PALMER STATION MONTHLY SCIENCE REPORT October 2012

The summer season begins at Palmer Station. Clockwise from top left: **Cormorants start building nests on Cormorant Island** *(image credit: Glenn Grant).* **Zodiac operations commence at Palmer Station** *(image credit: Genevieve Ellison).* **Sea ice in the Palmer boating area made zodiac operations slow, but occasionally possible** *(image credit: Stacie Murray).* **Adélie penguins return to Torgersen Island** *(image credit: Glenn Grant).*

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

The Palmer Station summer science season has officially begun, although we are still waiting for the summer weather. The arrival of five science groups (B-003 Morel, B-013 Fraser, B-018 Bench, B-019 Schofield, and B-252 Ducklow) has the bio lab humming with activity. Palmer Station spent most of October surrounded by sea ice, but science groups seized the few boating opportunities to begin the summer sampling season in earnest. Local wildlife sightings were also on the rise with the Adélie penguins returning in their colonies on Torgersen Island and several Elephant seal pups present on Elephant Rocks. Things are shaping up to be a great season, and we're all looking forward to settling into the busy rhythm of summer.

OCTOBER 2012 WEATHER
By Glenn Grant, Research Associate

Cold winds from the southeast and southwest strongly affected Palmer's weather during October, compacting brash ice inshore and keeping the temperatures crisp. Fourteen days saw prevailing winds from the SE or SW, often gusting above 30 knots. The strongest gust for the month was 44 knots from the SE. These winds brought unseasonably cold temperatures, bottoming out at -14.3° C on the 15th of the month, and helping to solidify the sea ice. The average temperature was -4.0° C, a bit colder than the historical average of -2.3° C.

For two weeks during the middle of the month the ocean was covered with at least 7/10ths brash ice, often appearing solid to the horizon. When open leads formed and the winds calmed, the cold air and ocean temperatures almost immediately formed grease ice on the surface. Visible and radar satellite imagery revealed that the southwest side of Anvers Island, where Palmer is located, had some of the densest sea ice in this region of the western Antarctic Peninsula. Anecdotal reports from passengers aboard the *ARSV Laurence M. Gould* suggested that the sea ice near Palmer Station was between 0.5 and 1 meter thick. Sea surface temperatures were typically around -1.6° C, warming suddenly to above -1.0° C near the end of the month when a series of storm fronts finally pushed most of the sea ice offshore.

Virtually all the precipitation during October came in the form of snow. Cumulative daily snowfall for the month was 37 cm, although this underreports the actual total due to the windy conditions. Total melted accumulation was 26.7 mm, which was less than half of the October average of 58.7 mm. Nevertheless, cold air temperatures preserved the snow pack, with the snow stake reaching an above-average depth of 96 cm on the 19th of the month.

B-003-P THE SEASONAL DYNAMICS OF CO2, PRIMARY PRODUCTION, AND DMS IN THE WESTERN ANTARCTIC PENINSULA: MEASUREMENTS OF POOLS AND PROCESSES USING MASS SPECTROMETRY

Dr. Francois Morel, Principal Investigator, Princeton University and Dr. Philippe Tortell, Co-PI, University of British Columbia

Personnel on Station: Elizabeth Asher, Sven Kranz, and Philippe Tortell

The overall goals of our project are to: 1) characterize the seasonal cycle of biogenic gases (O_2, CO_2, and dimethylsulfide, DMS) in near shore waters adjacent to Palmer Station; 2) quantify the dominant rate processes in DMS production and consumption using isotope tracer studies; 3) examine changes in phytoplankton photosynthesis and inorganic C uptake as a function of seasonal CO_2 changes, and; 4) conduct CO_2-controlled incubation experiments to assess potential responses of phytoplankton assemblages to future CO_2 perturbations.

