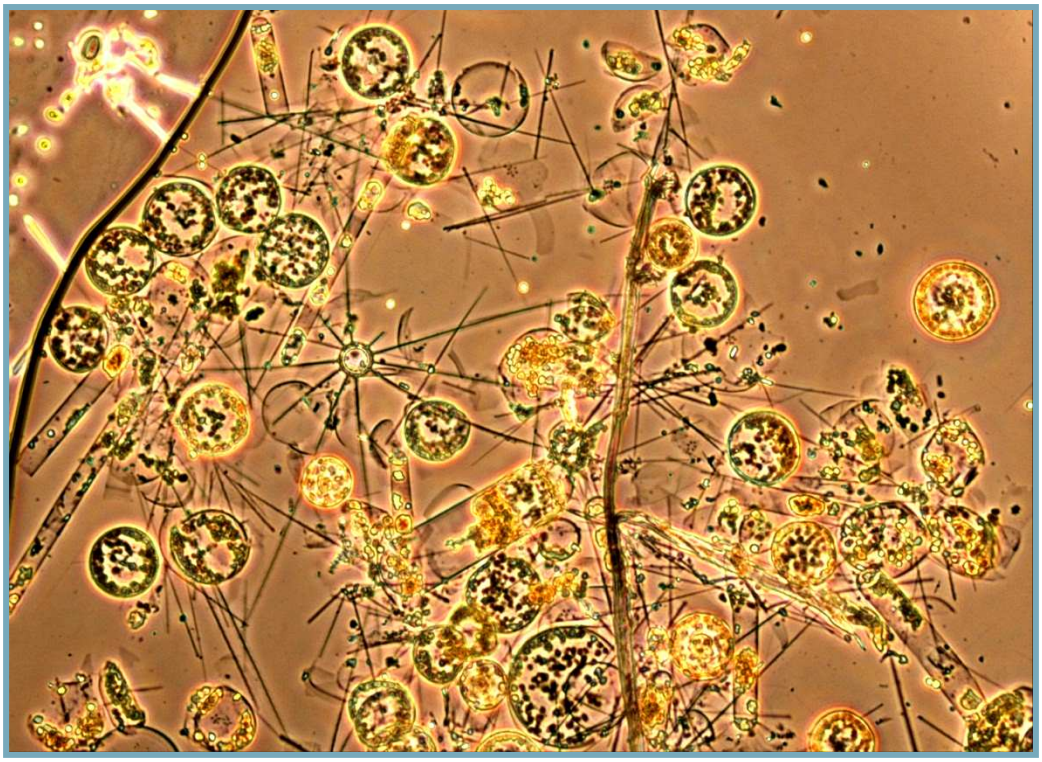
PALMER STATION MONTHLY SCIENCE REPORT

November 2012



The plankton bloom begins at Palmer Station. Bright-field 10X microscopy image of concentrated water sample from Station B *(image credit: Dr. Shellie Bench, B-018-P)***.**

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

The water in Arthur Harbor began to take on a greenish hue this month as the phytoplankton bloom begins. Science groups on station have settled into a sampling rhythm, and the level of collaboration between groups remains high. Weekly science lectures continue, and have been well received by the station community.

We were able to take a short, and well-deserved break for the Thanksgiving holiday. Everyone on station pitched in to cook a fantastic meal and enough pie to last for days. We feel quite spoiled as we look back to the cuisine tolerated by early Antarctic explorers and researchers. From all of us at Palmer Station, we hope you had a wonderful Thanksgiving holiday as well.

NOVEMBER 2012 WEATHER
By Glenn Grant, Research Associate

The unseasonably cold days of October continued into the first week of November, then warmed up to typical near-freezing temperatures for the rest of the month. The initial cold week depressed the monthly average temperature to -1.4° C, a degree colder than the 16-year average

of -0.4° C. The lowest temperature was -8.4° C on the 5th of the month, and the highest was +4.7° C on the 21st.

Precipitation -- or the lack thereof -- was the real surprise. Total melted precipitation, which includes both rainfall and snow, was only 14.0 mm. The cumulative solid precipitation total, mostly in the form of soft snowfall but also stinging pellets of gaurpel, was just 7 cm. By comparison, November usually sees almost 50 mm of melted precipitation and 22 cm of snow. The dry weather also brought an unusual string of clear and partially clear days, bright sunshine, and burning UV indexes above 5.0.

