

PALMER STATION MONTHLY SCIENCE REPORT

November 2009



Expedition Yacht *Spirit of Sydney*, MV *National Geographic Explorer*, and Zodiacs operating in Arthur Harbor

Image Credit: Zenobia Evans

NEWS FROM THE LAB

Tracey Baldwin, Supervisor of Laboratory Operations

Life at Palmer has been a whirlwind these thirty days of November. Ships and yachts called on station, opening the summer tourist season and delivering supplies and fresh faces. Local biological and iceberg activity increased remarkably and station personnel gave thanks during an extraordinary holiday celebration. The local weather remained calm, facilitating science sampling schedules. We continue to move snow from one place to another as we patiently wait for the melting of the persistent snowpack.

The R/V *Laurence M. Gould* (LMG) stopped by station for an early port call as satellite imagery indicated a challenging ice pack near her intended destination on the east side of the Antarctic peninsula. The friendly faces of the science teams en route to James Clark Ross and Livingston Islands added to the festive environment in the days leading up to our holiday celebration. The early port call was greatly appreciated as fresh fruit and vegetables arrived in time for the Thanksgiving feast prepared by our two outstanding station chefs, Stacie Murray and Diane Curran. We also welcomed to the celebrations a group of science journalists led by Chris Neill from the Marine Biological Laboratory (MBL).

The MV *National Geographic Explorer* cruise ship also called on Palmer Station twice during the month of November, officially opening the tourism season. The first Explorer visit facilitated a timely turnover of station managers Bob Farrell and Rebecca Shoop. Station science and support personnel greeted astronaut Neil Armstrong during the second Explorer visit. We were

welcomed aboard to attend Mr. Armstrong's lecture linking his space exploration and both historic and current Antarctic exploration. The lecture was a moving experience and the opportunity to meet a historical figure was greatly appreciated by all. The expedition support yacht *Spirit of Sydney* also stopped by station, spending an evening snugly tied in Hero Inlet. The contrasting experiences of tour ship to small yacht were readily apparent as we supported visits by both within a day of each other. The activities of those few days in November once again reminded us of the great opportunities available at Palmer Station, meeting exciting people and hear of their unique adventures while living unique adventures of our own. Outreach efforts are in full swing as we promote Antarctic science and these experiences. Much of the outreach on station is being conducted by the three science journalists here to experience polar field science. A brief synopsis of their early season activities is included in this station science report.

The journalists and others observed the regular appearance of whales within the visible limits of station. Humpback and minke whales are now frequent visitors yet they remain in singular or small pods. Whale watching is a favorite activity on station and we think the early and frequent presence of the gregarious mega fauna indicates a great year to come for whale watching. The area birds are happily nesting- their recruitment efforts are closely monitored by the predator component of the LTER. A phytoplankton bloom reduced the once crystal clear ocean visibility and consequentially increased the sampling activity of the LTER phytoplankton component. The Rutgers Autonomous Underwater Vehicle (AUV referred to as a glider) fleet took to the water for weeks of steady sampling efforts in conjunction with the repeated hand sampling of the bloom.

The snow persists around station and local islands with patches of mud and gravel slowly winning the battle of time and temperature. An unusual lack of rain has allowed for the snow pack to remain this late in the field season. Low occurrence of wind this month allowed steady sampling schedules for the science groups that frequent the outer limits of the boating area. This weather break for water sampling resulted in solid early season datasets. The same science groups are beginning to shift perspective as November comes to a close. They are turning their thoughts towards preparation for the annual LTER cruise in January. Station support personnel also redefine focus as we gear up for a busy December month in preparation of a long summer season of peak populations until May. And with that we send you best holiday wishes wherever this report may find you!

NOVEMBER WEATHER

Brian Nelson, Research Associates

In continuation of this dry year, snowfall for November was low at only 6 cm (compared to the average 21 cm). Year-to-date snowfall remains very low at 192 cm (compared to the average 352 cm). Aside from peak gusts of 67 knots on the 1st, the wind was quite low for the month, averaging only 8 knots. In addition to the calm breeze and lack of precipitation, sunny days seemed to dominate this November, especially mid-month.

The mean temperature was -1.3 °C, slightly below the average of 0.1 °C. Maximum temperature was 6.5 °C, two degrees above normal. Similarly, minimum temperature was two degrees below normal, at -9.5 °C.

The tabular berg visible on the horizon in October stayed throughout November. Sea conditions changed almost imperceptibly as bands of brash and icebergs moved in and out much more

slowly than last month. Sea surface temperatures trended upward from -1.0°C to 0.0 °C during November.