Our group arrived on station mid-way through October and have spent much of the past two weeks setting up equipment and optimizing our experimental protocols to local conditions. We have installed two instruments in the aquarium room; a membrane inlet mass spectrometer (MIMS) for continuous O_2, Ar, CO_2 and DMS measurements from the seawater supply line, and a purge and trap gas chromatograph coupled with a sulfur conductivity detector (PT-SCD) for high sensitivity analysis of DMS, DMSP and DMSO in discrete samples. Because this was our

first time working on station, we needed to adapt some basic electrical and plumbing configurations in the aquarium to accommodate our instruments. We are very grateful to the station support staff who provided outstanding assistance during this initial set up. Our first week was spent trouble shooting the equipment and repairing a few items that had been slightly damaged during southbound shipping. The instruments have now been running well for some days and preliminary data are included in the figures below.

Figure 1. Sample calibration standards run on the PT-SCD. The top panel shows peaks eluting from the column following the introduction of various standard solutions. The bottom panel shows a highly linear concentration – response curve.

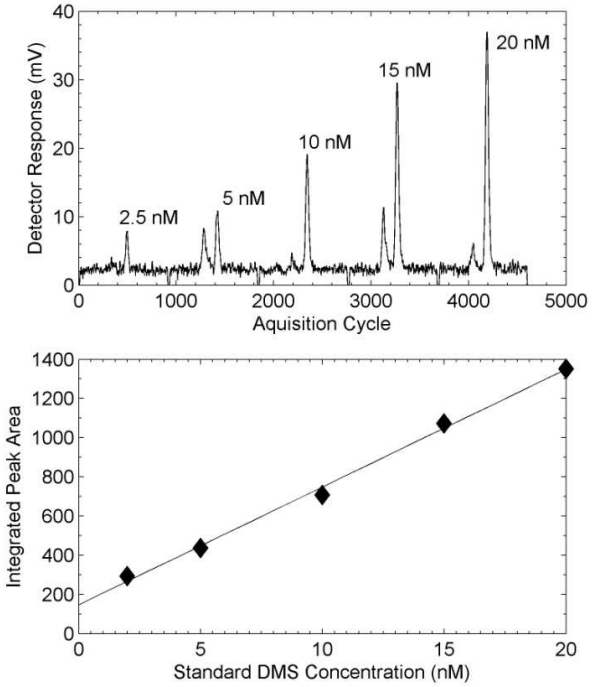


Figure 2. Results from continuous gas monitoring in the seawater supply line using MIMS. Top panel shows biological oxygen saturation (ΔO_2 /Ar) in relation to sea surface photosynthetically active radiation (PAR). The strong diel cycles in ΔO_2 /Ar reflect net O_2 production (from photosynthesis) during the day and O_2 consumption (from respiration) during the night. High wind speeds (bottom panel) can influence the diel cycling via air-sea gas exchange. Note that negative ΔO_2 /Ar implies that the water column remains net heterotrophic at this early point in the season. We expect values to exceed atmospheric equilibrium when the phytoplankton bloom begins.