Without the energy of November rains, snowstake levels remained stubbornly high; the snowstake started the month at 91 cm and gradually diminished to 66 cm (the historical average at the end of the month is 28 cm and the median is 19 cm). Most of the snow loss appeared to be through sublimation or melting due to solar radiation, leaving a hard crust over mushy snow: ideal conditions for post-holing. The winds were relatively light throughout the month, averaging 9.0 knots, as compared to the usual average of 10.1 knots. The maximum gust was 51 knots on the 12th.

Most of the sea ice that was still hanging on at the end of October blew out in November. At the end of the month, Arthur Harbor was completely clear of sea ice while some fast ice remained at the back of Hero Inlet. A few ice bergs and bands of brash ice lingered in the Palmer vicinity throughout 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; Dr. Philippe Tortell, Co-PI, University of British Columbia; Dr. John Dacey, Co-PI, Woods Hole Oceanographic Institution

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

Over the past month we established a good sampling schedule to meet our first objective; describing the seasonal cycles of carbon uptake, photosynthesis, and biogenic dissolved gasses in near-shore surface waters of the WAP region. We sample biweekly from 10 m depth at station B with a monsoon pump, collecting one hundred liters on average. This collection is timed to coincide with the long-term ecological research (LTER) program at Palmer Station.

At station B we collect samples for determining chemical parameters (*e.g.* pH, pCO_2), measures of phytoplankton community productivity and species assemblage composition, and carbon uptake physiology. We expect significant temporal changes in phytoplankton C uptake (*e.g.* a change from low to high affinity transport systems), particularly tied to altered pH and carbon dioxide (pCO_2) levels (**Fig. 1**). Thus far, bicarbonate is the major source of inorganic carbon taken up by phytoplankton, and cells show a medium affinity carbon uptake system (half saturation constant for inorganic C 200 μM). Over the coming weeks, we expect to see cells react to decreasing pCO_2 levels by switching to a high affinity carbon uptake system.

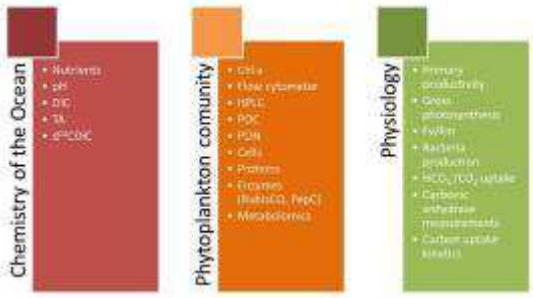


Figure 1. A diagram of sampling parameters for determining chemical parameters, measures of phytoplankton community, and carbon physiology at station B.

During our weekly sampling at station B, we collect water for analysis of the biogenic trace gas dimethyl sulfide (DMS) and the related reduced sulfur compounds dimethylsulfoxide (DMSO) and dimethylsulfoniopropionate (DMSP) using a sulfur chemiluminescence detector (SCD). DMS concentrations at station B remain low (1.9 ± 0.43 nM), likely due to an ongoing dominance of low DMSP-producing diatoms in the phytoplankton assemblages. Similarly total and dissolved DMSP concentrations are low (25.8 ± 3.12 and 2.0 ±0.25, respectively). Nonetheless, we have measured significant potential rates of DMS turnover in surface water, tied to a number of microbial metabolic pathways. More specifically, using isotope tracer experiments, we have measured high potential rates of DMS consumption, and DMS production from DMSP cleavage (**Fig. 2**). In contrast, we have not been able to detect any DMS production from DMSO reduction in the surface seawater from station B (Fig. 2). We expect to observe a seasonal cycle of DMS, related to the shifts in the autotrophic community structure, as well as changes in mixed layer depths, irradiance, wind speed, and bacterial activity.

