far, the team's field observations have generated some exciting ideas and hypotheses related to climate change, ice dynamics and ecosystem transformation on the WAP. They investigated previous observations that moss peatbanks have become greener recently on Litchfield and elsewhere. They hypothesize that the greening may reflect changes in bank-forming moss species from dry yellowish-looking turf moss *Polytrichum strictum* to wet bright green moss *Chorisodontium aciphyllum*, possibly caused by increase in snowfall/precipitation (or longer snow melt season) in response to climate warming during recent decades. They will use peat-core analysis and environmental monitoring data to test this hypothesis (see Fig. 1 for logger data).

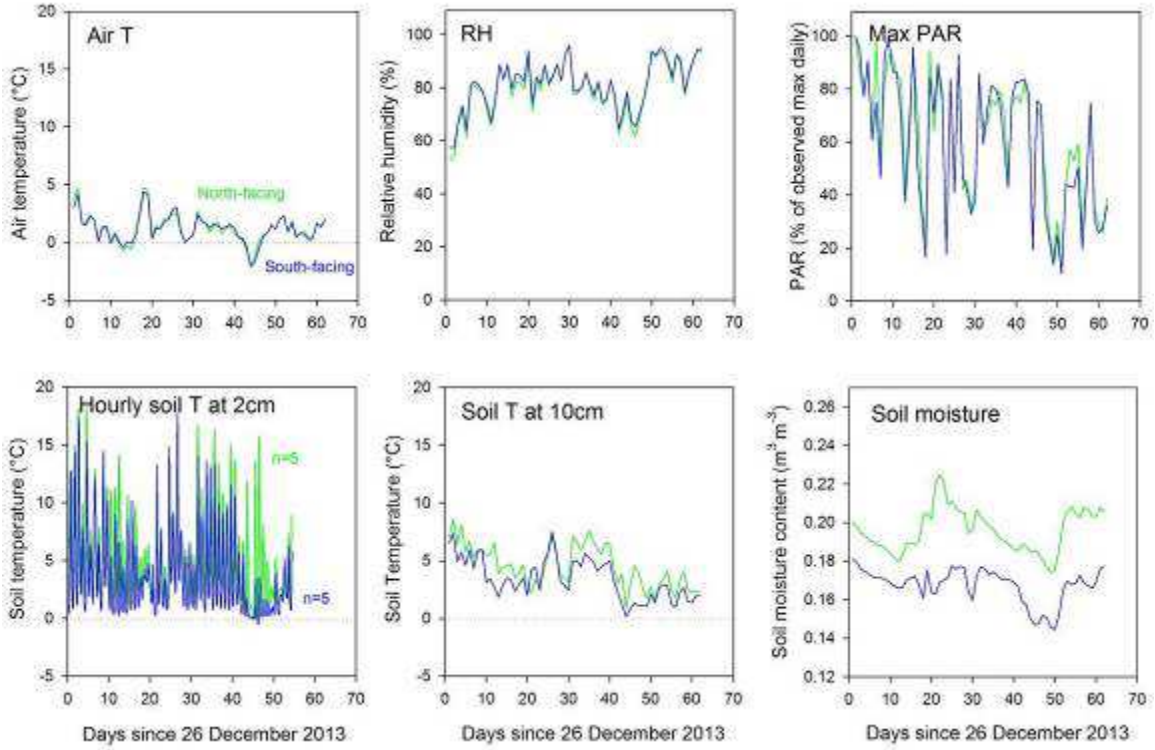


Figure 1. *Microclimate data showing daily air temperature, relative humidity (RH), maximum photosynthetically-active radiation (PAR), soil temperature and soil moisture over ~60 days from December 26th, 2013 to late February, 2014 from contrasting north-facing and south-facing moss peat banks on Litchfield Island. Air temperature and RH were similar at both exposures, suggesting well-mixed air probably due to frequent strong winds. Deceasing PAR over these two months likely represents seasonal change from mid-summer to autumn. The observations that soil temperatures are consistently and substantially higher than air temperature and that the soil displays a more pronounced decline during the period suggest that radiation plays a dominant role in heating peatbanks. The bottom-left panel showing the hourly averages from several iButtons across peatbanks. Higher soil moisture on the north-facing than south-facing slope may be due to either difference in peat properties (Polytrichum peat on north slope is much denser than Chorisodontium –dominated south bank) or more precipitation on wind-facing north slope. Much appreciation is extended to staff at Palmer (Mark, Carolyn and Glenn) who expertly installed the data logger masts and instrument right after Christmas.*

The field team's discovery of peatlands (waterlogged anaerobic wetlands that form peat and sequester carbon globally) dominated by *Sanionia uncinata* on Galindez and Winter Islands and near Rasmussen Hut may represent a transition from peatbanks to peatlands, which would be an important ecosystem transformation on the Antarctic Peninsula that could be promoted in a warmer and wetter climate. Alternatively, the waterlogged peatlands may represent the early-stage regeneration of old eroded peatbanks that perhaps were negatively influenced by a past cooler and/or drier climate period, such as the Little Ice Age (LIA) around 300 years ago. In either case, this ecosystem change is likely responding to recent climate warming. See cover photo for an example.

Also, on Galindez Island near Vernadsky and at Bonaparte Point near Palmer (see Fig. 3) they found previously ice-entombed and recently re-exposed dead mosses and intact ecosystems. They hypothesize that these buried mosses and peat represent growth during the warmer

Medieval Warm Period, when the ice and permanent snow were more limited in extent, followed by ice advance and snow cover expansion during the LIA that killed and buried these peat-forming ecosystems. Recent climate warming and ice/snow reduction have re-exposed these mosses and banks. Radiocarbon dating of preserved plant parts and peat will test this hypothesis.