THE FOLLOWING PROJECTS CONDUCTED RESEARCH AT PALMER STATION:

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, Kristen Gorman

Weather was favorable for most of November, allowing us regular field visits to all of the penguin colonies in the local area as well as Dream and Biscoe Islands. Near the end of the month, persistent high winds prevented long-distance field work for multiple days. We monitored the total number of Adélie adults and nests on Torgersen, Humble, Cormorant and Christine Islands. Breeding chronology and egg production were monitored on a subset of Adélie nests on Torgersen, Humble, Dream, and Biscoe Islands. A subset of Chinstrap nests on Dream Island and a subset of Gentoo nests on Biscoe Island were also monitored for the same purpose. A portion of these subsets of nests were sampled at the 1-egg stage to obtain adult body weights 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. The peak egg census for Gentoo and Chinstrap penguins will be completed in December. We have also been monitoring the number of depredated eggs from all 3 penguin species on all islands.

We have continued our brown skua band resighting and have begun to monitor nests for all brown skuas in the Palmer area, as well as on Dream and Biscoe. South polar skuas began arriving in the middle of the month; we began our band resighting and nest monitoring study of them on Shortcut Island. Counts of the blue-eyed shag colonies on Cormorant Island continue. Our monitoring of marine mammals continued this month and was highlighted by the first sightings of minke and humpback whales this season. Satellite transmitters for Giant Petrels were tested and deployed, thus beginning our work with this species. An early-season census of Giant Petrel nests was completed on Shortcut Island. Databases were set up for more of our upcoming Giant Petrel work. Lab work has continued with the processing of new samples. Tests of the Lotek system on Humble Island have commenced in preparation for our Adélie radio transmitter work. The first few cruise ships of the season visited this month, one of them bringing Neil Armstrong which was a highlight for Palmer Station. Science journalists for the LTER outreach program arrived at the end of the month and we will be coordinating with them during their few weeks on station.

RPSC has continued to provide great support for our project this month. Special thanks to Jeff Otten and Ken Kloppenborg for setting up the Lotek system early this season and testing the data link, as well as to John Fonseca for his meticulous rebuild additions to the second F470.

B-019-P: Palmer Long Term Ecological Research (LTER): Looking back in time through marine ecosystem space, phytoplankton component.

Oscar Schofield, Principal Investigator, Institute of Marine and Coastal Sciences, Rutgers University

Personnel on station: Brian Gaas, Tina Haskins, and L. Alex Kahl, Institute of Marine and Coastal Sciences, Rutgers University

Due to favorable weather for much of the month, samples were collected (at depths of 0, 5, 10, 25, and 50 meters below the surface) from stations E & B on thirteen days during the month of November. For all thirteen of these days, B-019 analyzed the water samples for Chlorophyll and accessory pigments (HPLC) and stored particulate organic carbon samples for subsequent analysis. Once per week for the entire month, a subset of the water samples from each station were used for simulated *in situ* primary productivity assays to estimate the rate of inorganic carbon assimilation in the waters surrounding Palmer Station. On each of the thirteen water collection days plus another seven days, B-019 also measured the Inherent and Apparent Optical Properties of the water column at stations E & B.

Beyond the standard LTER measurements outlined above, B-019 attempted to further extend the sampling area and resolution of the LTER dataset with the deployment of the first Autonomous Underwater Vehicle capable of diving to 1000 meters, RU 25. Unfortunately, while RU 25 was flying offshore along the 600-line, a leak was detected on board. The glider was subsequently allowed to drift at the surface until a recovery option could be resolved. As a result, RU 25 drifted south of Hugo island and became ensnared in a small eddy. As of the end of the month, RU 25 was still drifting within the eddy south of Hugo Island. Another glider-related highlight of the month was Neil Armstrong's visit to Palmer Station and his stop by Lab 10 to see the gliders.

In addition to the above, B-019 also initiated mixing depth experiments with a variable light incubator. B-019 is thankful for the support and flexibility (i.e. working outside normal hours) provided by RPSC in working to help achieve both our field and laboratory objectives.

B-045-P: Palmer Long Term Ecological Research (LTER): Looking back in time through marine ecosystem space, microbial ecology component.

