

PALMER STATION MONTHLY SCIENCE REPORT

September 2010



A quiet day in Arthur Harbor

Image Credit: Sean Bonnette

NEWS FROM THE LAB

Tracey Baldwin, Manager Science Support

September started as any other winter month here at Palmer Station. The station community continued their daily routines, the winter science continued to grow, and the display tank critters thrived just as they had all winter long. The sun started rising just a little bit higher in the sky while the snow continued to fall. Warmer weather, longer days, and incoming personnel become the quiet talk at the dinner table.

The calendar clearly marked the arrival of the *ARSV Laurence M. Gould (LMG)*, with the incoming station personnel, on Sunday the 18th. With her arrival, the winter isolation for the 18 winter over personnel ended. The winter over science from the 2009-10 season concluded with the packing up of fish embryos that slowly grew up over the long winter. The departure of this science group served as a slight break for the year round science supported on station. Mid-October will bring our summer science to a near full swing. These few weeks between winter and summer science will be full of basic maintenance on the lab facilities. We will shine the floors, scrub the sinks, and fill the facility with laboratory instruments and equipment for the start of another year of science support.

We are starting off this season well. I am happy to report that the majority of the marine invertebrates and small fish collected for the display tank remain happy and productive for the upcoming tourism season. The collection of these organisms by Chuck Amsler's group of science divers (B-022-P) last winter is greatly appreciated. This display tank allows Palmer Station visitors a glimpse of the undersea world obscured beneath their boats. It reconfirms for them that the system is more than what they can marvel at on the surface with the penguins, seals, and whales.

The *LMG* pulled into Arthur Harbor for the second time this trip towards the end of the month. Station personnel worked with the *LMG* crew to securely tie her to the pier after a quick science of opportunity sampling run for Tim Hollibaugh's work (B-114-L). This group took advantage of planned downtime by sampling from the near shore at Palmer Station, further adding to their science of opportunity. The station personnel completed turnovers with the remaining days of the port call and sent the *LMG* back north to Punta Arenas, Chile to round out the activities of the month.

And with that, we look to October and the possibilities of discovery and knowledge that lay at our doorstep. We hope this report finds you well.

AUGUST WEATHER

By Brian Nelson, Research Associate

This September had fairly typical stormy weather for the time of year, and was only notable for having less sea ice than normal. Multiple storm systems pushed through and several days saw average wind speeds over 20 knots. The average wind speed for the month was 13 knots, with a peak of 68 knots on the 14th. Snowfall was average for September at 36cm, bringing the year-to-date snowfall to 238cm.

The average temperature for September was -2.3°C, with minimum and maximum temperatures at -10.8°C and 3.9°C, respectively.

Sea surface temperatures remained reasonably steady near -1.5°C throughout the month. In early September, patchy sea ice was common, but late September saw primarily open water with occasional brash. A prominent berg remains lodged just beyond DeLaca island.

THE FOLLOWING PROJECTS CONDUCTED RESEARCH AT PALMER STATION:

B-037-P: PROTEIN FOLDING AND FUNCTION AT COLD TEMPERATURE: CO-EVOLUTION OF THE CHAPERONIN CCT AND TUBULINS FROM ANTARCTIC FISHES

H. William Detrich, Principal Investigator
Dept. of Biology, Northeastern University, Boston, MA

Personnel on Station: Corey Allard

The project completed their on station work studying several clutches of *Notothenia coriiceps* embryos. The project shipped embryos collected from suprphysiological temperature treatments for gene expression analysis and DNA extractions on *N. coriiceps* embryos for gene mapping

experiments to be completed at the University of Oregon. Live embryos were also sent back to the University of Oregon for further testing.

RESEARCH ASSOCIATE MONTHLY REPORT

September 2010

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 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. Samples collected over the winter were shipped out on LMG10-06.

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.

Carbon Cycle and Halocarbon sampling occurred normally during the month. Minor repairs were made to the sampling apparatus. Samples collected over the winter were shipped out on LMG10-06.

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.

Hard drives containing data collected over the winter were shipped out on LMG10-06. A sporadic serial port problem with the GPS unit prompted replacement, but the spare had locking issues so the original GPS was reinstalled. A new GPS unit will be sent down by the group.

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

Efthya 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. The webcam was returned to normal operation after a shut down period during construction in TerraLab. The fluorometer in the thermo-salinograph was cleaned.

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. Examination of the chiller filter showed minimal dust. Filter samples collected during the second quarter were shipped out on LMG10-06.

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 is still reporting faulty data. All reports are generated using the backup modular automatic weather system (MAWS) for temperature data.