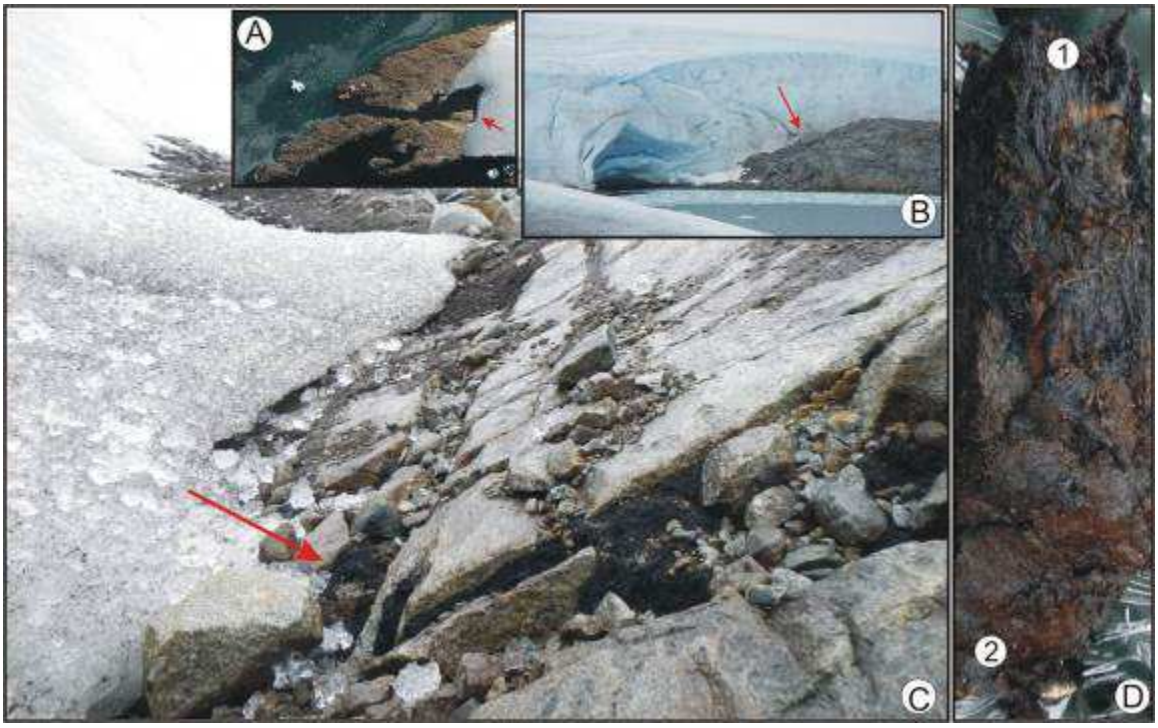


Figure 2. *Previously ice-entombed mosses and peatbanks at retreating ice margin at Bonaparte Point (Peninsula) near Palmer Station.* ***A.*** *Satellite image showing the sampling location at Bonaparte Point just south of Palmer Station;* ***B.*** *The sampling location (arrow) in front of glacier behind a big boulder;* ***C.*** *The exposed peatbank profile within 10 cm from retreating ice (arrow), along with other intact in situ black mosses on rock cracks;* ***D.*** *The sampled entombed peat profile: 1. Surface* ^{14}C *dating sample ANT 14 BON DM-3 (time of ice advance); and 2. Basal sample ANT 14 BON DM-4 (the age of peatbank initiation).*

Yu gave a science talk to the Palmer and LMG joint audience on February 27th, 2014 that highlighted some of these and other field observations, ideas and hypotheses as well as overviewed their peatland research, particularly on the circum-Arctic region and Patagonia.

We would like to acknowledge logistics support from research associates at Palmer Station (in particular Mark Dalberth, Carolyn Lipke, and Glenn Grant for their professional assistance with setting up data loggers on Litchfield Island), staff at the Ukraine's Vernadsky Station (Yuriy Gordienko, Ivan Parnikoza and the overwinter crew) for their field support, ASC personnel (Cara Ferrier and Adam Jenkins) for logistics arrangements, Ted Doerr for field assistance, and the entire *ARSV Laurence M. Gould* crew for making our sampling possible. Their continuous assistance has been invaluable and essential for the success of our field expedition and is greatly appreciated.