Dr. Hugh Ducklow, Principal Investigator, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA

Personnel on station: Margaret Waldron and Daniel Whiteley

November has been a busy and productive month for B-045. We have continued to sample twice weekly at stations B and E with B-019 for bacterial abundance, productivity, particulate organic carbon and nitrogen, dissolved organic carbon and nutrients. Due to a long streak of pleasant weather, we have been able to sample without interruption for the entire month of November. Since windy weather usually limits sampling at station E during the early part of the season, this has helped to flesh out our long-term data set. In addition to our sampling in the field, we have also completed six of our bacterial population dynamics experiments, which we are conducting in the environmental rooms at Palmer. The goal of the experiments is to assess the growth rates of different components of the microbial assemblage.

The NSF Science Journalists arrived at Palmer in late November. In addition to our regular sampling and experiments, we have been working with them on small science projects and taking them into the field to learn about our work and do hands-on scientific research.

Many thanks to B-019 for their collaborative efforts and to the RPSC support personnel for their continued assistance with our research.

Y-609-P IPY: Improving the Public's Understanding of Polar Research Through Hands-On Fellowships for Science Journalists in the Arctic and Antarctic

Christopher Neill, Principal Investigator, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA

Personnel on Station: Christopher Neill, Angela Posada-Swofford, Scott Canon, and Jason Orfanon

Three journalists and project leader Chris Neill from the Marine Biological Laboratory arrived at Palmer Station November 27. The journalists are Angela Posada-Swofford from *Muy Interesante* magazine (based in Spain and is the largest Spanish-language science magazine), Scott Canon (reporter for the Kansas City Star) and Jason Orfanon (who works for NPR.org). This project provides mid-career journalists with hands-on experience in the science of polar environmental change. The journalists will get hands-on field and laboratory experience by participating and designing experiments with in the Palmer LTER project.

On November 30, December 2, December 4 and December 7 they collected and analyzed concentrations of nitrate and chlorophyll at sampling stations "B" and "E." They will continue to collect samples there every 2 to 3 days to track the development of the annual phytoplankton bloom and its effect on ocean dissolved nitrogen concentration. On December 7 the journalists initiated another experiment to test the factors that limit phytoplankton growth in the southern ocean water near Palmer. They set up 12 carboys of 50L and assigned three to the following treatments: control, +nitrate, +trace metals, and +grazers (Antarctic krill). They will track the effect of the treatments on nitrate and chlorophyll every 2 days.

Since arriving at Palmer the journalists have initiated a large number of interactive blogs, chats and web conferences, including through *Muy Interesante*, Careers in Science (American Association for the Advancement of Science), Maloka Science Museum (Bogotá Colombia), NPR.org, Twitter and the MBL's web site.

**PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
November 2009**

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.

A temporary Uninterruptable Power Supply was installed to support the system while a new UPS sent by UNAVCO is in transit. The Research Associate requested and was granted access to the GPS receiver via the RA's computer.

The Roving GPS unit was used to collect data points per NASA's request. This data will be used to help verify information collected by the DC-8 flyover.

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

Rhett Butler, 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. Data files are recorded to tape and also sent real-time to the U.S. Geological Survey (USGS).

The station operated normally throughout the month. An off-center seismic mass was reported by the Research Associate. The grantees advised to “wait and watch,” and expect this is part of an annual trend that will pass. USGS performed a remote sensor calibration.

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 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. Second bi-monthly sample was delayed one week due to inadequate wind conditions.

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.

Sampling occurred normally during the month. The third week's samples were delayed several days due to inadequate wind conditions.

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 system collected data normally throughout the month. The anemometer direction on Bonaparte Point Automatic Weather Station was adjusted after being found to be off by 40 degrees.

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.

The system collected data normally during the month.

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).

A new master image area was created in order to provide imagery of Giant Petrel foraging grounds to the LTER group.

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 operated normally during the month.

B-390-P: THERMO-SALINOGRAPH

Vernon Asper, Principal Investigator, University of Southern Mississippi

Sea water is pumped continuously through a thermo-salinograph (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 webcam operated normally during the month. The thermo-salinograph outflow tube was attached to the aquarium floor drain mesh to prevent it from flopping about again. In response to a network vulnerability notification, the thermo-salinograph's telnet server was reprogrammed to allow network access only from necessary IP addresses, including the Research Associate's computer.

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 during the month.

T-998-P: IMS RADIONUCLIDE MONITORING

Michael Pickering, Principal Investigator, 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. Uninterruptable Power Supply batteries were replaced.

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. Incorrect conductivity and salinity readings were removed from the weather room display.

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).

Melted precipitation data will not be available until the new rain gauge arrives and is installed.

The weather room PalMOS display encountered frequent errors throughout the month. A file sharing conflict is suspected and a temporary fix has been implemented until updated error handling can be scripted.

Wind Chill information was added to the weather room display.

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