

**PALMER STATION MONTHLY SCIENCE REPORT**  
**October 2010**



Man overboard training, Boating II: Survival and Islands course  
*Image Credit: Sean Bonnette*

**NEWS FROM THE LAB**

**By Tracey Baldwin, Manager Science Support**

Early October resembled winter in many ways; the station population did not change, the wildlife was almost nonexistent, the wind blew, and the temperatures stayed cold. The station's summer support staff participated in the training for special teams, such as Ocean Search and Rescue pictured above. However, come mid-month and the return of the *Laurence M. Gould* (LMG) our routine changed. We welcomed back our friends on the LMG after they successfully opened the Copacabana field station.

The season started as planned with the arrival of our first science groups with representatives from the Long Term Ecological Research project (LTER) and one representative for Rebecca Dickhut's ODEN project. By the end of the month, the LTER projects completed their early season sampling and were well on their way to an established routine. The Dickhut project also got an early start with a very quick deployment of their two air sampling units.

The RPSC Hazardous Waste Department also arrived to station to complete a rare spring hazardous waste removal. Every two years, the Haz. Waste department spends several weeks at station preparing science and operational hazardous waste for shipment back to the United States for disposal. Typically, this occurs during the winter. The Palmer Station RPSC staff is happy to have our “wasties” with us during the better weather of the summer months. Sadly, the weather has not cooperated for the first half of their stay. The wind, rain, and constant snow conditions are leaving them wondering what summer on the Peninsula is really all about.

There were a few days with low enough winds for enjoyable recreation in the station’s backyard. But now, at the end of the month, the sun has reappeared and the wind has started to subside. The snow is melting in earnest, turning the one road around station into a river of melt water and the glacier into a slick of ice. As the weather changes, so does the pace at Palmer Station as we enter the full summer season, with penguins preparing to lay eggs, seals sunning on icebergs, and birds flying over head.

## **OCTOBER WEATHER**

**By Brian Nelson, Research Associate**

**WIND!!** One after another, low pressure systems bludgeoned the Palmer area throughout the month of October, bringing immense winds and sloppy precipitation from all directions. Peak winds topped 70 knots on several days. Average wind speed for the month was 18 knots. There were only four days with average wind speeds under 10 knots.

Precipitation came in all forms this month, combining for a total of 86 mm, melted. Snowfall was low for October at 28 cm. Snow was generally washed away quickly by wind or rain, and snowpack dropped steadily from 76 cm to 24 cm throughout the month.

Temperatures were particularly warm for October. The average temperature was -0.2 °C, two degrees above the 20-year average. Minimum temperature was -5.5 °C, and maximum was 8.3 °C, the warmest October temperature on record.

Sea surface temperatures remained reasonably steady just below -1 °C throughout the month. Brash ice blowing in from the north and west has been common. A prominent berg remains lodged just beyond DeLaca Island.

## **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: Jennifer Blum, Marc Travers

Our arrival at Palmer Station on October 11<sup>th</sup> was met with excessive winds, but we were able to tie up late in the evening and visit station briefly. Work began the following day.

Brash ice minimally impacted our field work through the rest of October; however, a number of field days were impacted by wind speeds exceeding boating limits. We were able to regularly conduct Adélie penguin counts on local islands: Torgersen, Humble, Cormorant, and Christine. Two trips were made to Biscoe Island to check the status of Adélie and Gentoo penguins; one trip to Dream Island was conducted late in the month to check the status of Adélie and chinstrap penguins, as well as brown Skuas. Breeding chronology studies have begun with the local population of Adélie penguins. Censuses of blue-eyed shags and marine mammals have also been obtained this month. In between our excursions into the field we unpacked and organized all of our gear and equipment; received and unpacked cargo that arrived with us; set up our lab and work areas; prepped files and field notebooks; updated our data sheets and databases; and made modifications to some field instruments. We also began processing samples in the lab.

Special thanks to Lily Glass for her efforts in prepping our boats prior to our arrival and working closely with us to make our operations more efficient.

Thanks to all of RPSC for their enthusiasm and efforts this month.