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

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

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

We continue our efforts to quantify glacial meltwater and groundwater discharge using radium and radon tracers in the nearshore environment along Anvers Island. January sampling was mostly focused on investigating the influence of tides on discharge of glacial meltwaters near Point 8 by conducting 24-hour time series sampling events and measurements of subsurface resistivity. February encompassed a different sampling strategy to capture variability of tracers over the course of the month at all three primary sites (Arthur Harbor (AH), Hero Inlet (HI), and Point 8 (P8)). Nearshore surface and deep samples were collected in transects from shore near the glacier terminus up to six times at each site (Figure 1). Additionally, a continuous radon survey in approximately a 450 km^2 grid along shore was conducted at each site on multiple dates (Figure 2). Preliminary data suggest that glacial meltwater may vary daily; however, tide and weather conditions may play an important role in the tracer dynamics.

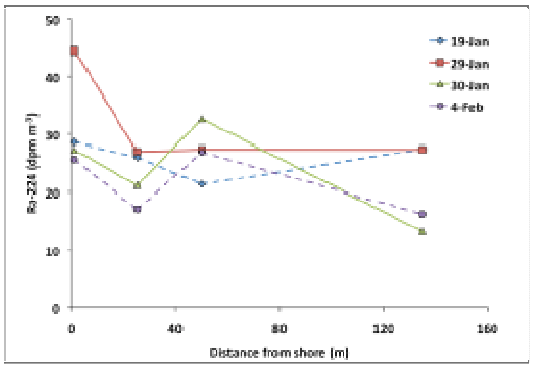


Figure 1. *Variability in Ra-224 (dpm/m^3) in surface waters with distance from shore and among different dates in Arthur Harbor.*

