

PALMER STATION MONTHLY SCIENCE REPORT
October 2011



A Weddell seal comes to investigate as Deneb Karentz and the B-466-P field team collects plankton samples through a hole cut in the sea ice. *Image Credit: Mark Dalberth* Zodiac parking lot and the newly arrived 2011-12 LTER field team. *Image Credit: Zena Cardman*

NEWS FROM THE LAB

By Carolyn Lipke, Assistant Supervisor of Lab Operations

At the beginning of October the sea ice surrounding Palmer Station grew thick enough for the B-466 (Karentz) group to traverse out to their sampling site at Station A. Recreational sea ice travel to Amsler Island was also established and yielded a long awaited opportunity to download data from the G-239 (Bockheim) weather station.

The Boating Coordinator assembled the first of four new Zodiac boats in preparation for more open water operations. For the rest of the month the science groups seized every ice-free opportunity to conduct their field work.

We ended the month with a Halloween celebration featuring several science-themed costumes. With the additional groups now on station the lab is abuzz with activity and we are all eagerly awaiting the return of summer.

OCTOBER 2011 WEATHER

By Brian Nelson, Research Associate

Ice was a dominant factor of this October's weather. For the first half of the month, fast ice filled the view and scientists had to walk out to their sampling stations. The fast ice broke up and blew out mid month, only to return as close pack ice a few days later. The pack ice came and went with the wind, and between the two, very little boating was possible.

Temperatures were normal for October. The monthly average was -2.0°C , the high temperature was $+4.8^{\circ}\text{C}$ and the minimum temperature was -12.7°C . Sea surface temperatures rose from -1.6°C to -1.1°C .

Precipitation was typical, with total melted at 55.6mm and snowfall at 49cm. Year-to-date snowfall is about 100cm lower than average at 229cm. Wind and light rain swept away much of the snowpack, leaving a patchy 20cm at the end of the month. Winds were also typical for October, averaging 12 knots with a maximum gust of 73 knots.

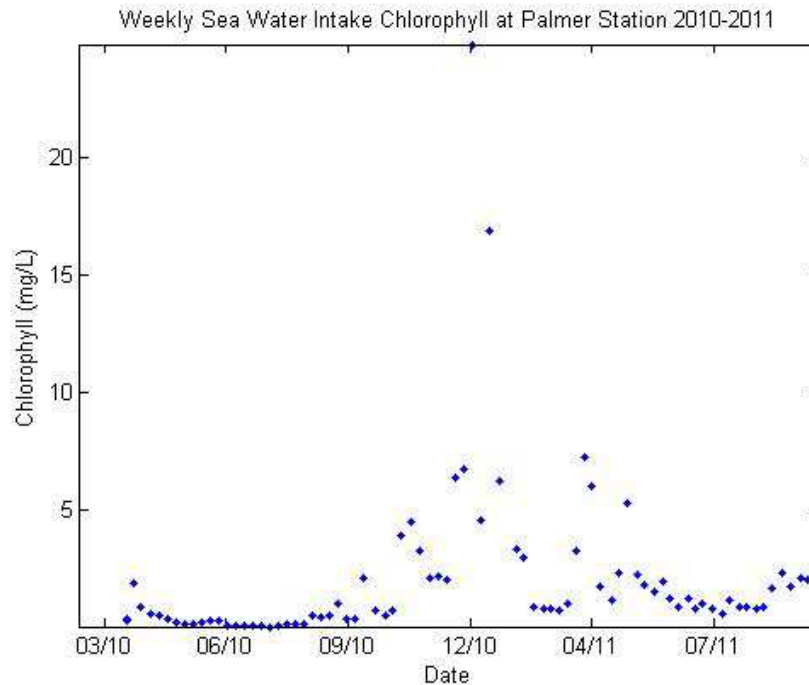
B-019-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, PHYTOPLANKTON COMPONENT

Principle Investigator: Oscar Schofield, Rutgers University

Personnel on Station: Kaycee Coleman, Josh Mayer, and Travis Miles

We arrived in early October to start another summer field season as part of the LTER project. We setup our lab and were prepared to begin sampling in near record time; unfortunately weather and ice conditions kept us from boating for most of the month.

We spent the majority of the month performing carbon-14 primary productivity experiments in collaboration with B-466-P (Karentz). Dr. Grzymiski will be using the data to calibrate a fluorometer, which will potentially be able to make equivalent instrumental primary productivity measurements. In addition to these experiments we analyzed the 2011 winter chlorophyll-a filters, collected by Palmer Science Support weekly for the past number of years.