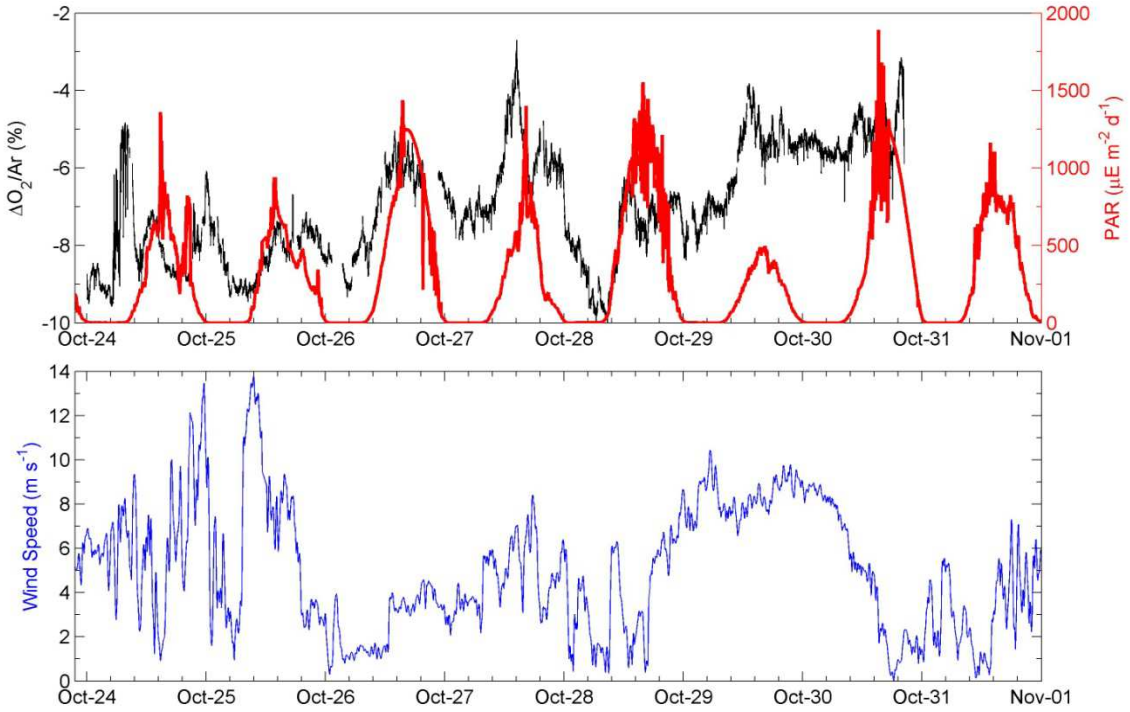
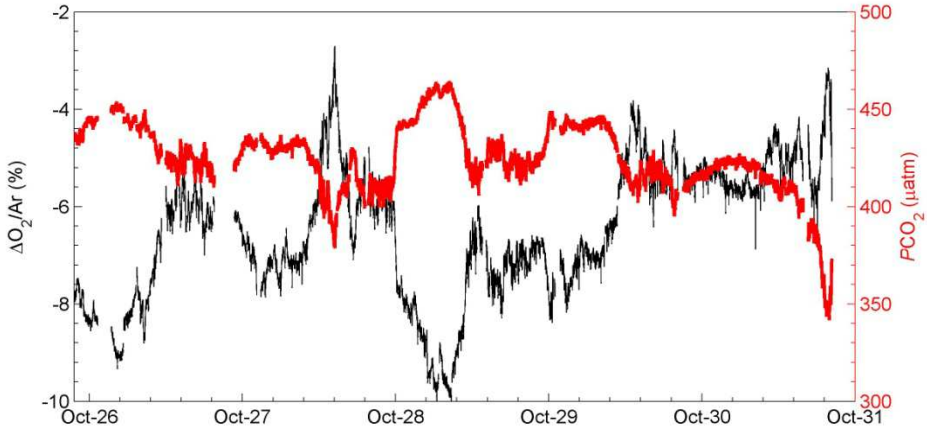
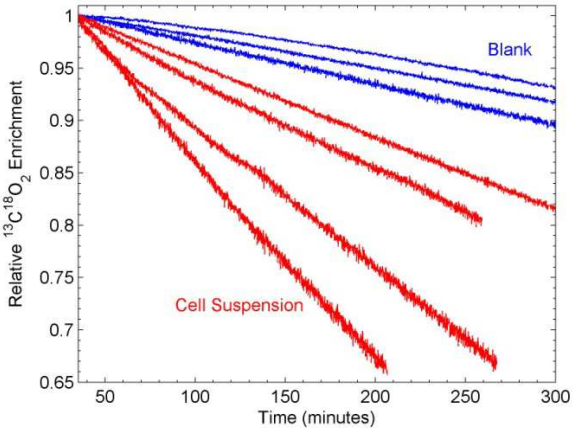


Figure 3. MIMS-based measurements of biological oxygen saturation (ΔO_2 /Ar) and pCO_2. This figure shows the strong anti-correlation between these gases expected given their coupled production/consumption in photosynthesis and respiration.