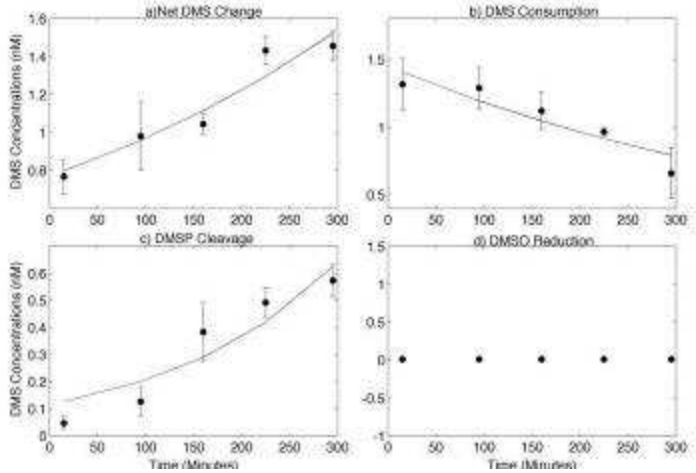


Figure 2. This graph shows the net DMS production (top left) during the course of the five hour incubation. DMS consumption is measured as the loss of deuterium-labeled (D-3) DMS with a molecular mass of sixty-five (top right). DMS production from DMSP cleavage is measured as the increase in DMS concentrations of deuterium-labeled D-6 DMS from D-6 DMSP. Finally, no reduction of DMSO to DMS has been measured thus far using a stable isotope labeled ^{13}C DMSO.

An additional, important component to our seasonal sampling is the use of membrane inlet mass spectrometry to autonomously measure a suite of dissolved gasses from the pump house intake. In particular, the instrument measures pCO_2, the ratio of oxygen to argon (O_2/Ar) and dimethyl sulfide (DMS) roughly every thirty seconds, and automatically runs calibration sequences. Our measurements to date show a clear temporal increase in net biological O_2 production

(photosynthesis – respiration), as measured as O_2/Ar, and pCO_2 uptake. In addition, these gases exhibit distinct diel (*i.e.* day – night) cycling demonstrated excess photosynthesis during daylight hours and excess respiration at night. Additional variability is due to the influence of wind-driven mixing events which bring deeper waters (with lower net productivity) into the surface layer. Several trends in the data have emerged over the past few weeks; namely, increasing biomass and primary productivity coupled with a sharp drawdown of CO_2 and low CO_2levels of roughly 100 parts per million.

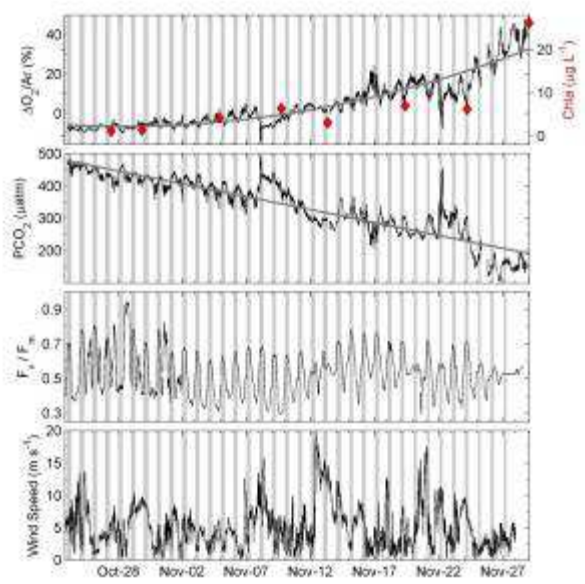


Figure 3. Membrane inlet mass spectrometry data showing an increase biological productivity, measured as O_2/Ar, paired with a similar increase in phytoplankton biomass (chlorophyll *a*). The second panel shows a drop in pCO_2, demonstrating the uptake of inorganic carbon. The third panel shows the diel patterns in photosynthetic efficiency (variable fluorescence) that are well correlated with the diel patters in these biologically produced dissolved gasses. Variable fluorescence data are provided courtesy of Joe Grzymski and Deneb Karentz (B-466-P). Finally, the bottom panel shows wind speed. High wind speeds are associated with mixing events and the increase of pCO_2, as well as the decrease in biological productivity.

Through longer-term (two to three week) incubations, we are exploring the potential of natural assemblages to respond to CO_2 perturbations. To assess potential responses of phytoplankton assemblages to future CO_2 perturbations, seawater samples are incubated and bubbled with different CO_2 concentrations (100, 400 and 800 ppm). We dilute the samples at a certain biomass to ensure that phytoplankton do not exhaust nutrient concentrations in bottle and can experience a prolonged phase of exponential growth sufficient to allow CO_2-dependent shifts in species composition (**Fig. 4**). At the end of the first and third dilution, we measure the same suite of chemical and biological parameters as during the seasonal sampling (**Fig. 5**).

