

PALMER STATION MONTHLY SCIENCE REPORT

February 2012



The Bockheim group (G-239) drilled their 15-meter bore hole at the top of Amsler Island during their time at Palmer Station this month. Temperature sensors placed in the bore hole will reveal the depth of the active (permafrost) layer in the Palmer area. The group also serviced the weather station they installed last season and mapped surficial geology, soil, and vegetation on the island. *Image Credit: Janice O'Reilly*

NEWS FROM THE LAB

By Carolyn Lipke, Assistant Supervisor of Lab Operations

February was yet again a busy month. The month began with a visit by the *M/S National Geographic Explorer* carrying former Vice President Al Gore and the Climate Reality Project cruise participants.

The *ARSV Laurence M. Gould* returned to Palmer bringing the Bockheim (G-239) group from the University of WI-Madison and their collaborators from the University of Lisbon, Portugal. The group of geologists and soil scientists have been drilling and mapping on Amsler Island. Historically studies in the Palmer area have focused on the biological and oceanographic results of climate change. This group's work will also help us understand how permafrost, seasonal-thaw dynamics, and soils are changing as the climate here warms.

We were also visited this month by the Blue Ribbon Panel. The visit to Palmer Station and Punta Arenas wrapped up their review of the U.S. Antarctic Program, and they will be presenting their suggestions for future directions of the USAP to the NSF later this Spring.

The days here at Palmer are getting shorter, the Adélie penguins are headed South, and the winter science support staff have arrived. The lab shows no signs of slowing down, however. Five research groups remain, and the aquarium room has been transformed to accommodate an elaborate and elegant ocean acidification experiment run by the McClintock-Amsler group (B-027).

FEBRUARY 2012 WEATHER

By Neil Scheibe, Research Associate

February was a bit gloomy early on, but the sun came through near the end of the month leading to a cool, calm stretch that lasted over a week. The average wind speed of 9 knots meant that only a small handful of the days in February were too windy for boating activities. The maximum gust this month was 55 knots on the 9th. Rain was relatively scarce, totaling only 36.6mm, and near the February average by 30mm. Occasional flurries didn't stick to the ground for long, but totaled up to 21cm by month's end.

Temperatures were normal again this month, averaging 0.9 °C. Maximum and minimum temperatures were 5.8 °C and -3.3 °C, respectively. Sea surface temperature averaged 0.6 °C.

The glacier continues to calve at a steadfast pace, pushing brash out of Arthur Harbor. A few large bergs crept into view from parts unknown, staying only briefly and rarely getting within the Palmer Station boating limits.

B-013-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, APEX PREDATOR COMPONENT

Dr. William R. Fraser, Principal Investigator, Polar Oceans Research Group, Sheridan, MT

Personnel on station: Jennifer Blum, Shawn Farry, Donna Patterson-Fraser

February was marked by the return of the *ARSV Laurence M. Gould* at the beginning of the month at the conclusion of the LTER cruise. Kristen Gorman and Jen Mannas returned to station for a brief time before departing for the season with Bill Fraser; Donna Patterson-Fraser arrived at the beginning of the month. Weather was surprisingly favorable through most of February; very little work was delayed due to high winds or precipitation until the last week of the month.

The Adélie penguin work continued this month, highlighted by the chicks fledging. Adélie chick counts and measurements of chicks about to fledge were obtained on local islands until all of the chicks departed. A census of Adélie, chinstrap, and gentoo penguin chicks was completed on the known penguin-breeding islands in the Joubins at the very end of January; a chinstrap penguin census was completed on Dream Island at the very beginning of February. Penguin foraging

ecology studies continued through February with our Adélie penguin radio transmitter study on Humble Island and gentoo penguin diet sampling on Biscoe Island.

Skua work continued with monitoring and banding of brown skua chicks on local islands as well as on Dream and Biscoe Islands. Band resighting and diet sample collections continue on Shortcut Island for south polar skuas. Monitoring of the blue-eyed shag colony on Cormorant Island continued and concluded at the end of the month. Our giant petrel satellite transmitter work finished up this month with the retrieval of all of our transmitters. A giant petrel chick census was conducted on multiple islands of the Joubins during a mid-month trip. Giant petrel chick banding initiated mid-month, banding most of the chicks on all local islands; the remaining chicks will be banded by early March. Growth measurements of giant petrel chicks continue on Humble Island.

Monitoring of marine mammals continued, highlighted by the exponential increase of fur seals on many of the area islands. Torgersen Island sediment trap samples were retrieved and processed, and repairs were made to both of the traps. Labwork continued with skua scat and blue-eyed shag boli analysis. Data analysis projects continue as well. The end of February brought the Blue Panel Review Board to Palmer Station; we participated in answering questions and providing information while they were on station, and also conducted a tour for them on Humble Island.