Beyond our equipment in the aquarium room, we also installed several additional instruments in the main laboratory for other chemical and biological analyses. These instruments include a purge and trap gas chromatograph coupled to a capillary inlet mass spectrometer (PT-CIMS) used for DMS tracer experiments, and a second MIMS system used to measure CO_2 and O_2 fluxes in phytoplankton samples. We are still optimizing the analysis conditions for the PT-CIMS to get consistent peaks and maximum sensitivity, and we hope to begin tracer experiments in the next few days. The MIMS system has thus far been used to analyze several phytoplankton samples with good results (Fig. 4).

Figure 4. MIMS-based measurement of stable isotope-labeled CO_2 species ($^{13}C^{16}O^{16}O$, $^{13}C^{18}O^{16}O$ and $^{13}C^{18}O^{18}O$) used to quantify the rate of CO_2 - HCO_3^- inter-conversion catalyzed by the enzyme carbonic anhydrase. This enzyme is a key component of the phytoplankton inorganic carbon uptake system. Enzyme activity is measured by comparing rates in the cell-free buffers (blank, shown in blue) and in the presence of a concentrated phytoplankton suspension (red lines).



We have thus far undertaken two short sampling trips to collect water from Station B, and deploy a CTD for depth profile analysis of Station A adjacent to the pump house inlet. We are coordinating our sampling with the LTER group so we can maximize data exchange and provide a broad oceanographic context for our measurements. Our water samples were used to collect material for ^{14}C uptake experiments, sulfur analysis and a variety of other ancillary measurements. Finally, we began the set up of our outdoor incubation experiments, and we expect to begin our first CO_2 manipulation experiment sometime next week.

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: Shawn Farry, Ben Cook

B-013 personnel arrived at Palmer Station via the *ARSV Laurence M. Gould* on the evening of October 16th. Unfortunately, sea ice around Palmer Station remained heavy allowing only 3 boating days by months end.

While iced in on station we unpacked and organized all of our gear and equipment; unpacked and inventoried cargo; set up our work areas; organized and packed camping equipment, emergency boat bags and caches; prepped files and field notebooks; updated our data sheets and databases; and tested field instruments, satellite tags and equipment.

Penguin population studies began with our first trip into the field October 27th. Regular censuses of Adélie penguin colonies on Torgersen and Humble will occur every 2 days and censuses on Cormorant and Christine Islands every 5 days, weather permitting. We had hoped to reach Biscoe Island during October to place an emergency cache barrel and begin gentoo penguin population studies; however we were prevented from doing so by ice and high winds. We also

took advantage of the few boating days in October to begin blue-eyed shag population studies and marine mammal surveys, the highlight of which was the observation of at least 15 nursing elephant seal pups on Elephant Seal Rocks.

Mark-recapture and breeding chronology studies will begin in November with brown skuas on Torgersen, Humble, Cormorant, Christine, Litchfield, Dream and Biscoe Islands, south polar skuas on Shortcut Island and giant petrels on all local islands.

Special thanks to the captain and crew of the *ARSV Laurence M. Gould* for the safe passage across the Drake and the final push through the ice to Palmer Station. Also, many thanks to all the ASC personnel at Palmer for their hard work and support, especially Jullie Jackson for the extra efforts it took getting our boating operations going this month.

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)

This is the first season of a three year project that aims to develop and apply microarrays to study the composition and gene expression of the phytoplankton community near the Western Antarctic Peninsula. The suite of data collected by the Palmer LTER will provide context for my molecular data, so the time and location of sampling will be coordinated with the LTER sample collection. This year, the goal is to collect samples once or twice weekly near Palmer station as well as a subset of the LTER research cruise stations. These samples will be used for DNA and RNA sequencing that will provide the basis for microarray design. Sampling will continue in years 2 and 3, and microarray experiments will be carried out using samples collected during all three seasons, and by the scientific community for many more years.