## **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, Travis Miles, Michael Garzio

After arriving in early October we set up the lab, took inventory of what supplies the station had available, and made sure the rest of our supplies would be on the next boat if they were not here. Boating 1 and 2 was conducted with the boating coordinator for all members of the team. Once our zodiac and platform were set up, weather permitting, we went out to stations Echo (E) and Bravo (B) to collect water samples with the Niskin bottles and to collect bio-optics with the ac-9 and Hyperspectral Profiler (spear). The sampling plan is that we will attempt to sample stations E and B on Mondays and Thursdays, or at least twice a week. On bad weather days we will sample

depths 0, 5, 10, 20, 30, 40, and 50 meters at station B, and depths 0, 5, 10, 20, 35, 50, and 65 meters at station E. On good weather days the bio-optical data will be graphed out on the water to determine at which depths to sample based on light levels and chlorophyll maxes. Once the water is back at station it is filtered for Chlorophyll A and HPLC analysis. Incubation experiments are then performed on the water using Carbon 14 to determine the primary productivity. Station B samples were collected on Oct. 21<sup>st</sup>, 25<sup>th</sup>, and 28<sup>th</sup>. Station E samples were collected on Oct. 23<sup>rd</sup>, 25<sup>th</sup>, and 28<sup>th</sup>. We had a few minor equipment setbacks including: ac-9 malfunction and calibration, Niskin bottle malfunction, and boat repair of the electric system and bowline ring. Therefore, some sampling time has been lost to repairs.

Towards the end of the month we have started acid washing for Oscar Schofield's post doctorate, Grace Saba's experiment titled: *Effects of enhanced carbon dioxide (CO<sub>2</sub>) on Antarctic phytoplankton community structure and biogeochemical cycles*. Glider work did not ensue this month, but it is planned for late November.

Preliminary results so far in October are that we have noticed the chlorophyll max is higher up in the water column at station B and deeper at station E. Additionally, on average, station B has a higher integrated mean production of milligrams of carbon per meters squared per day ( $\text{mg C m}^{-2} \text{d}^{-1}$ ).

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

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

We have, unfortunately, run into a number of issues that have prevented planned work being successfully carried out. From a logistics side, the zodiac platform requested by the group for zooplankton sampling, "Rubber Duke", is in bad condition and therefore will not be available for our use. We have, however, had excellent assistance from the RSPC science support team and the boating coordinator on station. The "Wonderbread" zodiac platform has been made available to our research until the LMG1009 cruise. We have tested out the plankton nets using "Wonderbread" but have been struggling to find the most effective and safe method for collecting zooplankton. Vertical net tows from the side of the zodiac are safe and easy to do, but they don't effectively sample the macrozooplankton community. Oblique net tows conducted while the zodiac is moving were more effective at collecting macrozooplankton, but as the net is towed from the port side of the zodiac, it acts as a sea anchor and pulls the zodiac to port side. On one attempt it actually started to tilt the zodiac towards port. We immediately stopped that particular attempt as we felt it was too dangerous to continue. At the moment, the only other option seems to be to try towing the net over the stern of the zodiac, but this also has the potential to be very dangerous as the cable would run next to the head of the person driving the boat. We have not yet attempted this.

The planned experiments have not yet been conducted since not enough zooplankton are being caught with the plankton nets. The DT-X Towfish echosounder has been set-up and we will be using this to locate krill aggregations for targeted sampling in order to

collect enough zooplankton to run the trophic cascading experiments. Data from the echosounder may also help to reveal the distribution patterns of krill in the waters within the Palmer Station safe boating limits, which in itself will provide valuable information.

## **B-045-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, MICROBIAL ECOLOGY COMPONENT**

Hugh Ducklow, Principal Investigator, Marine Biological Laboratory, Woods Hole Massachusetts

Personnel on station: Alice Alpert, Edgar Woznica, Kelsey Ducklow

This is our first report since we arrived on station on October 11. We are off to a running start this season collecting data that help develop a picture of nutrient cycling and marine productivity in the waters surrounding Palmer station. We are tightly coordinating with the B-019 group studying phytoplankton, conducting fieldwork together and sharing physical oceanographic data. We collect water at two sites near Palmer station from aboard a F580 zodiac. The past month has been characterized by unusually high winds here, posing some challenges for field work. We have, though, collected water on the five occasions in which it was safe to do so. Twice we have reached both of our collection sites in a single day. We are quite happy with the amount of field work we have been able to carry out despite the challenging weather conditions.

