

**PALMER STATION MONTHLY SCIENCE REPORT**  
**September 2011**



**Joe Grzyski and the B-466-P (Karentz) field team take advantage of a breakup of the sea ice and perform phytoplankton and water sampling from a zodiac.**

*Image Credit: Bethany Goodrich*

**NEWS FROM THE LAB**

**By Carolyn Lipke, Assistant Supervisor of Lab Operations**

Palmer Station spent most of September enshrouded in sea ice. Mid-month the *ARSV Laurence M. Gould* returned to station carrying the summer season support staff. After a long turnover period most of the winter-over support staff departed on a well deserved trip home.

The Karentz group (B-466-P) was busy in the lab and even had some opportunities for on-the-water sampling before the sea ice blew back in. The Research Associate kept Terra Lab instrumentation humming away as usual, and the rest of the science support staff began preparing labs for the incoming summer research groups arriving in October.

## **SEPTEMBER 2011 WEATHER**

**By Neal Scheibe, Research Associate**

September was a tug of war between windy storms and beautiful sunny days. Multiple turbulent systems pushed through, yet in between each of them Palmer Station was treated to clear vistas of the mountains and surrounding islands. The average wind speed for the month was 11 knots, with a peak of 68 knots on the 24<sup>th</sup>. Snowfall was average for September at 37cm, bringing the year-to-date snowfall to 180cm, which is down nearly 60cm from this time last year.

The average temperature for September was a chilly -5.8°C, with the minimum temperature of -19.1°C coming on a blustery 27<sup>th</sup>. The high of 4.0°C came on the 3<sup>rd</sup>, melting away much of the snow that had accumulated around station.

Sea surface temperatures remained reasonably steady near -1.5°C throughout the month. The ice that had persisted throughout the boating limits for several weeks suddenly gave way to open water on the 20<sup>th</sup>, only to return just as rapidly on the 24<sup>th</sup>. Palmer Station remains besieged by ice off to the horizon at month's end yet again.

### **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, Iva Neveaux, Bethany Goodrich, Austin Gajewski

September began with open water conditions and ended with consolidated sea ice. Our group continued to sample the seawater aquarium intake system at regular intervals. Our fast repetition rate fluorometer kindly provided by Zbigniew Kolber from University of Santa Cruz was operational the entire month with limited downtime for cleaning and periodic maintenance. This instrument continuously monitors the photosynthetic potential of organisms from an unfiltered seawater line in the aquarium. As well it is used to profile the response curve of organisms to various levels of light.

Given the amount of station time we initiated a series of experiments on cultures of diatoms kindly cultured and left by the B-239-P (Steward) group. We thank the Steward lab for leaving us this valuable resource. These experiments are being conducted under controlled light:dark conditions and will provide excellent data to the central, environmental focus of our project.

Our group collected phytoplankton samples, CTD and light profiles and fluorescence measurements from LTER stations A,B,C and E depending on brash ice conditions. In total we were able to sample from Zodiac on 10 different days during the month. The last day of open water was September 18<sup>th</sup>.

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 (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. An example from September 16 at Station E, of *in situ* physiological differences based on what phytoplankton are dominant in a given sample is shown in Figure 1.

Our September was aided by an incredibly smooth transition from the winter over crew to the summer crew; for this we thank Bob Farrell, Perri Barbour and the entire Palmer Station winter and summer team.