I arrived on station on 10/16 and spent most of what remained of the month setting up my laboratory, including inventorying supplies, assembling and testing my filtering apparatus, and familiarizing myself with the on-station flow cytometer and epi-fluorescence microscope. I also spent some time attending orientations for new station arrivals and training sessions for the boating that will be done to collect samples. As a first-time researcher to Antarctica, I must note that in my experience on multiple research vessels and at multiple universities, I have not previously seen the level of infrastructure and support for science that is provided at Palmer Station. The time-line between NSF funding of my project, and my arrival on station was incredibly short (less than 2 months). As such, there was not enough time to ship supplies, and I needed to carry all of my necessary equipment with me as checked baggage from the US. This would have been very difficult and incredibly expensive if not for the very well-stocked and well-organized scientific supplies on station. In addition, the existing supplies and equipment will make my work more efficient, as I will be able to carry out some aspects of my project (e.g microscopy & flow cytometry) on station that I expected would need to wait until after my return to Stanford.

While weather or ice cover prevented us from small-boat sampling for most of the month, there were two days where we were able to reach the nearest station (Station B), and I was able to

collect the first samples of my project. The ease of filtration and very preliminary flow cytometry and microscopy indicate that the phytoplankton community is made up of primarily small plankton species including dinoflagellates and multiple diatom species at relatively low abundances, which is to be expected at this time of year. These samples provided a chance to test and modify my filtration process, and also allowed me to begin working with on station instruments (i.e. flow cytometer and epi-fluorescence microscope).

I will be on station through November and will continue to refine my sampling and filtering process during that time in anticipation of leaving in December. After I leave station, Mike Stukel (B-252) will be collecting and processing the project's water samples for the rest of the season, except during the LTER cruise when samples on board and at station will be collected by members of the B-045 group.

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

Personnel on Station: Nicole Couto

After a bit of delay due to icy conditions, we arrived at Palmer Station on October 16th and dove right into setting up the lab. Station staff and grantees from other groups were incredibly supportive during this time and we would especially like to thank Mark Dalberth, Jullie Jackson, Carolyn Lipke, and Catherina Luria for their help. Unpacking, setting up workspaces, and preparing our electronic sampling equipment took nearly two weeks, but the sea ice around station kept us confined here for just as long. Once it retreated we completed Boating 2 and were ready to start sampling.

On October 31st we headed out to Station B on our Zodiac, "Bruiser," to collect our first samples of the season. We deployed a Seabird CTD, an AC-9 (absorption and attenuation meter), and a hyperspectral radiometer from Bruiser's winch. We also deployed two sets of Niskin bottles at seven different depths: the first cast for B-252 and the second for B-019 and B-045. From our water samples we will be measuring chlorophyll and carotenoid concentrations, primary production, and fluorescence.

Currently, we have three Slocum Webb gliders in the lab and two more are scheduled to arrive on LMG12-12. The three gliders here now arrived in good shape and had new iridium cards installed this month. Glider deployments will begin late in November.

B-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, The Ecosystems Center, Marine Biological Laboratories, Woods Hole, MA

Personnel on station: Catherine Luria, Nikhil Murgai, Sarah Laperriere, Stefanie Strebel

Cat and Nikhil arrived to Palmer Station on 22 September. They came down a month earlier than usual to conduct a series of special experiments examining the impacts of early spring sea ice retreat and diatom blooms on marine bacteria. Specifically, we are looking at the effects of sea ice meltwater on bacterial abundance, activity, and community composition in the water column. We hypothesize that this meltwater which contains concentrated dissolved organic carbon, nutrients, and phytoplankton and bacteria, will have significant impacts on water column microbes, potentially even "seeding" the water column with cells, triggering phytoplankton blooms and shaping microbial community composition.

