PALMER STATION MONTHLY SCIENCE REPORT
March 2009

Collecting samples from a successful trawl in Hero Inlet.
Photo courtesy of Rebecca Pirtle-Levy and Christian Clark

NEWS FROM THE LAB
Pat McMillan, Winter Assistant Supervisor of Laboratory Operations

The month began with the return of the *ARSV Laurence M. Gould (LMG)* on March 10th from the Food for Benthos on the Antarctica Continental Shelf (FOODBANCS) cruise. The return brought 2 new science field team members – Rebecca Pirtle-Levy and Christian Clark and we said goodbye to Maggie Waldron, Clara Flemming and Ross MacPhee. The *LMG* returned on March 30th for a brief stop to leave the winter folks for turnover before heading out for research. There are now 44 people on station including the science field team members and the food inspector.

The tour season ended with a visit from the *Molchanov*. We had a great time this season talking about our station and the science that is being done here plus meeting so many interested people.

Science on station was very successful and busy with their work over the month. The Adélie monitoring concluded. They continued monitoring of the Skua and Giant Petrel. The marine mammal monitoring continued, highlighted by a few sightings of Leopard Seals preying on Gentoo penguins. All of the HPLC samples collected during this season and the annual LTER cruise were processed. There were several very successful benthic trawls from a zodiac to collect deposit feeding animals for a feeding experiment.

The month came to a close as most began their turnover and looking forward to the *LMG* returning (aka their ship has come in). Those of us who remain on station wish our friends good-bye and a calm crossing. We are looking forward to this winter season and the return of the *LMG*.

MARCH WEATHER
Louise Hamlin, Research Associate

Winter is on its way with cooler temperatures. Several large storm systems swept through the Drake producing some windy conditions during the month and bringing heavier than average rainfall.

The glacier continues to calve, often bringing thick brash ice and bergy bits around the area. Sea surface temperatures cooled significantly this month to an average of 0.8 ºC.

The average air temperature for the month was 1.8C (35F), inline with historical averages of 0.9C (34F) (1990-2008). The coldest daily low temperature was on the 19th at -2C (28F) and the warmest was on the 6th at 7.5C (46F).

Palmer received 144mm of melted precipitation versus the average of 77mm. 27 cm of snowfall was recorded, versus an average of 22 cm.

The following projects conducted research at Palmer Station during March:

B-013-P: LONG-TERM ECOLOGICAL RESEARCH ON THE ANTARCTIC MARINE ECOSYSTEM: AN ICE DOMINATED ENVIRONMENT (SEABIRD COMPONENT)
Dr. William R. Fraser, Principal Investigator, Polar Oceans Research Group, Sheridan, MT

Personnel on station: Jennifer Blum, Kirstie Yeager

Weather continued to hamper some field operations this month, with winds delaying trips to some of the more distant islands as well as wet weather interfering with specific work that required handling of downy chicks. Despite some delays the planned field work for this month was completed.

Adélie work concluded this month, as the radio transmitter project on Humble Island came to a close. Equipment was removed from the island and data files processed. A telemetry scan was also performed on numerous local islands and molted transmitters were collected. Sediment trap contents were collected from Gentoo colonies on Biscoe Island and Chinstrap colonies on Dream Island. Repairs were made to a few of the traps, and some were completely replaced. Sediment trap sample processing continued until the end of the month.

Skua work continued throughout the month with both Brown and South Polar Skua chick growth monitoring and banding. South Polar Skua scat collections also continued on Shortcut Island. Limpet trap contents were collected from Kelp Gull colonies on four local islands. Giant Petrel chick banding was completed on all local islands. Growth measurements of Giant Petrel chicks continue on Humble Island. We commenced preparations and training for RPSC winter personnel who will be continuing some measurements for this project.

Marine mammal monitoring continued, highlighted by a few sightings of Leopard Seals preying on Gentoo penguins. Labwork continued and intensified throughout the month as all samples were processed. All samples and associated paperwork were prepped and sent north for evaluation and analysis. Project gear and supplies were cleaned, inventoried and packed up; project cargo was sent north. Data analysis and organization projects, other end-of-season inventories, and Lab/Polar Haven/boathouse organization/clean-up were also main activities. An end-of-season outbrief with science and station management was attended.

RPSC continued to provide great support this month, and we'd like to thank everyone for their efforts and attitude throughout the entire summer. Thanks to Pat McGuire for assisting with some special requests, as well as to both Bob DeValentino and Jon Brack for their extra help with our northbound cargo and samples.

B-019-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, PHYTOPLANKTON COMPONENT.

