

PALMER STATION MONTHLY SCIENCE REPORT

October 2009



NASA DC-8 as seen from Palmer Station

Image Credit: Jon Brack



Palmer Station as seen from NASA DC-8

Image Credit: NASA/John Arvesen

NEWS FROM THE LAB

Tracey Baldwin, Supervisor of Laboratory Operations

October brought the first station science deployments for the 2009-10 field season and the continued migration of wildlife to Arthur Harbor and surrounding islands. The NASA “Operation Ice Bridge” scientists and crew swung by at the end of the month, saying a quick aviator’s hello on a nearly cloudless spring day. October held true in terms of Palmer Station weather events with a few days of winds so high that all were reminded we are indeed on a harsh continent and that some times, you really do need to just hold onto your hat.

The R/V *Laurence M. Gould* (LMG) arrived at Palmer Station mid month after successfully opening two Antarctic field camps; Copacabana on King George Island and Cape Sherriff on Livingston Island. Palmer Station science participants and the remaining summer support staff assisted in the openings, offering both person-power and good spirits to the operation. The same LMG passengers hit the ground running once they arrived at station. Science labs were set-up and science lectures were given explaining some findings from the previous year’s data analysis, the intentions for the upcoming season, and the basics of oceanic microbial ecology. The boat parking lot is once again full and the radio is a buzz with science communications as the science groups motor among their sampling sites.

Station communications also included aviation radios on the afternoon of Halloween from the NASA DC-8 conducting “Operation Ice Bridge” on the Antarctic Peninsula. We were given notification of “inbound ETA 8 minutes” and station personnel within earshot of the radio scurried to the pier to spot our visitors. Within minutes we were able to communicate “HI” with a hasty deployment of the station float coats. The flash of the red navigation light on the belly of the plane signaled their hello back as they flew over station, returning to their temporary home in Punta Arenas, Chile. The plane was surprisingly quiet and caused no visible disturbances of the local wildlife.

Station also greeted a large male elephant seal that was apparently taught he was not quite big enough- everywhere he went, he left a little trail of blood from his wounds, likely inflicted by a larger, dominant male. He was welcomed to station and given plenty of room to regain his strength. The Gentoo and Adélie penguins continue to pop up around the water’s edge as they seek refuge from the local leopard seal that patrols our shores. Whales were spotted on the horizon earlier in the month but have since been elusive to the watchful eyes of station boaters.

The water is warming but the incredible visibility remains. The open water and lack of significant ice cover in October allowed for frequent early sampling trips. The snowpack in the backyard and on the islands also persists, though the high winds have scoured the glacier of much of the recreation friendly snow. Snow removal around station continues despite the high winds and low yearly total. It seems the snow drifts exactly where we do not want it to go as we prepare for our first cruise ship visit in mid- November. And so until then, station personnel continue science operations and hope this report finds you well.

OCTOBER WEATHER

Brian Nelson, Research Associates

Snowfall for October was lower than average (16 cm compared to the average 42 cm). Year-to-date snowfall remains very low (186 cm compared with 330 cm). There were several windy days with peak winds over 50 knots, especially early in the month. The highest gust speed was 65 knots on the 9th. Average wind for the month was 14 knots. The latter half of the month calmed considerably, and provided several beautiful sunny days.

Temperatures this month were fairly typical of October. The monthly average was -2.9°C, the high temperature was +4.1°C and the minimum temperature was -11.7 °C.

There have been several stationary icebergs visible throughout the month, with one particularly massive tabular berg visible on the horizon. Early October saw sea ice blowing in and out dramatically, governed by the changing direction of high winds. The second half of the month had mostly open water with occasional bands of brash. Sea surface temperatures trended upward from -1.5°C to -1.0 °C in the second half of October.

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

Our arrival at Palmer Station on October 19th was met with excessive winds, thus preventing the LMG from tying up until the following morning. The winds pushed out the remaining pack ice that apparently had been around for most of September.

Brash ice minimally impacted our field work through the rest of October; however, a small mass of pack ice did return to Arthur Harbor for a few days near the end of the month, preventing access to local islands. A few field days were also missed due to wind speeds exceeding boating limits. We were able to regularly collect Adélie penguin counts on local islands: Torgersen, Humble, Litchfield, Cormorant, and Christine. A trip was made to Biscoe Island to check the status of Adélie and Gentoo penguins. Censuses of Blue-eyed Shags and marine mammals have also been obtained. In between our excursions into the field we unpacked and organized all of our gear and equipment; received and unpacked cargo; 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.

Special thanks to John Fonseca for discovering a valuable resource: ice images produced by the National Ice Center (NIC). The LTER science groups have sought to utilize this resource and it will likely prove to be very useful for successful field operations and planning throughout the season.

Thanks to all of RPSC for their enthusiasm upon our arrival.

