

## PALMER STATION MONTHLY SCIENCE REPORT

### April 2011



A group effort: relocating the VLF antenna (A-306-P)  
*Image Credit: David Strauss*

### NEWS FROM THE LAB

**By Melinda Piuk, Winter Assistant Supervisor of Lab Operations**

The beginning of April brought a transformation to Palmer Science with several groups concluding their summer seasons and other scientists arriving on station to commence their work. The *ARSV Laurence M. Gould* (LMG) departed station and headed north with a majority of the summer support crew and several scientists. Departing groups, Fraser (B-013-P), Schofield (B-019-P), Steinberg (B-020-P), Ducklow (B-045-P), and Steward (B-239-P) wrapped up their work and headed back home. Members of Amsler/Baker/McClintock (B-022-P), Lee (B-256-P), and Bockheim (G-239-E) were left on station to enjoy conducting their research in unseasonably agreeable weather.

The LMG had a quick turn-around and arrived back at the station in mid-April with several visitors and a new science group. Kristin O'Brien's group (B-036-L/P) arrived to conduct their research through early June on the biochemical and physiological characteristics of Antarctic fishes. The group stayed aboard for a fishing cruise departing the next day. NSF visitors, Alex Isern and Tim McGovern, visited in order to gain familiarization with science support and to investigate possibilities for future expansion of the science program. Alex was based at the station, while Tim stayed aboard the LMG for the fishing cruise. Stewart Lamerdin of UNOLS (University-National Oceanographic Laboratory System) stayed for a week to evaluate the

feasibility of sending a regional class research ship to Palmer. Qian Wu also arrived for a week to perform maintenance on the A-132-P Interferometer.

The LMG returned from its fishing cruise and departed with our visitors, a few support staff, and several scientists. Jim Bockheim's group (G-239-E) completed their month of deploying soil instruments in the area and returned home with the LMG.

## **APRIL WEATHER**

**By Neal Scheibe, Research Associate**

The long spell of fantastic weather around station has finally been snapped, but not until late into April. Only a handful of boating days were lost this month, allowing various science groups to enjoy plentiful trips to the field. Winds reached a high peak gust of 64 knots on April 28, but prior to that average daily winds were in the single digits or low teens.

The coldest temperature was on the 10th at  $-6.8^{\circ}\text{C}$  and the warmest was on the 22nd at  $4.5^{\circ}\text{C}$ . The average temperature for the month was  $-1.9^{\circ}\text{C}$ . Sea surface temperatures stayed close to zero, with the average for the month coming in at  $0.1^{\circ}\text{C}$ . Little sea ice was observed around station, with no large bergs taking up residence around the boating area either.

The end of April brought the first layer of what should be a winter-long blanket of snow around station. While no large storms dropped significant snowfall, drifting left 11cm of snow at the snowstake at month's end. Palmer received 17 cm of snowfall throughout the month and measured only 8.1 mm of melted precipitation, both well below this time last year.

## **B-022-P: THE CHEMICAL ECOLOGY OF SHALLOW-WATER MARINE MACROALGAE AND INVERTEBRATES ON THE ANTARCTIC PENINSULA**

Charles Amsler and James McClintock, Principal Investigators, University of Alabama at Birmingham,

Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Bill Baker, Charles Amsler, Margaret Amsler, Bill Dent, Ruth McDowell, Jackie Salm, Kate Schoenrock, Julie Schram

April was another outstanding month for diving operations, continuing the outstanding streak of good weather that began in March. We completed 42 research scuba dives during April, with only three days between 1 and 27 April where weather precluded diving operations. In addition to collections for a wide variety of laboratory projects, we were able to recover/redeploy plants for interim measurements as part of a growth experiment on small concrete substrates in Kristie Cove. We also deployed and recovered three short-term experiments looking at consumption of filamentous intertidal algae transplanted to the subtidal.

The numerous collecting opportunities provided by the good weather also allowed us to stay very busy in the labs with feeding bioassays, reactive oxygen defense assays, and structural defense measurements. Diving collections also supported a variety of chemical extractions and preparations for experiments here and at our home institutions.

Team members Bill Baker and Bill Dent redeployed with LMG11-03 on 4 April and Jackie Salm redeployed with LMG11-04 on 24 April.

We are grateful for the generous and professional assistance of numerous RPSC staff. Phil Spindler, Mindy Piuk, Christina Hammock, Tom Purcell, and Neal Scheibe deserve special thanks for facilitating our laboratory and diving operations. We are also very grateful to Chance Miller and the other LMG Marine Techs for generously supporting dive operations from the Tin Can during the first few days of April.

### **B-036-P: LINKAGES AMONG MITOCHONDRIAL FORM, FUNCTION AND THERMAL TOLERANCE OF ANTARCTIC NOTOTHENIROID FISHES**

Dr. Kristin O'Brien, Principal Investigator, University of Alaska, Fairbanks

Personnel on station: Kristin O'Brien, Lisa Crockett, Devin Devor, Irina Mueller, and Paula Dell

Members of B-036 arrived at Palmer Station on Sunday, April 17. One field team member, Irina Mueller, remained at the station to unpack and set up equipment and begin experiments while all others in the field team (O'Brien, Crockett, Devor and Dell) went fishing on board the LMG. We departed Palmer Station on Monday, April 18 and returned Thursday, April 21. While we were out fishing, Harry Snyder and Rob Lyons from FEMC did a fantastic job assembling our tanks for measuring thermal tolerance in red- and white- blooded notothenioid fishes. The tanks were up and running by April 27 and we began measuring thermal tolerance under normoxic and hyperoxic conditions in the red-blooded notothenioid, *Notothenia coriiceps*. We also harvested tissues to measure parameters associated with oxidative stress in notothenioid fishes.