In contrast to our hypothesis that unfiltered melted sea ice would trigger high growth rates inside mesocosms, our preliminary results show equally high bacterial abundance and production after both filtered and unfiltered sea ice additions (Figure 1 and 2). These data may indicate that the dissolved fraction of melted sea ice (i.e. nutrients and dissolved organic carbon) is the source of observed sea ice effects.

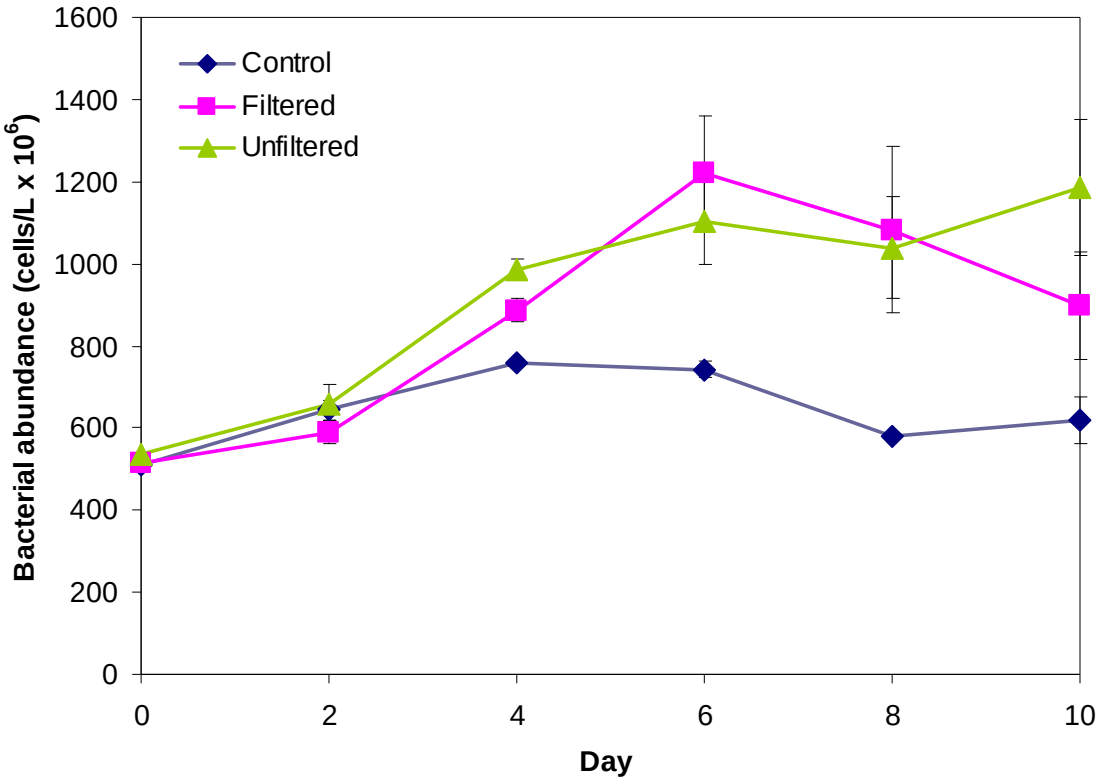


Figure 1. Bacterial abunce over a 10-day microcosm incubation experiment wherein filtered and unfiltered melted sea ice was added to 50-L carboys.