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

After helping open the Copacabana and Cape Shirreff field camps, Brian, Tina, and Alex arrived at Palmer with the other LTER groups (B-013 and B-045) in late-October. Within one week of arriving on Station, we sampled station B at 5 depths for chlorophyll and accessory pigments. We also worked with B-045 at station B to collect depth profiles at 1 meter resolution of salinity, temperature, light absorbance (9 wavelengths), light attenuation (9 wavelengths), and backscatter (6 wavelengths). We replicated these discrete water samples and profile measurements during our second day of sampling (stations B & E) whilst coordinating sample collection with B-045 again. In addition to the field measurements we are also preparing to measure rates of primary production using an incubator that has been extensively modified by FEMC. We are setting up a second incubator to simulate various mixing depth light availability and the associated rates of

primary production by a wide range of isolated and mixed phytoplankton cultures. In addition to these phytoplankton collection and manipulation measurements, we are busy preparing our three Autonomous Underwater Vehicles (AUVs) for their upcoming flights in the Palmer Basin, to Rothera, and on the LMG during the January LTER cruise. Thus far, the season has proceeded according to schedule with the help of the LMG crew, PAL logistics, Ted from FEMC for his extensive work with our incubator, and the PAL lab supervisor and instrument technician. We are thankful for the help these groups and individuals have provided in support of B-019s science objectives.

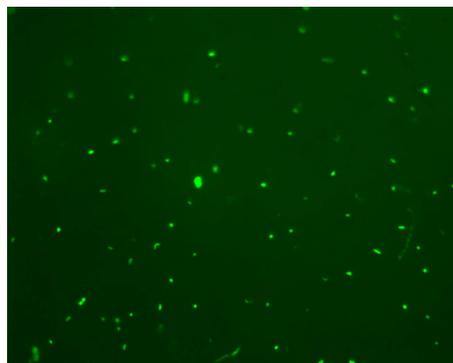
B-045-P: Palmer Long Term Ecological Research (LTER): Looking back in time through marine ecosystem space, microbial ecology component.

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

Personnel on station: Margaret Waldron and Daniel Whiteley

Maggie and Dan arrived at Palmer Station in late October to begin the field season for B-045. We began sampling at station B within the first week, joining with B-019 to collect samples for bacterial productivity, particulate organic carbon and nitrogen, flow cytometry, dissolved organic carbon and nutrients. Stations B and E were sampled at five discrete depths which will be replicated twice weekly for the duration of the season. Since our arrival at Palmer we have sampled these stations twice each. We are also continuing to filter surface water onto sterivex cartridges to preserve DNA for bacterial community composition.

In addition to the ongoing sampling in and around Arthur Harbor, we have also begun a season-long series of bacterial population dynamics experiments. These weeklong experiments are intended to help us derive a conversion factor with which we can calculate bacterial production in carbon units (e.g., $\mu\text{gC l}^{-1} \text{h}^{-1}$) from rates of molar isotope incorporation (e.g., $\text{pmol leucine l}^{-1} \text{h}^{-1}$).



Bacterial community at station B on Nov. 2, 2009. Cells magnified 1000x; image taken with Nikon Eclipse E800 microscope and Spot camera.

This season is off to a great start and we wish to thank everyone on the Palmer science support staff for their hard work. We are also very grateful to Brian Gaas, Tina Haskins and Alex Kahl of B-019 for their collaborative efforts in sampling and data collection.

RESEARCH ASSOCIATE MONTHLY REPORT

October 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.

An unplanned power outage early in the month caused a hard shut down of the system. It was returned to normal operation after power was restored. A new UPS is being sent by the group.

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.

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. Software updates were installed on the data ingestor computer, remotely by the PI.

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.

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.

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.

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.

Spectrogram generation for web data display was temporarily interrupted after the unplanned power outage, but did not affect data collection. Extra continuous data was transmitted to Stanford to capture two Terrestrial Gamma ray Flash events.

T-312-P TERASCAN SATELLITE IMAGING SYSTEM.

Dan Lubin, Principal Investigator, Scripps Institution of Oceanography

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 throughout 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 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 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 webcam operated normally during the month. The thermosalinograph was temporarily disabled to replace tubing and clean the fluorometer. The telnet server providing data from the TSG was reported as a network vulnerability. The group is looking into options to limit telnet access.

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. A special request sample was sent to a processing lab in Canada for system integrity purposes.

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.

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).

In addition to the rain gauge heater being inoperable, the unit began reporting outrageous amounts of melted precipitation about mid-month. As spare parts are not available on station, accurate melted precipitation data will not be available until the new gauge, which has already been purchased, arrives and is installed.

Scheduled inspections were carried out at the Gamage Point tower. Weather updates were forwarded to the R/V *Laurence M. Gould*.