

**PALMER STATION MONTHLY SCIENCE REPORT**  
**July 2010**



Nacreous clouds over Anvers Island during sunrise on a cold morning in July.

*Image Credit: Christopher Seliga*

**NEWS FROM THE LAB**

**Christopher Seliga, Winter Assistant Supervisor of Laboratory Operations**

The month of July started with a good old-fashioned BBQ to celebrate Independence Day, participation in a continent wide film festival, and the return of the sun. Construction in TerraLab also began this month to house a new Fabry-Perot Interferometer (FPI).

Dr. Qian Wu (PI) will deploy in November to complete the FPI installation. We are excited to add this project to the collection of Research Associate supported data collectors in Terra Lab. The FPI will analyze mesospheric and thermospheric neutral wind and temperature data. The project will work in collaboration with two other FPI's deployed to Davis and Mawson stations (Australia). Look to the future Research Associate Monthly Reports for updates as we establish this new project.

Roughly half of the station personnel participated in the annual 48-hour Antarctic Winter Film Festival. It is a fun project where each participating station around the Antarctic creates an original movie in 48 hours. Each movie must contain five specific items that are revealed just before the contest begins.

Direct sunlight returned to station mid-July after being blocked by our glacier for about four weeks. We received a spectacular show one morning. Digging out from a snowstorm, we witnessed the sky above the glacier light up with jaw-dropping nacreous clouds (photograph above). Sea ice formed around station for the first time this winter at the end of the month.

## **JULY WEATHER**

**Neal Scheibe, Research Associate**

July started typically, with cool temperatures and low winds early on, but winter made a grand entrance as a snowstorm late in the month that caused deep drifting and bitter cold. Also noteworthy midmonth was a brilliant display of nacreous clouds. The high altitude light show lasted most of the daylight hours on the 15<sup>th</sup>. The minimum temperature this month was -17.7°C on the 29<sup>th</sup> and a high of 2.6°C came on the 18th. The average temperature of -4.4°C is slightly above the average for July of -5.4°C. The average wind speed for the month was right at the historical average of 12 knots for July, predominantly from the southwest.

The late system that moved through the Palmer Station area brought over half of the month's 48 cm of snowfall, compared with the 47 cm average for July. We have accumulated 178cm of snow so far for the year compared with the 15-year average of 202cm by this time of year. The melted precipitation came in at 57mm.

The average sea surface temperature for the month was -1.6°C. Though sea ice had already been present in the back of Hero Inlet for a couple of week prior, sea ice started forming rapidly during the final week of July well outside the boating limits. Snow collected on the ice rind, dampening the waves and providing a relatively flat surface out to the horizon at month's end. Several large bergs have been present in the region for well over a month and show no sign of wandering off.

## **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

During July, I continued my studies of several clutches of *Notothenia coriiceps* embryos. I have collected and fixed embryos at weekly intervals for future analysis of the microtubule cytoskeleton and of bone formation (to be performed at Northeastern University and at the University of Oregon, respectively). I have also implemented new parameters for heat-shock experiments designed to establish the thermal limits for "normal" embryonic development. Throughout this work, I have employed the Nikon SMU stereomicroscope and the Nikon Eclipse microscope to document the developmental rates and morphologies of the embryos. Finally, I am working to perfect a protocol that will enable me to transport live embryos to NU and UO at the conclusion of my field season (end of September).

I thank the Palmer Station personnel for their excellent help in making my winter research program a great success.

**PALMER STATION  
RESEARCH ASSOCIATE MONTHLY REPORT  
July 2010**  
Neal Scheibe

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

The seismometer operated normally for the duration of the month. The data processing (DP) computer was moved during the month to facilitate construction in the TerraLab building. Coinciding with the timing of the move, one of the tape drives failed on the data backup system. The tape drive was swapped out for two different backup drives and different tapes were tried, but the error persisted. There is currently only one drive working on the DP.

**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. There were problems with transmission of data to the University of Wisconsin, which was resolved by updating the ftp destination site used.

**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 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. There was a brief power outage that affected data collection temporarily, as the same antenna is used as the A-306-P project.

### **A-306-P GLOBAL THUNDERSTORM ACTIVITY AND ITS EFFECTS ON THE RADIATION BELTS AND THE LOWER IONOSPHERE.**

Umrhan 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.

Changes were made to the automatic whistler detection and analysis (AWDA) computer software configurations to facilitate remote log in. The prior settings disallowed users from logging in after one failed attempt, which was too stringent.

A brief power outage resulted in system reboots, but otherwise data collection occurred normally during the month. The rack for the VLF system was moved a few feet to make way for construction occurring in the TerraLab building.

### **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**

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.

There was a brief power outage while the system was moved for construction purposes in TerraLab. Otherwise, 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/tsg/>.

The thermosalinograph operated normally during the month. The webcam was taken offline during the month during construction in TerraLab while the network rack is repositioned. The webcam will be returned to normal operation once construction has completed.

### **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. There were significant construction efforts taking place within the RASA room during the month, but efforts were made to minimize the impact on this project. The system lost connectivity to the network briefly during the month while the network rack was moved, but it did not affect data collection.

## **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. Cold weather and a failed heating system in TerraLab resulted in low temperatures in the roofbox section of the UV monitor. Heating was returned and temperatures stabilized on the system.

## **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.