RPSC continued to provide great support this month. Field volunteers were incredibly helpful during the Adélie fledgling period; again, many thanks to Carolyn Lipke for coordinating the volunteer schedule.

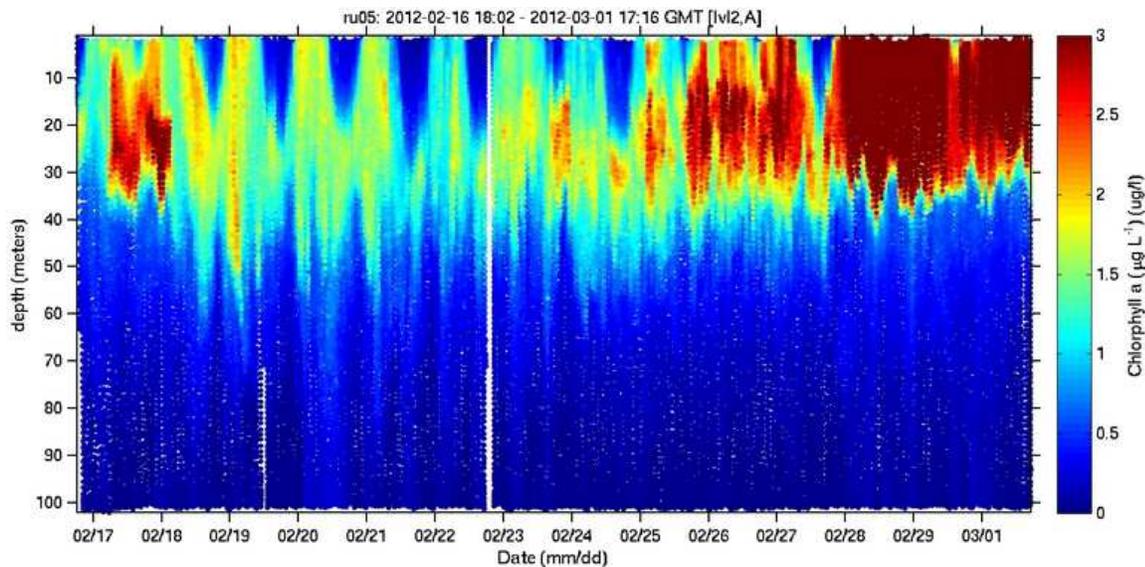
B-019-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, PHYTOPLANKTON COMPONENT

Principle Investigator: Oscar Schofield, Rutgers University

Personnel on Station: Katie Brennan and Travis Miles

February at Palmer Station we continued time-series sampling at station B and E and had another round of WEBB Slocum Glider deployments. These were the latest glider deployments we've performed in Antarctica. Glider deployments were aimed at the Waurmans and south side of the Palmer Deep. Three gliders were deployed and initially sampled off the Waurmans. Gliders then moved to the Danneberg islands, then over the middle of the Palmer Deep. One glider became disabled at this location 14 miles away from Palmer Station. In order to rescue it, we utilized the 'Tin Can' landing craft brought down by the *ARSV Laurence M. Gould*, while having the Gould on stand-by for SAR operations. We also recovered and re-deployed a second glider having communication issues.

Data collection showed a clear diurnal signal in chlorophyll suggesting a vertical migration over the south and central portions of the canyon. This signal was less strong over the head of the canyon where phytoplankton biomass was higher. This signal was also not seen in previous deployments during the height of summer and may be associated with the decreasing day length as we transition into fall and winter at Palmer station.



This brought the 2011-2012 glider field sampling season to a close. We had over 160 days of glider time in the water and a groundbreaking deployment from Palmer Station to Rothera Station, fostering future collaborations and solidifying AUVs as a staple of LTER research.

B-027-P: THE EFFECTS OF OCEAN ACIDIFICATION AND RISING SEA SURFACE TEMPERATURES ON SHALLOW-WATER BENTHIC ORGANISMS IN ANTARCTICA

James McClintock, Charles Amsler, and Robert Angus, Principal Investigators, University of Alabama at Birmingham

Personnel on station: Charles Amsler, Margaret Amsler, Nell Herrmann (PolarTREC participant), James McClintock, Kate Schoenrock, and Julie Schram.

B-027 arrived at Palmer on the morning of 17 February with LMG12-02. Initial efforts centered on setting up our lab space, dive locker, and our portion of the aquarium building as well as on mandatory boat training.

From February 19-29 our group completed 18 dives including checkout dives off the Pier and numerous dives to collect organisms for laboratory studies. Unseasonably good weather during this interval greatly aided us in making these collections.

The bulk of our efforts have been spent assembling and calibrating our main ocean acidification and temperature manipulation set-up. This has been going well and we hope to have it finished in time to start the main experiment in early to mid March.

