

PALMER STATION MONTHLY SCIENCE REPORT

September 2012



Sunrise over Terra Lab.

Image Credit: Graham Tilbury

NEWS FROM THE LAB

By Janice O'Reilly, Winter Assistant Supervisor of Laboratory Operations and Carolyn Lipke, Summer Assistant Supervisor of Laboratory Operations

September was a very busy time in the labs and station wide, as the winter grantees and crew completed end of season tasks. The Detrich fish research groups (B-037-P and B-038-P) completed the work they started back in March, marking the end of a very productive winter science season. The end of the month brought the arrival of the *ARSV Laurence M. Gould* (LMG) delivering the summer support staff, a few new grantees, and some much appreciated freshies for the winter-overs. Visiting station on this port call were NSF representative Vladimir Papitashvili, Aeronomy & Astrophysics Sciences Program Director, and Qian Wu (A-132-P) who installed some new instrumentation on the Fabry-Perot Interferometer. Two members from B-045-P (Ducklow) also arrived to do some early season water sampling. The port call was busy with cargo unpacking, lab set-up, staff turn-over, emergency team trainings, and lab checkouts.

With the onset of the summer season, some animal species returned in small numbers to the Palmer Station area. During this month some bird populations increased, including blue-eyed shags and sheathbills. On 1 September a flock of approximately 300 blue-eyed shags flew by station in a northwesterly direction. On 4 September and 30 September at least 100 blue-eyed shags were observed near Elephant Rocks, swimming on the water surface in a tightly packed flock, some occasionally splashing and diving. Blue-eyed shag activities were commonly reported throughout the month, including two reports of a shag flying with nesting material in its beak. On 24 September approximately 30 terns, perhaps either Antarctic or Arctic, were observed standing on the sea ice near the pump house. Sheathbills made their presence known on station by scurrying the boardwalks, occupying the garage entrance and chasing each other on roof tops. There was one report of approximately two to four penguins on Shortcut Island, as observed from the third floor of GWR. Other birds observed almost daily throughout September included giant Antarctic petrels and kelp gulls. There was one report of a Wilson's storm-petrel early in the month. Seal reports for the month included four leopards, one Weddell, three crabeaters, ten fur seals, and two elephant seals seen hauled out on islands. There were no reports of whales during the month. Wildlife sightings for most of the month were usually limited to Palmer Station, the Backyard, and Bonaparte because of limited boating opportunities.

SEPTEMBER 2012 WEATHER

By Glenn Grant, Research Associate

September started with moderate temperatures, just below freezing, and brisk winds averaging around 15 knots and gusting into the 40's. Temperatures cooled during the first week, reaching the monthly minimum of -11.2°C on the 11th. With the cooling came lighter winds but frequent light snowfalls. The second half of the month saw a series of maritime storm fronts move through, bringing a return to warmer temperatures and high winds. The high temperature for the month was $+4.5^{\circ}\text{C}$ on the 28th, which also had the maximum atmospheric pressure of 1013.6 mb. The maximum wind gust was 57 knots, with a monthly average of 9 knots.

The same storms that arrived late in the month contributed significantly to the total snow accumulation. Snowfall on the 25th was 12 cm and, when combined with drifting, raised the snowstake level from 50 cm to the monthly maximum of 78 cm. Snowstake accumulation at the end of the month remained at 77 cm, with a monthly cumulative snowfall of 43 cm (36.1 mm melted precipitation). The average temperature of -3.1°C helped preserve the accumulated snow.

Windy conditions from the north and east throughout the month tended to push sea ice and brash up against the Peninsula and local islands. The areas of pack ice were typically poorly consolidated, consisting mostly of slushy pancakes and lumpy grey shuga ice, coated with a mushy layer of snow. At the end of the month the water temperature was still hovering around -1.7°C , cold enough to form grease ice when the winds calmed but unable to solidify on blustery days.

B-037-P MICROTUBULE FUNCTION, PROTEIN FOLDING, AND EMBRYOGENESIS IN ANTARCTIC FISHES: AN INTEGRATIVE APPROACH

H. William Detrich, Principal Investigator, Depts. of Earth and Environmental Sciences and of Biology, Northeastern University, Boston, MA

By Dr. Irina Mueller (B-038; B-029-U and B-038-P are projects affiliated with B-037-P and this report encompasses work by all three projects.)

Personnel on Station: Corey Allard (B-037-P) and Irina Mueller (B-038-P)

We finished the long-term warm acclimation of red-blooded notothenioid fish embryos (*Notothenia coriiceps*) to elevated temperatures, which will allow us to compare developmental gene expression during thermal challenge (+4° C) to that of control embryos developing at “normal” ambient temperatures (-1.5° C; B037 and B-029). In addition, embryos were exposed to heat shock protocols to determine the effect of acute temperature elevation on gene expression during development. Embryos were either preserved in RNAlater for future transcriptome analyses or were fixed for future gene expression studies by *in situ* hybridization. These studies will be carried out at our home institutions after sample retrograde.

We continued to sample embryos held at ambient temperature bi-weekly to determine the role of reactive oxygen species (ROS) in the bone development of Antarctic fishes (B-038). We focused on localization of reactive oxygen species in living embryos. Furthermore, we quantified the activity of superoxide dismutase, the first antioxidant in the defense against reactive oxygen species, in animals sampled throughout their development during this season. Finally, we acclimated embryos short-term to elevated temperatures (+4° C) to investigate the effect of temperature on the production of reactive oxygen species and antioxidant defenses in these animals. Reactive oxygen production was quantified *in-vivo* in a subset of the embryos, and the remainder was frozen for analysis of antioxidant defenses at our home institutions.