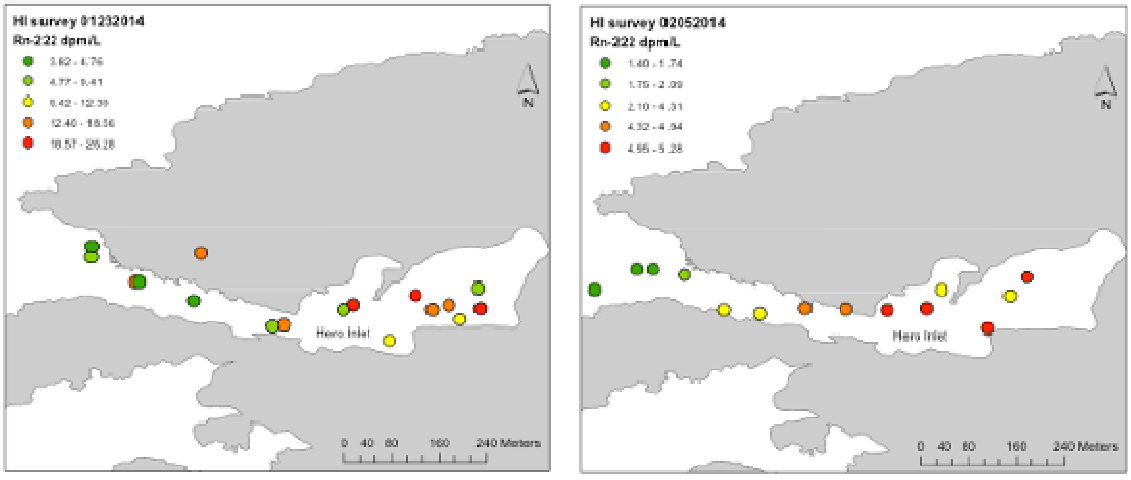


Figure 2. *Radon-222 (dpm/L) from Rn surveys conducted on two different dates in Hero Inlet. Radon-222 concentrations are elevated near the head of the channel where the glacier terminates and decreases towards the open ocean. Note the difference in scale. Rn significantly varies between the two surveys, potentially from increased discharge on January 23rd, 2014.*

On February 18th, the LMG arrived with the rest of our team (Reide Corbett, Ian Connery, and David Young). We set sail the following day for a 5-day cruise to sample our isotopic tracers and Fe in the fjords and shelf waters (Figure 3). This aspect of our work is focused on quantifying the mixing rates and across shelf transport of terrestrially-derived Fe from glacial meltwater (surface and subsurface flow) to offshore waters. We completed four transects perpendicular to shore up to 100 km offshore and sampled three fjords. We returned to Palmer Station on February 25th to continue terrestrially-based sampling with the entire team to complete our final days here at Palmer Station. Hopefully the weather holds for this final week of sampling!

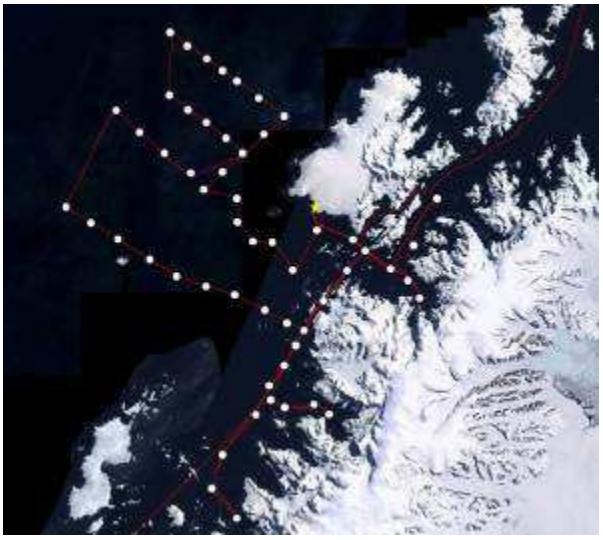


Figure 3. *The cruise track of the LMG (red line) and our sampling sites (closed white circles) are focused on the region around Anvers Island, including the continental shelf and several nearby fjords.*

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
February 2014
Glenn Grant

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.