(High chlorophyll values may be due to sea ice or growth in the inflow tubing)

On October 28th we accomplished our first day of sampling at Station B. In collaboration with B-045 onboard the Bruiser platform we collected 7 depths of data (0, 5, 10, 20, 30, 40, and 50 meters), deployed our AC-9 cage and a newly refurbished hyper-spectral profiler.

The coming month will include continued sampling at Station B and E, weather permitting, as well as our first Autonomous Underwater Vehicle (AUV) Webb Slocum Glider deployment. This glider (RU26) is planned to fly northward to collect bio-physical data along LTER grid lines that are no longer sampled by the Laurence M. Gould. After this is completed it will turn south heading for the British Antarctic Survey's Rothera Base, collecting data along the way.

B-020-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, ZOOPLANKTON COMPONENT.

Dr. Debrah K. Steinberg, Principal Investigator, Virginia Institute of Marine Science, VA
 Personnel on station: Kim Bernard, Domi Paxton

We arrived at Palmer Station on October 13, after a safe and calm crossing of the Drake Passage. Our zodiac, named Ms. Chippy, was ready for us with many new additions. A fuel filter is attached to the engine, separating water (both freshwater and seawater) from the gasoline to prevent condensation, which can ultimately cause the motor to die. A long distance radio for use during our extended boating trips is hooked directly up to the zodiac batteries for longer range and reliable power. We are very appreciative of these additions to our zodiac and that Ms. Chippy was ready for us when we arrived.

After settling in at the station, we set forth to test out our instruments. In the aquarium lab on station, we tested the DT-X echo sounder and computers and found them all working. However,

our towfish (the wooden platform that the echo sounder attaches to) was looking a little worn down. So, after some sanding and priming we gave it a new paint job! In addition to our other gadgets, FEMC installed a box on the zodiac for the towfish/echo sounder. In the previous year, it was risky to carry the towfish/echo sounder from the boat each day up a slippery slope and unsafe to leave it in the boat in case of bad weather. The box sits bolted onto the bottom portion of the zodiac platform, protecting the echo sounder on all sides.

With everything working and ready to go, we head out into Arthur Harbor and were able to complete a successful calibration of the echo sounder. However, since then we have been unable to sample due to high winds and multitudes of sea ice. In the mean time, we are preparing for the NSF site visit in December by preparing posters of our zooplankton research.

B-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: MICROBIAL / BIOGEOCHEMICAL COMPONENT

Principal Investigator: Dr. Hugh Ducklow (Ecosystems Center, MBL)

Personnel on station: Zena Cardman & Luke McKay (UNC Chapel Hill)

B-045 personnel arrived at Palmer Station two weeks ago, and have begun our first experiments for the 2011-2012 field season! Our overall objective is to observe changes in bacterial abundance and activity throughout the summer. We work closely with B-019-P (Oscar Schofield) and by integrating their data on primary productivity with our microbial data, we can see how phytoplankton and bacterial populations relate to Dissolved Organic Carbon, nutrients, temperature, salinity, Oxygen, and other factors over the next few months. Sea ice has kept our sampling at bay – literally – for most of the month, but we finally made it to Station B on the 28th for the full battery of analyses. The ice has provided an exciting opportunity, though: we melted a chunk of brash ice into a carboy of 0.2µm-filtered seawater. The ice was tinged brown with algae, and we hope to capture (through flow cytometry and Leucine incorporation) a change in this ice-associated community during a ten-day incubation.

Thanks to Kaycee Coleman, Josh Mayer, and Travis Miles of B-019-P for their collaboration, and special thanks to Carolyn Lipke, Mark Dalberth, and all other RPSC staff for their wonderful support!

B-466-P: COLLABORATIVE RESEARCH: FUNCTIONAL GENOMICS AND PHYSIOLOGICAL ECOLOGY OF SEASONAL SUCCESSION IN ANTARCTIC PHYTOPLANKTON: ADAPTATIONS TO LIGHT AND TEMPERATURE

Deneb Karentz, Principal Investigator, University of San Francisco

Joe Grzymalski, Principal Investigator, Desert Research Institute

Personnel on station: Deneb Karentz, Joe Grzymalski (until Oct 20), Iva Neveaux, Bethany Goodrich, Austin Gajewski

October began with consolidated brash ice as far as the horizon, a condition that had persisted since mid-September. On October 3 it was possible to safely walk on the ice and Palmer's GSAR/OSAR team members Steve Sweet and Graham Cosgrove chain-sawed a sample hole for us in the Harbor near LTER station A. For five days we were able to collect samples and make frequent measurements of the water column on a nearly diel basis (9:00, 13:00, 17:00 and 21:00).