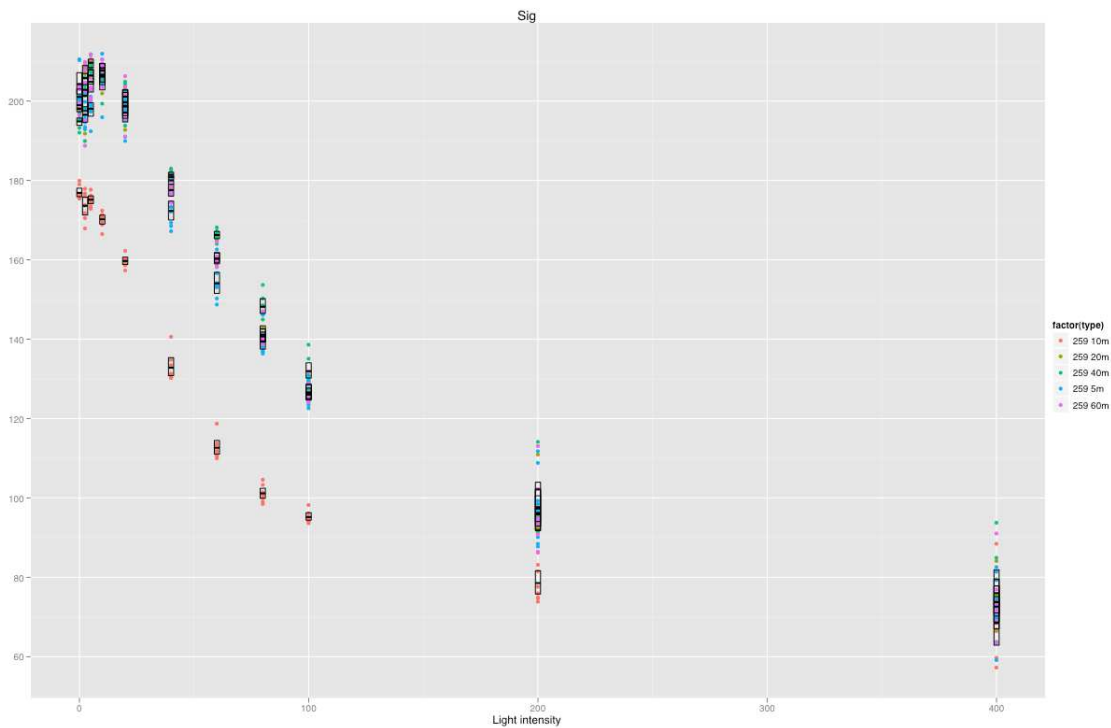


Figure 1. Changes in the absorption cross section of photosystem II versus light intensity from seawater samples collected from LTER Station E, Palmer Station, Antarctica. Depths are indicated by colored points – water was collected from 5, 10, 20, 40 and 60m. We attribute the difference between the 10m sample and the other depths not to light adaptation in this strongly mixed water column but to species composition of the sample – all samples except the 10m sample were dominated by the diatom *Corethron*.

## **PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT September 2011**

Neal Scheibe

### **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.

### **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.

A switch sensor on the azimuth control of the sky scanner was replaced, after having failed in August. The interferometer had not been running since then. After installing the new sensor on September 18, the interferometer began functioning normally again.

### **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.

The ingestor screen still does not display the data, but the PI has been working on updating the software remotely to resolve the issue. Otherwise, the system is working normally.

### **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<sub>2</sub> (detected through changes in O<sub>2</sub>/N<sub>2</sub> 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 CO<sub>2</sub> 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 O<sub>2</sub> and CO<sub>2</sub> content takes place.

Sampling equipment and operations were per plan throughout the month. A crate of flasks was prepared for shipment to Scripps and new flasks were received during the month.

#### **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 (N<sub>2</sub>O) 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. A crate of flasks were prepared for shipment back to NOAA and one new crate arrived.

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

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. An annual three lamp calibration and system inspection was carried out near the end of the month.

#### **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.

New batteries and a solar panel were installed on the Bonaparte Point automated weather station. The old batteries and solar panel were disposed of, while the plastic case containers used for housing the batteries were shipped back to University of Wisconsin. The system has worked normally, outside of the two hours needed for the battery swap.

**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

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. Data was archived onto a backup drive. The backup drive became full mid-month, so older data was cleared off of it.

**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.

After an upgrade to the local network software by Palmer's information technology group, there was diminished data flow coming from the VLF computer. Once the software updates were removed, data transfer resumed as it had prior to the update. 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 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. 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.

### **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.

There was a twist in the filter media running across the blower vents within the RASA unit. This same issue occurred in July, both times being noticed by a drop in blower pressure. The twists were manually corrected and the following filter advances were observed by the local operator.

At the end of the month, the filter media rolls, the mylar backing material, and the barcode label roll were all replaced. The new media will last until about September of 2012.

## **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).

Scheduled inspections were carried out at the Gamage Point tower. Weather updates and satellite imagery were forwarded to the R/V LAURENCE M. GOULD.