### **B-256-P: ROLE OF DEHYDRATION AND PHOTOPERIODISM IN PREPARING AN ANTARCTIC INSECT FOR THE POLAR NIGHT**

Richard E. Lee, Jr. and David L. Denlinger, Principal Investigators, Miami University, Oxford, Ohio and Ohio State University, Columbus, Ohio.

Personnel on station: Yuta Kawarasaki and Nicholas Teets

April posed a great challenge for sampling of *Belgica antarctica* larvae due to the freezing of the ground and increased snow cover. However, we managed to collect enough larvae to carry out a number of experiments designed to characterize changes that are associated with larvae preparing for the winter.

Continuing from our experiments in January, groups of field-collected midge larvae were left in the backyard to study the expression of clock genes. Clock genes are the genes that are responsive to daily light cycles and used by many animals to keep track of the seasons. We hypothesize that despite a drastic change in day length between summer and winter in Antarctica, midge larvae still use this mechanism to trigger anticipatory responses for the coming of winter. The samples left in the backyard were processed every three hours throughout the day and night and the results will be compared with the January samples. Additional experiments were carried out to characterize physiological differences between summer and winter larvae.

We are grateful to station personnel for their support. Especially, we thank Phil Spindler, Mindy Piuk, and Christina Hammock for their assistance in the laboratory. We also thank Kendall Barbery and Tom Purcell for the boating support. The field collection could not have been completed without the help from Harry Snyder, Jeff Otten, and Christina Hammock.

**G-239-E: IMPACT OF RECENT CLIMATE WARMING ON ACTIVE-LAYER DYNAMICS, PERMAFROST, AND SOIL PROPERTIES ON THE WESTERN ANTARCTIC PENINSULA**

Dr. James G. Bockheim, Principal Investigator, University of Wisconsin, Madison

Personnel on station: Kelly Wilhelm, Adam Beilke, and James Bockheim

We achieved the following during our visit 27 March to 23 April: (1) installed soil climate station at Old Palmer; (2) described and sampled 12 soils on various landforms; (3) installed 10 shallow boreholes (1.2-1.6 m) in the “Backyard,” at Old Palmer, and on Hermit Island, and (4) identified a site for a 20-m borehole for monitoring permafrost dynamics next field season. The soil climate station is recording air temperature, rainfall, relative humidity, photosynthetically active radiation, wind speed and direction, and soil temperature, moisture, and salinity at four depths. The station is equipped with a camera which automatically takes photographs of snow cover near 12 stadia rods. A total of 36 soil samples were collected and will be sent to the UW Soil Testing Laboratory for analysis. The boreholes are at elevation ranging from 15 to 67 m above sea-level and automatically record soil temperature at 5, 15, 40, 60, 80, 100, 120, 140, and 160 cm. The permafrost borehole will be sited on “Mt. Amsler” at an elevation of 67 m. Our project is part of PERMANTAR, an international study aimed at active-layer (seasonal thaw layer) and permafrost dynamics along a latitudinal gradient on the western Antarctic Peninsula. We gratefully acknowledge the assistance of RPS staff at Palmer and the crew of the LMG.

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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.

The focus mechanism in the Fabry-Perot Interferometer was replaced during a visit by the principle investigator. The computer keyboard, monitor, and mouse were moved outside the dark room to allow access to the computer without causing light contamination to the instrument.

**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 operated normally for the duration of the month.

**O-204-P A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL TO DECADEAL 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.

**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.

**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.

### **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 was halted throughout the month. See A-306-P below for more details.

### **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.

A grantee from Stanford visited early in the month to help troubleshoot the ongoing problems with the antenna and cabling. The antenna move was completed by the riggers and the cable was moved back inbounds on the glacier. A section of cable was replaced by the grantee, which temporarily restored the system to normal operation. Soon after the departure of the grantee, the system began to experience the same problems that have plagued it for several weeks. The power supply began blowing fuses and the remaining older sections of cable that had not been replaced were experiencing a large voltage drop, which was resulting in the voltages from the power supply to be severely reduced once measured at the pre-amp at the antenna on the glacier. The section of cable that had been taken out of the system was brought to TerraLab to allow it to warm up and have one of the connectors replaced. This refurbished cable was placed back into the system to replace one of the suspected remaining bad cables, but with no change to the signal reaching TerraLab. No other known-good cables exist on station. Troubleshooting continues at month's end and plans were made to have another site visit by representatives from Stanford with fresh cables.

### **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 system operated normally during the month, using the cloned system that is on loan from the Palmer IT department. Spare parts for the repair of the original system arrived at the end of the month, but have not yet been placed into operation.

### **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.who.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 (CTBT) 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 operated normally throughout the month. Annual maintenance was performed during a site visit by a grantee for this project. The uninterruptible power supply was found to be faulty and a new one was placed on order.

## **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 month and all scheduled calibrations were carried out. During a site visit by a grantee for this project, the instruments were given thorough maintenance checks and calibrations using independent light sources. The on-hand inventory was checked and spares were ordered as needed.

## **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.