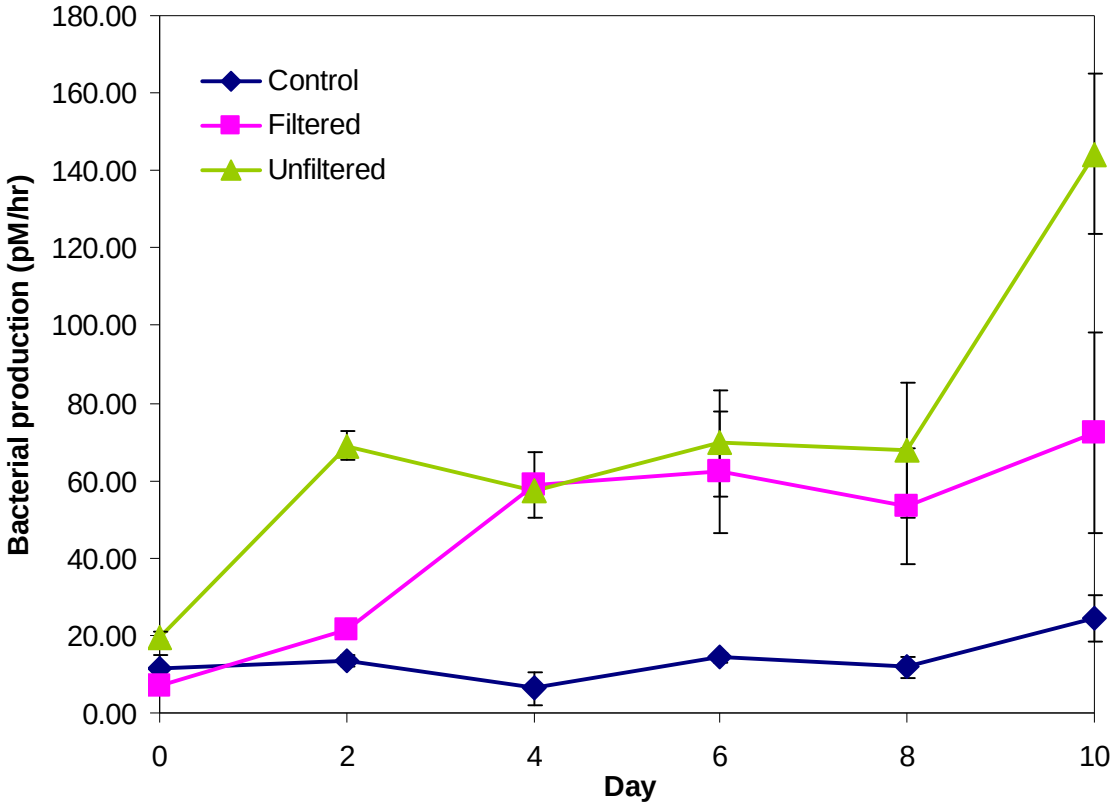


Figure 2. Bacterial production, determined through ^{3}H-leucine incorporation, over a 10-day microcosm incubation experiment wherein filtered and unfiltered melted sea ice was added to 50-L carboys.

The arrival of the LMG on 16 October signaled the official beginning of the LTER season. Cat and Nikhil were joined by Sarah and Stef who will take over B-045's portion of the LTER project when Cat and Nikhil depart on 19 November. As always, our early spring sampling efforts ran up against difficult boating conditions, with heavy ice and wind. After staring longingly out to sea for several weeks, 31 October marked our first official LTER sampling day! As in previous years, we will work closely with B-019 (Schofield) to characterize the water column near Palmer Station. We are also excited about new collaborations with several other groups: B-003 (Morel), B-018 (Bench), and B-252 (Ducklow). This season, all five groups plan to coordinate sampling days, allowing new groups to utilize the rich LTER data set and contribute to our overall knowledge of this rapidly changing ecosystem.

We would like to thank all of the ASC employees who have enabled our work here at Palmer Station. We are especially grateful for the special efforts that got Nikhil and Cat up and running early in the season during a busy turnover period.

B-252-P THE SEASONAL CYCLE OF EXPORT PRODUCTION IN AN ANTARCTIC COASTAL MARINE ECOSYSTEM

Dr. Hugh Ducklow, Principal Investigator, The Ecosystems Center, Marine Biological Laboratories, Woods Hole, MA

Personnel on station: Mike Stukel

We have arrived on station and begun setting up our equipment. It is only within the last week that we have been able to sample, as ice has been blocking Arthur Harbor off from the stations B & E. Our plan for the season is to measure new and export production weekly at Station E. New production will be measured by $^{15}NO_3$ uptake. Typically five depths will be taken and incubated for 24-hours at roughly in situ light levels in flow-through incubators on station.