We gratefully acknowledge the ASC Palmer Station staff for their excellent and dedicated support of our winter research activities.

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT

September 2012

Glenn Grant

The incoming summer Research Associate took over duties from the winter RA at the end of September.

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION. Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

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). The Research Associate operates and maintains on-site equipment for the project.

The system operated normally throughout the month.

A-109-P: ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY (ELF/VLF) OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION (LEP).

Robert Moore, Principal Investigator, University of Florida

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. The Research Associate operates and maintains on-site equipment for the project.

A failure of the VLF receiver or antenna system occurred on September 30th. Because the A-109-P system piggybacks on the A-336-P VLF system, it is also affected by the failure. See the entry for A-336-P below for more details.

A-132-P: FABRY-PEROT INTERFEROMETER (FPI)

Qian Wu, Principal Investigator, National Center for Atmospheric Research

The Fabry-Perot Interferometer observes mesospheric and thermospheric neutral winds and temperatures at Palmer Station. The Research Associate operates and maintains on-site equipment for the project.

Qian Wu, the PI for this project, visited station at the end of September. A GPS antenna and a cloud detector were added to the instrument; the cloud detector is intended to reduce data processing by identifying times when the night sky is obscured by clouds, and thus no valid FPI data is available. The system operated normally throughout the month.

O-202-P: ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC) SATELLITE DATA INGESTOR.

Mathew Lazzara, Principal Investigator, University of Wisconsin

The AMRC 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 Research Associate operates and maintains on-site equipment for the project.

The data ingestor operated normally for 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 help to determine rates of marine biological productivity and ocean mixing as well as 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. The Research Associate collects samples fortnightly from both TerraLab and the VLF Building.

Sampling occurred regularly throughout the month.

**O-264-P: COLLECTION OF ATMOSPHERIC AIR FOR THE NOAA/GMD
WORLDWIDE FLASK SAMPLING NETWORK**

James Butler, Principal 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. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon sampling occurred normally during the month.

**O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING
NETWORK**

James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; Boulder, CO

A Biospherical Instruments (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. A BSI GUV-511 filter radiometer, an Eppley PSP Pyranometer, and an Eppley TUVR radiometer also continuously measure hemispheric solar flux within various spectral ranges. The Research Associate operates and maintains on-site equipment for the project.

The UV monitor collected data normally throughout the month. The RA performed the season-opening triple absolute calibration.

O-283-P: ANTARCTIC AUTOMATIC WEATHER STATIONS (AWS).

Mathew Lazzara, Principal Investigator, University of Wisconsin

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 Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point.

The automated weather station on Bonaparte Point has been returned to the institution for refurbishment. Data collection has stopped until the instrument is returned to Palmer Station.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Joe Pettit, Principal Investigator, UNAVCO

Continuous 15-second epoch interval GPS data files are collected at station PALM, compressed, and transmitted to the NASA-JPL in Pasadena, CA. The Research Associate operates and maintains on-site equipment for the project.

The GPS operated normally for the duration of the month. An LED fault was identified on one receiver, however data collection appears to be unaffected.

A-336-P: ELF/VLF OBSERVATION OF LIGHTNING DISCHARGE, WHISTLER-MODE WAVES AND ELECTRON PRECIPITATION AT PALMER STATION.

John Gill, 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 and magnetosphere. The Research Associate operates and maintains on-site equipment for the project.

Data collection on the VLF system stopped on 30 September due to a failure of a cable connector leading up to the antenna. Options for repair or replacement are being discussed with the grantees.

T-312-P: TERASCAN SATELLITE IMAGING SYSTEM

The TeraScan system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. The Research Associate operates and maintains on-site equipment for the project.

The TeraScan system operated normally for the month.

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

Eftyhia Zesta, Principal Investigator, University of California Los Angeles

The three-axis fluxgate magnetometer is one in a chain of longitudinal, ground-based magnetometers extending down 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. The Research Associate maintains the on-site system.

The magnetometer collected data normally the month. A replacement surge suppressor was installed on the GPS antenna cable.

B-466-P: FLUORESCENCE INDUCTION AND RELAXATION (FIRe) FAST REPETITION RATE FLUOROMETRY (FRRF)

Deneb Karentz, Joe Grzyski, Co-Principal Investigators, University of San Francisco

The focus of this project is to identify and evaluate changes that occur in genomic expression and physiology of phytoplankton during the transition from winter to spring, i.e., cellular responses to increasing light and temperature. A Fast Repetition Rate Fluorometer (FRRF) with a FIRe (Fluorescence Induction and Relaxation) sensor is installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

The FRRF was cleaned weekly and data were sent to the PIs. The FRRF experienced occasional glitches where data collection unexpectedly stopped; these were easily corrected by resetting the system. Otherwise, the system operated normally.

T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE COMPREHENSIVE NUCLEAR TEST BAN TREATY ORG. (CTBTO)

Managed by General Dynamics

The IMS Radionuclide Aerosol Sampler and Analyzer (RASA) is part of the CTBTO verification regime. The automated RASA continually filters ambient air and tests for particulates with radioisotope signatures indicative of a nuclear weapons test. The Research Associate operates and maintains the instrument.

The RASA operated normally for the month.

TIDE GAGE

Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. The Research Associate operates and maintains on-site equipment for the project.

The tide gauge software has a bug that causes it to display the wrong time zone, and this was evident during September. Data collection appears to be unaffected by the display issue. Tide data for 2011-12 was provided to B-019-P (Schofield).

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. 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).

The weather station operated normally throughout the month. Inspections were carried out at the Gamage Point tower. A temperature sensor failed on the backup weather system; the failure does not affect Palmer's primary data collection efforts or synoptic reports. Diagnosis of the problem is ongoing.