Salinity, temperature and light were profiled through the water column. Water and plankton net samples were processed for taxonomic identification of phytoplankton species, chlorophyll concentration, fast repetition rate fluorometry (FRRF) and isolation of nucleic acids for genome and transcriptome sequencing. These data will provide a fine-scale look at short-term changes in phytoplankton physiology and gene expression. (During this week there were many large ctenophores present in Arthur Harbor, and we also collected a number of bioluminescent zooplankton organisms.)

The ice eventually cleared on Oct 10; however, boating conditions for the rest of the month were quite variable and unpredictable. Between too much ice or too much wind, there were only five boating days for the month of October. On those days full profiles were made for the same hydrographic and biological parameters listed above for the ice hole sampling. We continued our daily sampling of plankton species and the weekly sampling schedule from the aquarium unfiltered seawater system, collecting the same sorts of data and samples as are obtained from the Zodiac stations. Weekly phytoplankton size fractionation for chlorophyll and FRRF analyses from aquarium water is an ongoing activity. The fast repetition rate fluorometer, kindly provided by Zbigniew Kolber from University of Santa Cruz, was in continuous service quantifying photosynthetic characteristics from the unfiltered seawater system until co-PI Joe Grzymiski departed on Oct 21. Since that time, samples are analyzed every four hours on a Satlantic bench top FIRE system.

Light-adaptation experiments with phytoplankton cultures generously donated to us by B-239-P (Steward) continue as described in the September report. These experiments are being conducted under controlled light:dark conditions and will provide excellent data to the central, environmental focus of our project. Over 30 new cell isolates have been cultivated from water samples and these clones will be used to further characterize and compare genomic and transcriptomic characteristics on an inter- and intra-species basis.

Our scientific focus remained on characterizing changes in phytoplankton community composition coincident with changes in local physical/chemical conditions such as changes in day length, average light levels, mixed layer depth and other factors that will be determined at home (e.g., nutrients). Community composition changes and phytoplankton adaptation strategies will be linked to community gene expression changes measured using massively parallel sequencing. The latter analysis will be done in years 2 and 3 of the project.

Thank you to Palmer Area Director Bob Farrell, Boating Coordinator Graham Cosgrove, and the entire Palmer Station summer team for their excellent support.

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT

October 2011

Brian Nelson

G-090-P GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION.

Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

The Research Associate operates and maintains on-site equipment for the project. Station PMSA is one of more than 143 sites in the GSN monitoring seismic waves produced by events worldwide. Real-time telemetry data is sent to the U.S. Geological Survey (USGS).

Data collection occurred normally during the month.

A-132-P FABRY-PEROT INTERFEROMETER

Qian Wu, Principal Investigator, National Center for Atmospheric Research

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

Data collection occurred normally during the month.

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

Mathew Lazzara, Principal Investigator, University of Wisconsin

The Research Associate operates and maintains on-site equipment for the project. The AMRC SDI 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.

A temporary fix has been put in place by the PI, returning the data display to normal, visually. The data ingestor is not receiving information from TeraScan, and so it is contacting a server at the University of Wisconsin for that data.

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 O₂ (detected through changes in O₂/N₂ ratio), which can aid in determining rates of marine biological productivity and ocean mixing. The results are also used to help determine the terrestrial and oceanic distribution of the global anthropogenic CO₂ sink. The program involves air sampling at a network of sites in both the Northern and Southern Hemispheres. Palmer Station is especially well situated for resolving signals of carbon cycling in the Southern Ocean.

The Research Associate collects samples fortnightly from both TerraLab and the VLF Building. A goal is that all sampling will eventually be moved to TerraLab. Samples taken from the station are sent to Scripps where the analysis of O₂ and CO₂ content takes place.

Sampling equipment and operations were per plan throughout the month.

G-239-E SOIL PROPERTIES, PERMAFROST, AND ACTIVE-LAYER DYNAMICS

James Bockheim, Principal Investigator, University of Wisconsin

The overall objectives of this project are to describe, sample, and classify soils at key sites along the Antarctic Peninsula to be used as benchmarks for evaluating the consequences of continued climate warming in the region and for examining latitudinal gradients in soil properties.

The Research Associate responds to requests concerning the weather station on Amsler Island.

Several trips were made to the station to try to retrieve data from the logger. The battery had insufficient voltage and was brought back to station for recharging. After being reinstalled back into the system, data could still not be retrieved from the logger. Troubleshooting will continue as weather allows.

O-264-P: COLLECTION OF ATMOSPHERIC AIR FOR THE NOAA/GMD WORLDWIDE FLASK SAMPLING NETWORK

James Butler (Principle 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.

Palmer Station is one of many sites around the world providing data to support these projects. The Research Associate collects weekly air samples for Carbon Cycle Greenhouse Gases Group and fortnightly samples for Halocarbons & other Atmospheric Trace Species Group.