Figure 4: Experimental setup to acclimate phytoplankton to different CO_2 concentrations. The gas-cylinders are connected to the incubation bottles filled with seawater. The screening blocks roughly 50-60% of sunlight mimicking a water depth of 5-10m.

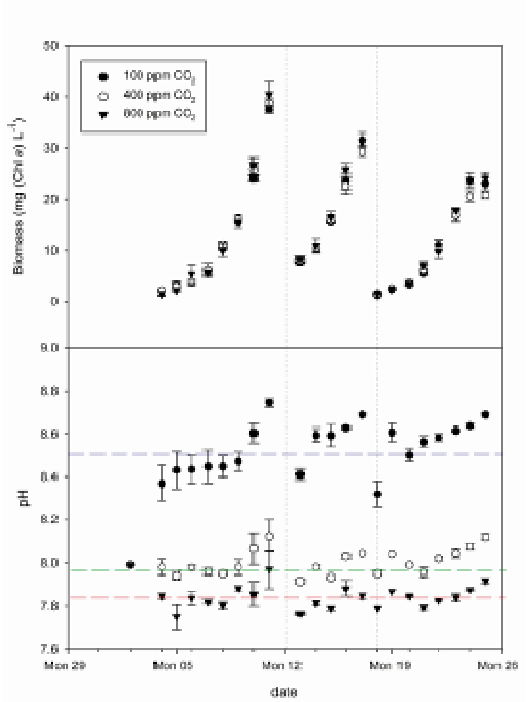


Figure 5. Exponential growth of phytoplankton during CO_2 perturbation experiments, shown by changes in phytoplankton biomass in the top panel, and the corresponding changes in pH. Symbols denote different *p*CO_2 perturbations, and error bars represent the standard deviation, vertical lines denote times when incubations were diluted, and the red, green and blue dashed lines mark the target pH values for each experimental pCO_2 level.

Sulfur enrichment incubations are being conducted to examine whether natural heterotrophic and autotrophic plankton assemblages are capable of converting recalcitrant forms of sulfur such as DMSO and $DMSO_2$ to DMS. Thus far, the biological reduction of DMSO to DMS has not been observed at Station B during short-term rate experiments. The enrichment experiments are thus designed to provide an excess of DMSO and $DMSO_2$ in attempt to select for those micro-organisms which can grow using these substrates. The first enrichment experiment indicated that microbial assemblages are capable of reducing DMSO to DMS, as well as of reducing $DMSO_2$ to DMSO. Moreover, background concentrations of DMSO and DMS increased in the first three days of the experiment. These experiments have been conducted in collaboration with B-018 (S. Bench) to study the potential shifts in autotrophic and heterotrophic communities resulting from

S enrichments. The second enrichment experiment, begun at the end of the month, will be incubated for 10-14 days, with daily sub-sampling for DMS and DMSO. Samples will be diluted every 5-7 days with filtered water from below the mixed layer to ensure exponential growth. These measurements will be paired with samples for RNA, DNA, flow cytometry and microscopy collected by our group and Dr. Bench prior to dilution.

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 and Ben Cook

Weather conditions improved in November allowing boating 23 of 30 days, the installation of the Biscoe emergency cache and numerous trips to both Biscoe and Dream. We continued with our regular censuses of Adélie colonies on Torgersen, Humble, Cormorant and Christine Islands, as well as with gentoo colonies on Biscoe Island. Breeding chronology and egg production were monitored daily on a subset of Adélie nests on Torgersen and Humble Islands. A portion of nests were sampled at the 1-egg stage to obtain adult body size, mass, and egg measurements. Timing of the peak egg census for Adélie penguins was determined and completed for Adélies on all local islands as well as on Dream and Biscoe Islands.

This season the gentoo population on Biscoe is several weeks behind the Adélie colonies, therefore peak egg census for gentoo's will be conducted in December. Chinstrap penguin colonies on Dream Island are also slightly behind the Adélie colonies and peak egg census for chinstraps will be conducted in early December.

During November we also continued our brown skua band resighting and nest monitoring in the Palmer area as well as on Dream and Biscoe Islands with the first brown skua egg of the season documented on November 30th. South polar skuas began arriving in the Palmer area on November 21st initiating our band resighting and nest monitoring study of them on Shortcut Island. Marine mammal observations were recorded throughout November with the highlight being a sighting of 2 orcas near station on November 19th.