Export will be measured by the ^{238}U:^{234}Th disequilibrium method. Water column samples will be taken from 8 depths spanning the euphotic zone at Station E. We will assess the C:^{234}Th ratio by two different methods. We will deploy a sediment trap at 50 m depth to directly collect sinking material near the base of the euphotic zone. Our eventual plan is to deploy the sediment trap mooring at Station E, although early in the season we will be deploying it near Station B, where we can monitor it from shore and pick it up quickly if conditions (ice/wind) turn bad. We will also use a monsoon pump to collect and size-fractionate particles (>50-um) in the upper water column (10 m and 30 m) for a complementary estimate of the C:^{234}Th ratio.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
October 2012
By 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. Minor maintenance was performed on the seismic vault door.

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.

A failure of the VLF signal cable was repaired and the system is receiving data again. All other operations were normal.

A-132-P: FABRY-PEROT INTERFEROMETER (FPI)
Qian Wu, Principal Investigator, National Center for Atmospheric Research

The Fabry-Perot Interferometer observes mesospheric and thermospheric neutral winds and temperatures at Palmer Station. The Research Associate operates and maintains on-site equipment for the project.

The system operated normally during October. Data collection was gracefully halted during a planned network outage, and restored when the network became available again.

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 for 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.

Sampling occurred regularly 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 sampling occurred normally during the month. A problem with HATS sampling was traced to a defective flask valve, and remedied by using a different set of flasks.

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 UV monitor collected data 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 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 automated weather station on Bonaparte Point has been returned to the institution refurbishment. Data collection has stopped until the instrument is returned to Palmer Station.

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 GPS receivers operated normally for the month.

A-336-P: ELF/VLF OBSERVATION OF LIGHTNING DISCHARGE, WHISTLER-MODE WAVES AND ELECTRON PRECIPITATION AT PALMER STATION.
John Gill, Principal Investigator, Stanford University

Stanford University has been operating a Very Low Frequency (VLF) receiver antenna at Palmer Station since the 1970's. By receiving naturally and manmade signals between 1 and 40 kHz, the Stanford VLF group is able to study a wide variety of electromagnetic phenomenon in the ionosphere and magnetosphere. The Research Associate operates and maintains on-site equipment for the project.

The VLF signal cable failed at the end of September due to tension from snow drifts. The cable break was temporarily spliced together until seasonal melting allows for better access and a permanent repair. The VLF system is again collecting data normally.

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 system operated normally for the month.

A-357-P: EXTENDING THE SOUTH AMERICAN MERIDIONAL B-FIELD ARRAY (SAMBA) TO AURORAL LATITUDES IN ANTARCTICA
Eftyhia Zesta, Principal Investigator, University of California Los Angeles

The three-axis fluxgate magnetometer is one in a chain of longitudinal, ground-based magnetometers extending down 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.

Configuration problems with a network-enabled power strip were diagnosed and corrected.

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.

The FRRF was cleaned weekly and data sent to the PIs. All operations were normal.

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 RASA operated normally for the month. At the request of the CTBTO, a special filter sample was prepared and priority-shipped to an analysis laboratory.

TIDE GAGE
Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. The Research Associate operates and maintains on-site equipment for the project.

Software and system debugging continued through October. As of the end of the month, the system is now correctly reporting and recording UTC sample times, and properly adjusting for the local time zone and daylight savings time. The predicted tide database was repaired, correcting a visual mismatch between the measured and predicted tidal phases and amplitudes. The small tsunami caused by the earthquake off the British Columbia, Canada coastline was observed on Palmer's tide gage approximately 20 hours after the earthquake. On arrival at Palmer Station, the tsunami produced tidal variations of roughly 0.10 meters.

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 NOAA for entry into the Global Telecommunications System (GTS).

The weather station operated normally throughout the month.