Carbon Cycle and Halocarbon sampling occurred normally during the month.

O-264-P: Ultraviolet (UV) Spectral Irradiance Monitoring Network (UVSIMN)

The Research Associate operates and maintains on-site equipment for the project. A 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, while the sun is above the horizon. A BSI GUV-511 filter radiometer, which has four channels in the UV and one channel in the visible for measuring Photosynthetically Active Radiation (PAR), is located next to the SUV-100.

The UV monitor collected data normally for the month. At the end of October, the 45 watt lamp power supply blew a fuse, affecting daily calibration scans for a few days. The fuse was replaced and the unit is being monitored. A spare power supply was already scheduled to arrive at the next port call.

O-283-P ANTARCTIC AUTOMATIC WEATHER STATIONS (AWS).

Mathew Lazzara, Principal Investigator, University of Wisconsin

The Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point. 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 weather station ran normally during the month.

G-295-P GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Bjorn Johns, Principal Investigator, UNAVCO

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

The GPS operated normally for the duration of the month.

A-109-P ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION.

Robert Moore, Principal Investigator, University of Florida

The Research Associate operates and maintains on-site equipment for the project. Extremely Low Frequency/Very Low Frequency (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. Lightning source currents are estimated or directly measured by experimental observations of individual natural and rocket-triggered lightning flashes in North America. Together, the North American and Antarctic data sets are used to experimentally identify and analyze the components of lightning and the effects of lightning, such as lightning-induced electron precipitation, that are observed in the Antarctic, more than 10,000 km distant.

Data collection went as planned for the month.

A-306-P GLOBAL THUNDERSTORM ACTIVITY AND ITS EFFECTS ON THE RADIATION BELTS AND THE LOWER IONOSPHERE.

Umran Inan, 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 (uppermost layer of the atmosphere ionized by solar radiation) and magnetosphere (the area surrounding the earth dominated by the Earth's magnetic field and particles trapped by it. Many of these studies relate to the energetic releases associated with lightning. For example, Palmer Station's unique location enables it to pick up small bits of radiation from lightning strikes as far away as Africa, the USA, or the Pacific Ocean.

Data collection was normal throughout the month.

T-312-P TERASCAN SATELLITE IMAGING SYSTEM.

The Research Associate operates and maintains on-site equipment for the project. Throughout the month, the TeraScan system collected, archived, and processed DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. A weekly 85GHz SSM/I ice concentration image was produced and transferred to UCSB for B-032-P (Smith).

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 through 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. Palmer's magnetometer is also a conjugate to the Canadian Poste de la Baleine station, allowing the study of conjugate differences in geomagnetic substorms and general auroral activity. The station Research Associate maintains the on-site system.

The system collected data normally during the month.

B-390-P: THERMO-SALINOGRAPH

Vernon Asper, Principal Investigator, University of Southern Mississippi

Sea water is pumped continuously through a thermosalinograph (TSG) sampling system, recording the temperature, conductivity, salinity, and fluorescence. The real-time data, including graphs and web camera images of the ocean in the vicinity of Palmer Station, are compiled by a local server into web page format and relayed to a mirror site at Woods Hole Oceanographic Institute, which is a collaborator in the project. The URL for the WHOI mirror site is <http://4dgeo.whoi.edu/tsg/>.

The thermosalinograph operated normally during the month, but the website isn't being updated, probably due to continued server issues after hurricane Irene.

T-998-P: IMS RADIONUCLIDE MONITORING

Managed by General Dynamics

The International Monitoring System (IMS) radionuclide sampler is part of the Comprehensive Test Ban Treaty Organization (CTBTO) verification regime. The automated Radionuclide Aerosol Sampler and Analyzer (RASA) unit pumps air continuously through a filter for 24 hour periods, collecting particulates in the .2-10 micron range. The filter is then tested for particulates with radioisotope signatures indicative of a nuclear weapons test. The station Research Associate operates and maintains the instrument.

The system ran normally throughout the month.

TIDE GAGE

The Research Associate operates and maintains on-site equipment for the project. Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. Although salinity (conductivity) is also recorded by the tide gauge, the measurements are incorrect and should not be used. Correct salinity data can be found on the TSG system.

The tide gauge operated normally during the month.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. At the end of the month a summary report is prepared and sent to interested parties. 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 PalMOS anemometer suffered damage toward the end of the month. There was a brief wind speed outage while the spare anemometer was prepped and installed. Scheduled inspections were carried out at the Gamage Point tower. Weather updates and satellite imagery were forwarded to the R/V LAURENCE M. GOULD.