Satellite transmitter deployments on giant petrels began on November 22nd and will continue through February. An early-season census of giant petrel nests was completed on Shortcut Island with a complete survey of all nests to be initiated in December. We also continued the monitoring of the small blue-eyed shag colonies on Cormorant Island. An additional sighting of note in November was a rockhopper penguin observed on Dream Island on November 17th.

During weather days in November we conducted lab work and were able to complete the processing of all blue-eyed shag boli and south polar skua scat and diet samples from the 2011-2012 season.

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)

The weather and sea ice improved throughout November allowing small boat sampling twice weekly on most weeks. During the month, I collected samples on nine days from Station B, and all but one were collected in very close temporal and spatial proximity to the LTER sampling done on the same day. The LTER data will provide important biological, physical, and chemical context to aid in interpreting my results. Because I am processing multiple replicates per sample with two filter sizes for each replicate, there are now nearly 80 samples in the freezer awaiting shipment home. Some of those will be used for DNA and/or RNA extraction and sequencing, and others will remain archived for experiments after the microarray is fabricated.

For most of the month, I easily processed over 4 liters in each replicate. However, a bloom started in the last week of the month, and the biomass was high enough that I had to reduce the volume processed to prevent the filters from becoming clogged. Even with the reduced volume, after filtering, the 3 μm filter was almost brown in color from the dense phytoplankton (see image at right).

In addition to processing samples for nucleic acid experiments as described above, the two on-station members of the B-045 group are running each of my samples on their flow cytometer, and I am processing each for microscopy. I have spent some time over the last few weeks optimizing how to best prepare samples for microscopy. While there is still improvement to be made, I now have a process in place to examine samples and collect images using bright field and epi-fluorescence. Some bright field images of the variety of observed phytoplankton species are shown below, including one of the bloom assemblage from the last week of the month.

I expect to continue sampling twice weekly until I depart in the third week in December. After that, sampling will be done once weekly on station, plus 12 stations during the LTER annual cruise. Prior to leaving, I also plan to coordinate experiments with the B-003 and B-252 groups. The experiment with the B-003 group will involve genetics of their incubations with DMS compounds. The B-252 collaboration will involve the use of molecular methods to examine the microbial community in sediment traps. If the experiments are able to be carried out, they will be described in more detail in the December report.

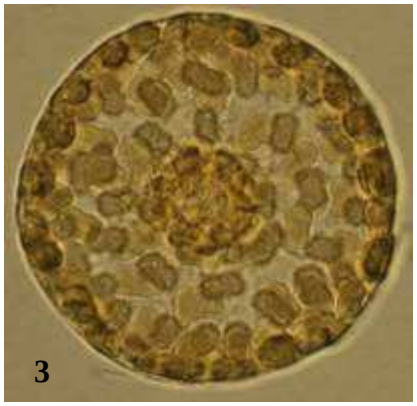
Bright-field microscope images, (all stained with Lugol's iodine, except 4, 8, & 9).

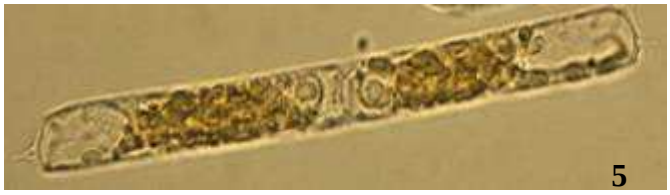
1) Small Phaeocyctis-like flagellate
2) Larger flagellate
3) Large centric diatom
4) Pennate diatom (top) with dinoflagellate (bottom)

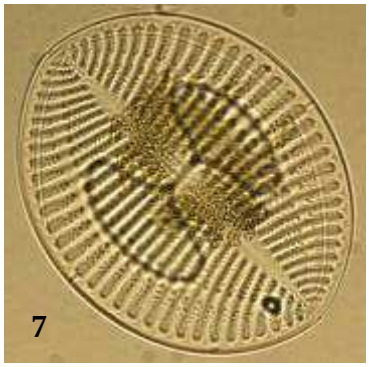
5-7) More pennate diatoms with varying morphologies

