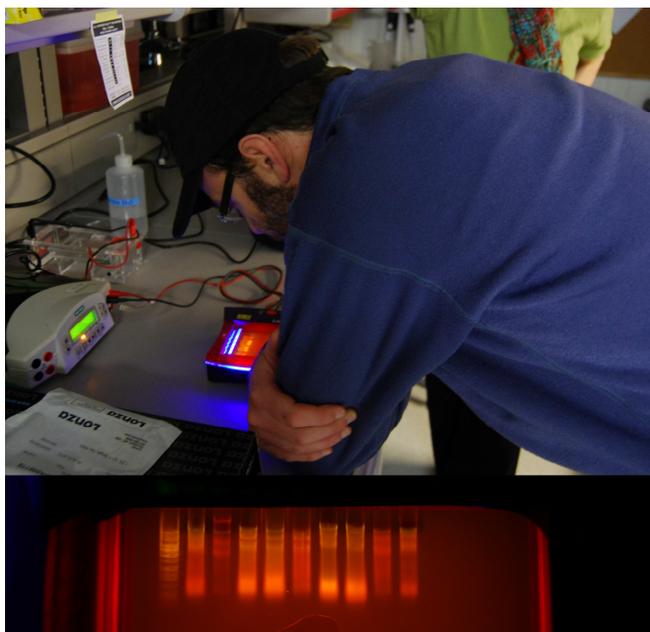


PALMER STATION MONTHLY SCIENCE REPORT

August 2011



Joe Grzymiski observes the results of an RNA gel electrophoresis and Deneb Karentz uses a microscope to count and identify phytoplankton cells (B-466-P, Karentz).

Image Credit: Bethany Goodrich

NEWS FROM THE LAB

By Melinda Piuk, Winter Assistant Supervisor of Lab Operations

Palmer Station started off the month surrounded by sea ice. Although things were frozen outside, they were lively inside, as the winter-over crew prepared for the arrival of the *ARSV Laurence M. Gould* (LMG) on its first cruise of the '11-'12 season, LMG11-06A. The LMG was delayed by ice and arrived on August 7th, ending the station's short 2-month isolation with an influx of station personnel, visitors, and scientists with the Deneb Karentz group (B-466-P).

A busy week followed with projects being compressed into the short 4-day port call. Justin Li of Stanford University spent the port call performing maintenance on the A-306-P VLF system. The station drinking and waste water systems were evaluated by the USAP environmental engineering group. A site fire inspection also took place including an expertly planned fire drill. The LMG departed station and headed to Punta Arenas, Chile on a different route in order to conduct research with the Jim Ledwell group (O-124-L). The station population is now at 23 people, with the original winter-over crew being reinvigorated by the new energetic personnel.

The last two weeks of August were occupied with continuing winter projects throughout the station and helping the Karentz group (B-466-P) get up and running. Neal Scheibe hosted the 4.5th Annual Palmer Scavenger Hunt, sending us in all directions looking for "various bits and pieces of guerilla art that has popped up around Palmer Station over the years, as well as some permanent and semi-permanent obscure miscellanea that you can only find here". It was a fun mission for all involved and a wonderful introduction to Palmer history for the newly arrived residents.

AUGUST 2011 WEATHER

By Neal Scheibe, Research Associate

August weather was characterized by cold, clear, calm days due to a resilient high pressure system for much of the month. Two low pressure storms later in the month broke up the tranquility briefly, but the high pressure quickly returned. Light precipitation for historically snowy August left the month's snowfall at 32cm. This was enough to bring the annual total to only 143cm, which is about 100cm below the average for this time of year.

The average temperature for the month was -7.2°C , cooler than the 15-year average for August of -5.9°C . The coolest days came early, with the lowest temperature on the 3rd at -18.8°C , while the high temperature this month was 6.1°C on the 22nd. The sea surface temperature was a steady 1.6°C throughout the month.

The real story for the month was the persistent widespread sea ice. August began where July ended, with the ice firming up throughout the boating area and far off to the horizon. Satellite images confirmed that the entire peninsula was packed in. There was one day where the sun and winds broke up the ice enough to allow some boating on the morning of the 23rd. The winds quickly reversed and filled the boating area back up with thick pancake ice which persisted until month's end.

B-466-P: COLLABORATIVE RESEARCH: FUNCTIONAL GENOMICS AND PHYSIOLOGICAL ECOLOGY OF SEASONAL SUCCESSION IN ANTARCTIC PHYTOPLANKTON: ADAPTATIONS TO LIGHT AND TEMPERATURE

Deneb Karentz, Principal Investigator, University of San Francisco

Joe Grzyski, Principal Investigator, Desert Research Institute

Personnel on station: Deneb Karentz, Joe Grzyski, Iva Neveaux, Bethany Goodrich, Austin Gajewski

Our group arrived at Palmer Station on August 7 to begin work on a project that will characterize physiological responses of phytoplankton to the gradual change in season from winter to spring (e.g., day length, light intensity, temperature). A primary focus of the research is to track changes in gene expression during this transition period and evaluate species fitness relative to their dominance in the temporal pattern of species succession.