Our purpose is to filter water to measure dissolved organic carbon and nutrients such as silicate, phosphate and nitrate, which will be analyzed at the Marine Biological Laboratory in Woods Hole. These data tell us about what materials are available for bacterial and plankton growth, and what nutrients may be at low enough levels to limit growth. In addition, we filter water to measure both the DNA of the organisms present and the ratio of Carbon, Hydrogen and Nitrogen in the water. The correlation or lack of correlation between the availability of these nutrients and the growth of bacteria and plankton can give us an insight into what physical or chemical parameters are limiting growth in this ecosystem.

At this early point in the season, we expect to observe an initial bloom in bacterial growth as light levels increase. This year we are very excited to be able to document this bloom using a powerful new instrument: a flow cytometer. This technique allows us to measure bacterial abundance extremely accurately as well as record changes in specific populations within the bacterial and plankton community such as diatoms, dinoflagellates and blue-green algae. We use stains and varying wavelengths of light in order to see distinguishing characteristics of these organisms such as size and the presence of chloroplasts and cell nuclei. We look forward to following these populations throughout the summer season.

In addition, we are conducting experiments in which we allow bacteria to incorporate the radioactively tagged amino acid Leucine as part of their growth process. Measuring the level of radioactivity in the bacteria after a given period of time permits us to calculate the growth rate of the bacteria.

In order to learn more about the relative growth rates of the bacteria and the dinoflagellate grazers that eat them, we conduct week-long growth experiments in the environmental rooms here at Palmer station. Seawater in 2-Liter bottles is sampled daily and we do flow cytometry and radioactive amino acid incubation analysis. Based on the relative growth of the bacteria and the grazers we can gain insights into the balance of growth rates over time in these two populations.

We would like to thank Tracey Baldwin, Jonathon Miller and Lily Glass and the whole RPSC team for being incredibly responsive, helpful, and accommodating to our requests for assistance. We could not do our work without you! We also would like to thank Kelsey for working us this month, and wish her luck with the birders!

**B-389-P COLLABORATIVE RESEARCH: PERSISTENT ORGANIC POLLUTANTS IN THE ANTARCTIC MARINE FOOD WEB: IMPACT OF CLIMATE CHANGE AND INSIGHTS INTO THE FEEDING ECOLOGY OF APEX PREDATORS**

Rebecca Dickhut, Principal Investigator, Virginia Institute of Marine Science

Personnel on station: Jenna Luek

Arrival at station went smoothly and sampling began on October 19<sup>th</sup>. We have two air samplers running twenty-four hours a day in the backyard collecting both particulate and gas-phase compounds. Snow has been collected on Torgerson, Jacobs, and Old Palmer Islands, and melted and filtered in the lab. Glacial snow and glacial melt water will be collected and processed in the next few days, and sample collection will wrap up by the end of the week. Samples will be sent north on the *R/V Laurence M. Gould* and will be processed for persistent organic pollutants at the Virginia Institute of Marine Science. We are very thankful to all of the RPSC staff who have assisted in sample collection.

**RESEARCH ASSOCIATE MONTHLY REPORT**

**October 2010**

By Brian Nelson

**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.

**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 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.

**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 continued throughout 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 continued normally through the month, but problems with the VLF computer caused occasional data loss and regular communication loss. A replacement computer is currently en route. Maintenance and repairs were performed on the VLF antenna.

### **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.

### **A-357-P EXTENDING THE SOUTH AMERICAN MERIDIONAL B-FIELD ARRAY (SAMBA) TO AURORAL LATITUDES IN ANTARCTICA**

Efthyhia 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/tsq/>.

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. Construction taking place within the RASA room continues to a much lesser degree. Again, no impact on data collection occurred.

### **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 schedule calibrations were carried out.

### **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.

The temperature sensor on the PalMOS system was replaced. The monthly meteorology report for October still used temperature data from the backup modular automatic weather system (MAWS). All future reporting will revert back to PalMOS data.

The ceilometer has returned to station after repairs and calibration by the manufacturer, however, a communications issue is still preventing data collection. Troubleshooting is underway.