

PALMER STATION MONTHLY SCIENCE REPORT
August 2008



*Sea Ice engulfs Palmer Station.
Photo courtesy of Christopher Seliga.*

NEWS FROM THE LAB

Christopher Seliga, Winter Assistant Supervisor Laboratory Operations

The month of August saw sea ice form around Palmer Station for the first time this season. Both research groups on station, B-005-P (DeVries) and B-229-P (Murray), were very busy collecting and analyzing, samples and specimens. The *Laurence M. Gould* returned to help B-005-P conduct two more fishing cruises in August, before it headed north to Punta Arenas, Chile. The *Laurence M. Gould* also assisted B-229-P in collecting some water samples from the both the Palmer Deep and Gerlache Strait.

On station, personnel continued to help support a very busy IPY winter season at Palmer station. The days keep on getting longer as spring approaches, and the winter-overs have started to think about the end of the season and their plans for the future off the ice. Lots of birds have been seen during the month, including blue-eyed shags flying in large flocks or congregating on various islands. Other commonly seen birds around Palmer Station in August were giant petrels, sheathbills, kelp gulls, and Antarctic terns. The only penguin sightings have been some gentoos that were seen in the waters early in the month, before the sea ice set in.

AUGUST WEATHER

Payot Scheibe, Research Associate

The season continues to be historically dry. Despite a huge layer of snow that was dropped on station in a 24 hour period (30 cm), snowfall for August still came in at the historical average of 46 cm. The total accumulation for the year, 193cm, is well below the historical average of 246cm. Melted precipitation for August measured at merely 7.6 mm compared to the average of 53.0 mm, and year-to-date accumulation measures 397 mm compared to 503 mm.

The monthly average temperature for August was -7.1°C, slightly cooler than the 15-year average for August of -6.1°C. There were only 3 days with average temperatures above 0.0°C. The high temperature this month was +3.0°C and the minimum temperature was -17.6°C. The cooler temperatures coincided with lower wind speeds. Most of the last week saw single digit wind speeds, allowing the wind bird to be overcome by frost as it sat idle.

Sea surface temperatures remained steady at -1.7°C for most of the month. Pack ice formed mid-month, causing multiple problems for LMG cruise operations and Palmer science data collection. Ice cover has been at nearly 100% for the second half of the month, with ice as far as the eye can see in every direction.

The following projects conducted research at Palmer Station during August:

B-005-P: ENVIRONMENTAL, ORGANISMAL AND EVOLUTIONARY PHYSIOLOGY OF FREEZE AVOIDANCE IN ANTARCTIC NOTOTHENOID FISHES

A.L. DeVries, Principal Investigator, Dept. of Animal Biology, University of Illinois, Urbana-Champaign

Personnel on Station: A. DeVries, Chris Cheng, Paul Cizko, Grace Tiao and Kevin Bilyk

Notothenioid fishes were collected by trawl and trap from the LMG research vessel in the Gerlache Strait, Neumayer Channel, Andvord Bay and Paradise Harbor. The ice fish catch included many specimens of *Chionodraco rastrospinosus* and *Chaenodraco wilsoni* and a few of the uncommon *Cryodraco antarcticus*. Traps captured nototheniid fishes, including *Gobionotothen gibberifrons*, *Trematomus scotti*, as well as *T. hansonii* and *T. bernacchii* which are typically abundant in McMurdo Sound. In addition to notothenioids, the traps produce a couple hundred zoarcid eelpouts of three presumptive species. Serum and tissue samples were collected for biochemical and evolutionary analyses on return to Illinois.

Laboratory experiments at Palmer Station to determine whether *N. coriiceps* specimens collected from the ice-laden shore waters of Arthur Harbor sequester ice in their spleen were continued. Although their gills always tested positive for ice, only 10% of the specimens tested positive for splenic ice. A preliminary conclusion that can be drawn is that with this species ice crystals rarely enter the circulation when compared to some McMurdo Sound species such as *Pagothenia borchgrevinkii* where the spleen almost always tested positive for ice.