Diagnosis and repair of the ELF/VLF system continued. In the interim, and in preparation for the antenna move to the backyard, the main antenna and much of the supporting infrastructure (cables, ropes, wires, insulators, etc.) were removed from the glacier. A small, temporary antenna was received and erected in the backyard; as soon as the receiver system fault has been resolved, this temporary antenna will fill the data collection gap until the main antenna can be installed later this season.

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

Mathew Lazzara, Principal Investigator, University of Wisconsin

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

The data ingestor operated normally through the month.

O-204-P: A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL TO 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 both Terra Lab and the VLF Building.

Air samples were collected throughout the month.

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

Gregory Roberts, Principal Investigator, Scripps Institution of Oceanography

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

The Research Associate supported periodic maintenance of the system. The system operated normally throughout the month.

O-264-P: COLLECTION OF ATMOSPHERIC AIR FOR THE NOAA/GMD WORLDWIDE FLASK SAMPLING NETWORK
James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; Boulder, CO

The NOAA ESRL Carbon Cycle Greenhouse Gases (CCGG) group makes ongoing discrete measurements to document the spatial and temporal distributions of carbon-cycle gases and provide essential constraints to our understanding of the global carbon cycle. The Halocarbons and other Atmospheric Trace Species (HATS) group quantifies the distributions and magnitudes of the sources and sinks for atmospheric nitrous oxide (N2O) and halogen containing compounds. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon samples were taken throughout the month.

O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK
James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; Boulder, CO

A Biospherical Instruments (BSI) SUV-100 UV spectroradiometer produces full sky irradiance spectra ranging from the atmospheric UV cutoff near 290nm up to 605nm, four times per hour. A BSI GUV-511 filter radiometer, an Eppley PSP Pyranometer, and an Eppley TUVR radiometer also continuously measure hemispheric solar flux within various spectral ranges. The Research Associate operates and maintains on-site equipment for the project.

Data was collected normally during the month. The RA performed a thorough inspection of the roof box enclosure and instrument to make sure everything is properly sealed and dry.

O-283-P: ANTARCTIC AUTOMATIC WEATHER STATIONS (AWS).
Mathew Lazzara, Principal Investigator, University of Wisconsin

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

The system operated normally.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.
Joe Pettit, Principal Investigator, UNAVCO

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

The primary GPS station collected data normally throughout the month. A separate receiver's computer, intended for NASA data collection, failed. The Research Associate assisted the grantees with repairs to the system.

T-312-P: TERASCAN SATELLITE IMAGING SYSTEM
The TeraScan system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. The Research Associate operates and maintains on-site equipment for the project. The TeraScan weather and ice imagery is used for both research and station operations.

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

B-466-P: FLUORESCENCE INDUCTION AND RELAXATION (FIRe) FAST REPETITION RATE FLUOROMETRY (FRRF)
Deneb Karentz, Joe Grzymski, Co-Principal Investigators, University of San Francisco

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

Weekly cleaning of the instrument and data downloads were performed as scheduled. A special "deep cleaning" was performed to rid the system of algal buildup.

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

The IMS Radionuclide Aerosol Sampler and Analyzer (RASA) is part of the CTBTO verification regime. The automated RASA continually filters ambient air and tests for particulates with radioisotope signatures indicative of a nuclear weapons test. The Research Associate operates and maintains the instrument.

The system collected data normally during the month.

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

METEOROLOGY
The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. Weather data collected using the automated electronic system is archived locally and forwarded twice each month to the University of Wisconsin for archiving and further

distribution. Synoptic reports are automatically generated every three hours by the Palmer Meteorological Observing System (PalMOS) and emailed to the National Weather Service for entry into the Global Telecommunications System.

The system collected data normally throughout the month.