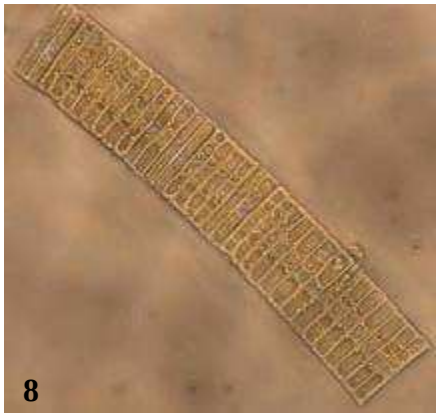
8) Chain-forming pennate diatoms

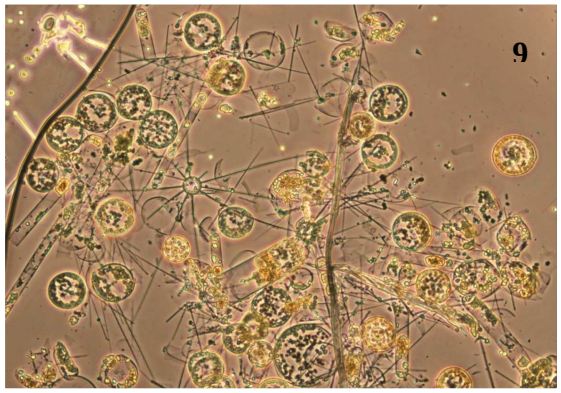
9) Mixed assemblage from the recent bloom - under lower magnification, showing mostly diatoms











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

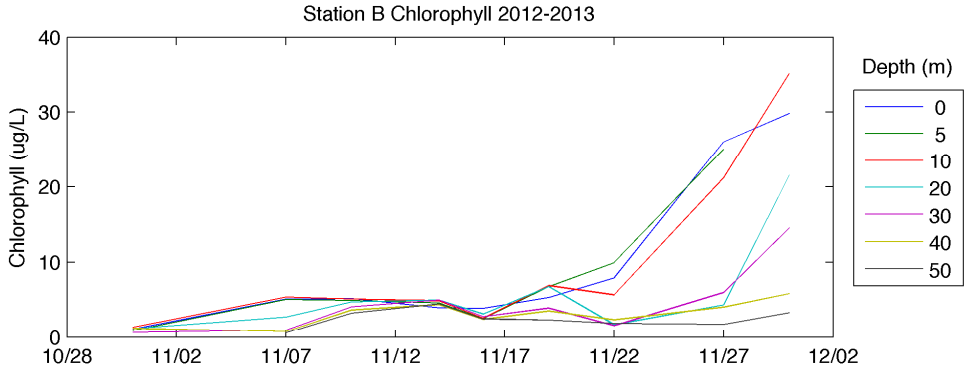
Dr. Oscar Schofield, Principal Investigator, Rutgers University

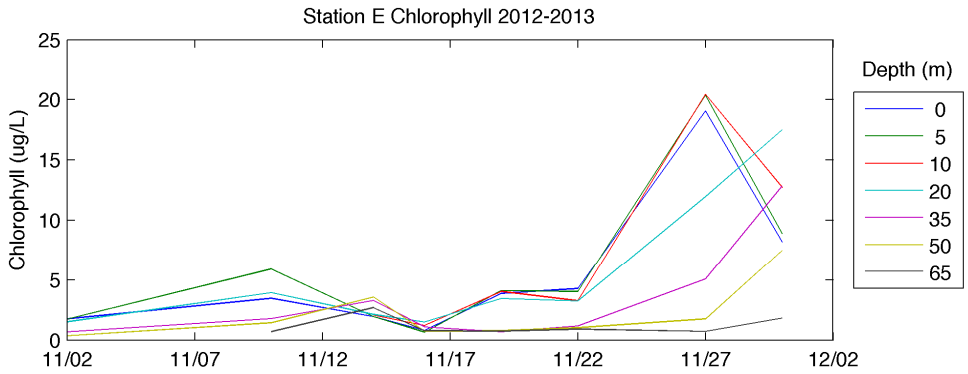
Personnel on Station: Nicole Couto and Filipa Carvalho

November was a month of changes for our group and for the LTER. Sea ice and winds prevented us from keeping a regular sampling schedule at the beginning of the month, but we still managed to get out to collect data twice a week. Weather and ice conditions were much more favorable at the end of the month and we are beginning to maintain a more predictable schedule. Filipa Carvalho arrived on the 9th. In addition to helping with our group's component of the LTER project, she will be doing her own study involving nutrient influx from Circumpolar Deep Water in the canyon region.