Dr. Oscar Schofield, Principal Investigator, Institute of Marine and Coastal Sciences, Rutgers University

Personnel on station: L. Alex Kahl and Elizabeth Leonardis, Institute of Marine and Coastal Sciences, Rutgers University

Working with Maggie Waldron from B-045, we sampled stations B and E on 05 March. On 12, 19, and 26 of March Christian Clark and Rebecca Pirtle-Levy from B-237 assisted with sampling at stations B and E. On all four days, we collected water samples at various depths for pigment analysis and we also collected bio-optics and CTD measurements from the water column. On 17 March we deployed our autonomous underwater vehicle, RU05, for a late season hydrographic fluorometric survey of the penguin foraging zone near station E. However, due to instrument malfunctions onboard RU05, recovery of the AUV was required 2 hours after deployment. In addition to the above fieldwork, we also processed all of the HPLC samples collected from the 2008-2009 season and from the annual LTER cruise in January. All other samples such as

nutrients and dissolved organic carbon are being sent back for analysis by B-045 in the U.S. B-019, with help from guest scientist Andrew McDonnell, also had the opportunity to participate in a video conference with Jane Long Elementary School (located in Texas) students. The outreach with the students was one of the highlights of the season and is something we hope to participate in more in the coming seasons.

B-237-P: Benthic Faunal Feeding Dynamics on the Antarctic Shelf and the Effects of Global Climate Change on Bentho−Pelagic Coupling
Dr. Dave DeMaster and Dr. Carrie Thomas, Principal Investigators, North Carolina State University

Personnel on station: Rebecca Pirtle-Levy, North Carolina State University (NCSU) and Christian Clark, University of Hawaii

At the end of the FOODBANCS cruise on the LMG, Rebecca Pirtle-Levy and Christian Clark remained at Palmer Station. We had a few benthic invertebrate deposit feeders from trawls aboard the LMG that were in decent condition. They were placed in aquarium tanks with 5cm of sediment lining the bottom on March 11. The algae spiked with ^{13}C and ^{15}N was mixed into the surface layers of sediment. More animals were required to realize the full scope of the proposed experiment and, with the help of a number of people at Palmer Station, we built a box trawl in order to collect animals living on the soft-bottom, benthic regions around the station. We trawled in Hero Inlet and collected brittle stars and bivalves for feeding experiments on March 17, 19, and 21. The aquarium tanks for the feeding experiments with brittle stars and bivalves were set up as previously stated. All animals in the aquarium tanks were allowed to feed for one week. At the end of the week all animals were removed from the tanks and dissected. Tissue samples from the gut/stomach, muscle, and body wall of the animals were frozen for subsequent analysis at NCSU.

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT
MARCH 2009
Louise Hamlin

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. Bjorn Johns arrived on LMG 09-03 on March 30th and will upgrade the TSCe GPS controller and replace the UNAVCO receiver.

The system operated normally throughout 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 station operated normally throughout most of the month. On March 31st the station terminal locked up and was rebooted per instructions from Joel Edwards. Data tapes were sent out on LMG 09-02.

O-202-P ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC) SATELLITE DATA INGESTOR.
Matthew 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 throughout 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 O_2 (detected through changes in O_2/N_2 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_2 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_2 and CO_2 content takes place.

Sampling equipment and operations were per plan throughout the month. One flask was received broken and will be returned to Scripps for repair. A crate of sample flasks will be shipped out on LMG 09-03.

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.

Flasks for Halocarbon sampling were unavailable in March due to a problem in flask shipment. Flasks were received on LMG 09-03 and sampling will resume per normal in April. Carbon Cycle flasks will be shipped south on LMG 09-03.

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

Matthew 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.

On March 13th, a problem concerning wind speed in the AMRC data was discovered by Palmer IT and conveyed to University of Wisconsin. The issue was traced to a software problem and the data archive was corrected.

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.

The VLF_RECORD computer experienced a number of small issues throughout the month including a couple of spontaneous reboots. LMG 09-03 brought Dan Golden of Stanford and a replacement for VLF_RECORD. Mr. Golden will be performing calibration of the VLF antenna and surveying for a future VLF location as well as reconfiguring the data processing computers.

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.

A small issue emerged mid-month with passes being written to the data tapes. The tape drive seems to be frequently interrupted in its writes, necessitating a restart command. Data tapes will be shipped out on LMG 09-03.

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 though 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 was turned off from March 23rd to March 25th to assist in troubleshooting an issue with the CTBT RASA experiment. Apart from this, the webcam and salinograph performed normally during the month.

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. 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.

Per instructions from General Dynamics, the filter media was removed from the blower path and a blank measurement was performed on the system from March 11th until March 18th. On March 25th, a problem was noted with the advance of filter through the system. The lead plates were removed and filter routing was corrected. As of the end of March, the issue of the "bump" in the spectra seen at ~140 keV has not been resolved and continues to be under investigation. Apart from the issues noted, the monitoring station operated 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.

Several small issues occurred at the Daylight Saving time change with the tide gauge software. These were resolved. Apart from this, 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).

The weather station operated normally throughout the month. Scheduled inspections were carried out of the Gamage Point tower.