B-229-P: BACTERIOPLANKTON GENOMIC ADAPTATIONS TO ANTARCTIC WINTER

Alison Murray, Principal Investigator, Desert Research Institute, Reno, Nevada
Hugh Ducklow, Principal Investigator, The Ecosystems Center, MBL, Woods Hole, MA

Personnel on Station: Alison Murray, Hugh Ducklow, Joseph Grzymiski, Matthew Erickson, Jean-Francois Ghiglione, Kristen Myers and Vivian Peng

For the B-229 team, August was an action packed and dynamic month here at Palmer Station. Reasonably good weather conditions enabled us to get out in the field four times before August 13th to sample from the zodiac, we also sampled from the seawater intake system on a number of occasions following the arrival of Antarctic winter conditions and temperatures which facilitated sea ice accumulation in Hero Inlet/Arthur Harbor for as far as the eye could see by August 18th.

We carried out three different seawater mesocosm experiments lasting from 10-12 days studying differences in light, temperature, addition of a phytoplankton bloom, and inorganic electron donors on the bacterioplankton autotrophic and heterotrophic growth, hydrolytic enzyme activities and community structure. In addition two dilution experiments designed by Dr. Ghiglione were conducted to decipher the relationship between biological diversity and complexity of function.

Concomitantly we have been conducting molecular profiling surveys, fluorescent in situ hybridization targeted assays to enumerate specific groups of the bacterioplankton, quantitative PCR assays to quantify DNA for particular organisms of interest in seawater samples we're collecting. We also have set up analytical instruments for DOC and nutrient analyses – thus the complement of B-229 has been fully engaged!

During this month we both gained and lost field team members (gained co-PI Joe Grzymiski August 19th via a rather dramatic arrival over the sea ice, and lost Kristen Myers due to a medical emergency that resulted in a successful med-evac August 26th).

The community spirit and people coming together to solve problems were seen on a number of occasions this month - we thank all RPSC personnel on Station for supporting our research program and for helping in the med-evac. The leadership of Eric Pohlman, Ken Keenan, Lily Glass, care from the doctor and his assistant Amber Bates and energetic participation of everyone else really made this a very special time. Thanks everybody!

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT
August 2008

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 project operated normally for the month.

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 system operated normally throughout the month. Data tapes were shipped north while new shipping supplies were received on station.

O-202-P ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC)
SATELLITE DATA INGESTOR.
Charles Stearns, 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 weather station collected data normally during 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. Samples taken from the station are sent to Scripps where the analysis of O₂ and CO₂ content takes place.

Samples were taken on both the new and old systems every two weeks for intercomparison purposes.

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

Dr. David Hofmann (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 Palmer Physician collects weekly air samples for Carbon Cycle Greenhouse Gases Group and fortnightly samples for Halocarbons & other Atmospheric Trace Species Group.

All sampling occurred with no problems. New flasks were received on station while full flasks were shipped back to Boulder.

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

Charles Stearns, 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 station transmitted data normally during 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.

New computer equipment has been shipped to the station to upgrade the data storage capabilities of the system. Several special epochs were recorded for analysis at Stanford upon request. The standard sampling period was changed from 0300-0900UT to 0200-0800UT, again at the request of grantees from Stanford.

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 NASA MODIS subset for Palmer was increased to enhance scientific activities on and around the peninsula. This subset is available via the internet for science groups on and off the ice.

One of the data writing drives quit responding. The drive was swapped out and connections were checked, but the problem still persists at the conclusion of the month.

Cruise support SSMI images generated by the system were sent to LMG scientists daily.

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 magnetometer operated well 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 had to be restarted on two occasions after failing to move to the new sequence location.

T-513-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK (UVSIMN)

Charles Booth, Principal Investigator, Biospherical Instruments, Inc

The Research Associate operates and maintains on-site equipment for the project. 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. Data from the GUV-511 instrument is made available on a daily basis on the project's website at <http://www.biospherical.com/nsf>.

The UV monitor operated normally throughout the month. The lamp calibrations were completed successfully.

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 monitoring station operated normally during the month. Late in the month there was a grantee visit to perform calibrations and annual maintenance. A new humidity monitor was installed under the deck of Terra Lab, adjacent to the preexisting CTBT weather station.

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 equipment has operated normally this month. Various data from the instrument was used by several members of B-005 and B-229.

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).

Isobaric charts were sent to R/V LAURENCE M. GOULD in support of the current cruise.

The wind bird on Gamage Point became covered in hoar frost on a few instances at the end of the month when wind speeds were too low to keep the frost from forming.