We spent some time at the end of November preparing our fleet of gliders for their missions. At the beginning of December we will deploy two shallow gliders equipped with an ADCP and a FIRe sensor to measure currents and phytoplankton activity in the Palmer Deep. Meanwhile, two deep gliders will travel south along the Peninsula extending the range of the Palmer LTER grid and monitoring eddies which shed from the Antarctic Circumpolar Current and onto the shelf.

In the local region, we witnessed a phytoplankton bloom at stations B and E at the end of November. With the ice gone and occasional sunny days, it seems the conditions were ideal for abundant phytoplankton growth. By the last day of the month, the bloom appeared to be dying out at station E but still going strong at B.





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, and Stefanie Strebel

The month of November marked a significant change in weather. The ice cleared and the winds calmed enabling us to get out sampling twice per week at both stations B and E with B-019. As part of the LTER, B-045 samples biweekly for bacterial productivity, bacterial abundance, dissolved organic carbon, particulate organic carbon and nitrogen, and nutrients.

Looking at the long-term biological productivity data, though it is still early in the season, it appears that productivity is slightly higher than last season. The season should start to take off at any moment!

We would like to thank all of the ASC employees for their continued support of our research.

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

Our plan for the season is to measure new and export production weekly at Station E using a combination of $^{15}NO_3$ uptake measurements (for new production) and ^{234}Th:^{238}U disequilibrium (for export). Since the ice cleared in late October, we have been able to consistently get out onto the water to make our measurements. Starting on October 31st, we have weekly measurements of ^{234}Th concentration (8 depths – 0, 5, 10, 20, 35, 50, 65, 100m) and twice weekly measurements of $^{15}NO_3$ uptake (0, 5, 10, 20, 65m). Preliminary results (not shown, because until ^{234}Th decays, allowing background counts, the uncertainty is unacceptably high) suggest that our measurements have preceded the onset of significant carbon export in the region. Conversion of ^{234}Th export to carbon export requires measurement of the highly variable C:^{234}Th ratio of sinking material. To this end we have made three separate types of measurements. Using a monsoon pump at Station E, we have collected >50-μm particles (presumably representative of sinking material) from depths of 0, 10, and 30m each week. We have also had two successful deployments of sediment traps at Station B. In December we plan to move the moored sediment trap array to Station E, but while the pack ice was common near Palmer, we chose to deploy at Station B where we could monitor the sediment trap's location as the ice approached. Our third type of measurement is weekly profiles (7 depths) of total particulate ^{234}Th. While these measurements should not be considered representative of sinking material, they should help us understand the processes controlling the C:^{234}Th ratio of exported material.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
November 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.

A-109-P: ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY (ELF/VLF) OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION (LEP).

Robert Moore, Principal Investigator, University of Florida

ELF/VLF radio wave observations at Palmer Station are used to provide a deeper understanding of lightning and its effects on the Earth's inner radiation belt. The Research Associate operates and maintains on-site equipment for the project.

The system was reset once to correct a software hang, but otherwise data collection 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 by measuring the wind-induced Doppler shift in the air's nightglow emissions. The Research Associate operates and maintains on-site equipment for the project.

The system operated normally. Due to increasing daylight hours, the system could no longer collect meaningful data; it has been shut down for the 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 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 TerraLab 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.

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. Several errors were noted that relate to the system's auxiliary measurements of the wavelength calibration; these were corrected by the grantee. The SUV diffuser, GUV, and Eppley sensors were inspected for damage due to bird activity on the roof.

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 Bonaparte Point automated weather station is at the home institution for refurbishment.

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 cable and antenna system were inspected. The system collected data normally throughout the month. Supplies and spare parts for the VLF system were reorganized.

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.

The magnetometer operated 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.

The FRRF was cleaned on a weekly basis and the data sent to the PIs. A special deep cleaning of the FRRF plumbing was made to evaluate its effect on data quality.

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.

Several minor errors were observed in the RASA detector and serial communications system. The errors were corrected by remote grantee action or operator intervention. The system generally operated normally throughout the month.

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 concluded in November. The system is now operating normally and displaying predicted tides accurately.

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 was inspected several times during November. The horizontal visibility sensor, which had been inoperable for over a year, was repaired. The automated synoptic weather observations were modified to include the visibility data. Brief data dropouts were seen several times during the month, but the intermittent nature of the problem hindered a thorough diagnosis.