Palmer Station has been surrounded by consolidated brash ice since we arrived, making boating impossible. Sampling in August was restricted to the seawater system. While not ideal, unfiltered water from the pump house and aquarium provided a good opportunity to set up and test our instruments and equipment, and to begin sampling. Water collection for RNA sequencing, chlorophyll concentrations, photosynthetic physiology, CHN content and cell counts to follow the succession of species were initiated in our first week on station and will continue through our field season. Approximately 60 species of phytoplankton have been observed in the water from Arthur Harbor, however cell concentrations are extremely low. It has been necessary to filter nearly 1000 liters per day to collect enough biomass for RNA isolations. Several experiments have been completed on light adaptation of the late winter phytoplankton community, and an outdoor mesocosm experiment is underway.

More information on our project is available at <http://antarctica.dri.edu>. An iPhone/iPad app (“Mission Antarctica”) to navigate the website is available from iTunes. The website and app have been specifically designed for middle school students and our outreach efforts have included not only reporting on science, but also highlighting the activities of the support staff that make science possible.

We have had excellent support from Perri Barbour, winter station manager, and all of the staff at Palmer Station. Their efforts to facilitate and advance our research have been much appreciated.

**PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT**

August 2011

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. Real-time telemetry data is sent to the U.S. Geological Survey (USGS).

Data collection occurred normally during the month.

A-132-P FABRY-PEROT INTERFEROMETER

Qian Wu, Principal Investigator, National Center for Atmospheric Research

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

A switch sensor on the azimuth control of the sky scanner failed mid-month. The sky scanner is unable to find the ‘home’ position and simply rotates without stopping once powered up. A new switch is being sent down, but in the meantime the interferometer is not in operation.

**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 screen stopped showing data during the last week of August. Data is still flowing correctly and the problem is deemed to be a software incompatibility issue by the PI. After initial attempts at a fix, the issue remains at month's end.

**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.

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. A crate of flasks was prepared for shipment to Scripps and new flasks were received during 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 (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. Three crates of flasks were prepared for shipment back to NOAA and one new crate arrived.

O-264-P: 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 scheduled calibrations were carried out. After a software update initiated by representatives at NOAA, there were excessive errors on the system. An extra calibration was performed and the errors stopped.

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.

New batteries and a solar panel arrived to replace an old set running on Bonaparte Point. Due to sea ice conditions, a trip to replace the old batteries has not been made by the end of 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 went as planned for the month. Data was archived onto a backup drive.

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

Umran Inan, Principal Investigator, Stanford University

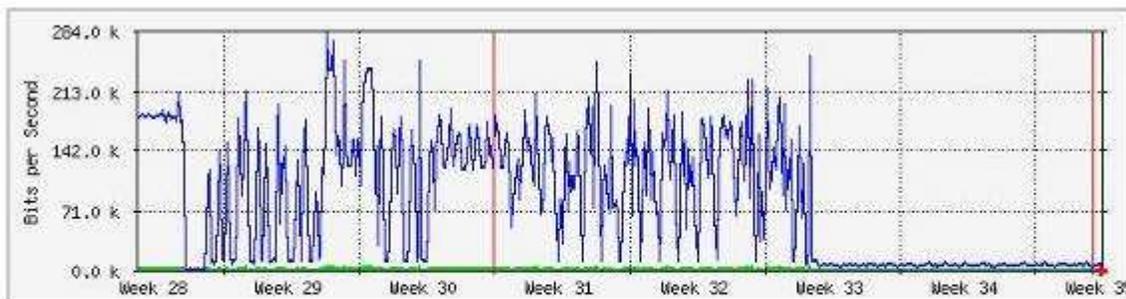
Stanford University has been operating a Very Low Frequency (VLF) receiver antenna at Palmer Station since the 1970's. By receiving naturally and manmade signals between 1 and 40 kHz, the Stanford VLF group is able to study a wide variety of electromagnetic phenomenon in the ionosphere (uppermost layer 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.

There was a site visit by a representative from Stanford to swap in a new section of signal cable at the base of the glacier. Two 500-foot sections were used to replace a one thousand foot section. Also, newly designed line driver cards were brought down to try in the pre amp box at the base of the antenna on top of the glacier. The new cards were found to be not compatible with the current system so the old cards were put back into service. The system ran normally through the rest of the month.

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 TeraScan system has been operational for the duration of the month. The high network traffic coming from this system was found to be related to a coding problem in a transfer script. The issue was resolved mid-month and network traffic returned to normal. A plot of the data flow for the last month is attached:



	Max	Average	Current
In	5048.0 b/s (0.2%)	1496.0 b/s (0.0%)	128.0 b/s (0.0%)
Out	280.6 kb/s (8.4%)	79.9 kb/s (2.4%)	5320.0 b/s (0.2%)

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 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 website listed above went offline temporarily due to hurricane Irene causing outages on the WHOI server, but was back in operation by the end of the month.

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 Organization (CTBTO) 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 ran normally throughout the month. The first two quarterly samples have been shipped once requested by CTBTO. A swipe of the RASA was performed at the request of a third-party group, Pacific Northwest.

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. Weather updates and satellite imagery were forwarded to the R/V LAURENCE M. GOULD.