We are grateful for the generous and professional assistance of numerous RPSC staff. Carolyn Lipke, Lily Glass, Ryan Wallace, Neal Scheibe, Graham Colegrove, Janice O'Reilly, and Brian Nelson deserve special thanks for facilitating our laboratory and diving operations. We are also grateful to Ted McKinley and other FEMC staff for constructing and modifying the platform for our main experiment.

B-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: MICROBIAL / BIOGEOCHEMICAL COMPONENT

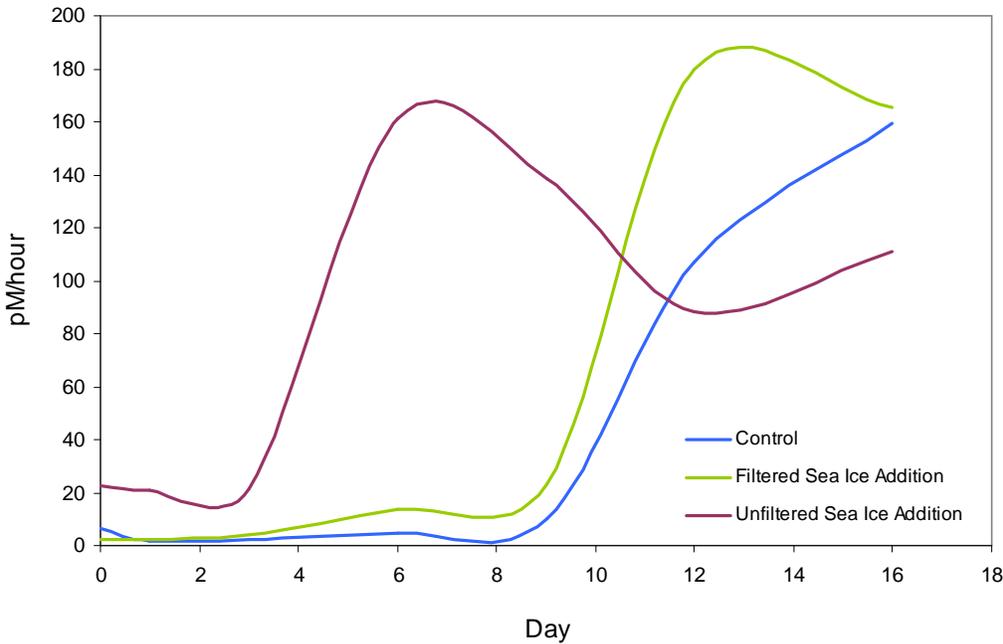
Principal Investigator: Dr. Hugh Ducklow (Ecosystems Center, MBL)

Personnel on station: Nikhil Murgai and Catherine Luria

February was a very busy and productive month for B-045. At the beginning of the month Luke McKay and Zena Cardman departed Palmer for their next adventure, while Nikhil Murgai was joined by Catherine Luria, who had just completed the month-long annual LTER cruise along the Antarctic Peninsula.

We continue to collaborate with B-019 to collect samples for our bi-weekly measurements of nutrients, dissolved organic carbon, bacterial and phytoplankton abundance, and bacterial production. Once per week we also filter water to concentrate bacteria for later genetic analyses and conduct incubation experiments to look at bacterial and phytoplankton growth rates. As we move into fall at Palmer Station, we have begun to observe declines in bacterial abundance and production, perhaps due to shorter day length and decreased primary production.

In addition to routine data collection and experiments, Nikhil and Catherine have conducted several special projects during the last month. The first was an experiment to observe the effects of sea ice meltwater on bacterial abundance, activity, and community composition in the water column. Our team aboard the *ARSV Laurence M. Gould* collected plankton-rich sea ice during the southern leg of the LTER cruise. This sea ice was melted and either filtered to remove cells or left unfiltered. Small amounts were then added to winter water and incubated for 16 days in order to test the hypothesis that melting sea ice “seeds” the water column and fuels an early burst of microbial activity in the spring. The figure below shows bacterial production over the course of the 16-day experiment, including an early peak in production in carboys to which unfiltered sea ice were added. Back in Woods Hole, we will use high-throughput sequencing to examine how these experimental treatments affected bacterial communities.



We are grateful to all of the RPSC employees who have enabled our routine sampling as well as our special projects and have made Palmer Station a great place to live and work.

G-239-E: ANTARCTIC PERMAFROST AND ACTIVE-LAYER DYNAMICS

Principal Investigators: Jim Bockheim (University of Wisconsin-Madison) and collaborator Goncalo Vieira, (University of Lisbon, Portugal)

Personnel on station: J. Bockheim, G. Vieira, N. Haus, K. Wilhelm, A. Trindade, and Stian Alesandrini

We stayed at Palmer Station from 17 Feb to 5 March 2012. Our accomplishments during this time were as follows:

- (1) Drilled a 15.5 m borehole on the highest summit of Amsler Island (67 m above sea level) and fitted the borehole with a string of iButton thermistors at the following depths: 0.2, 0.4, 0.8, 1.2, 1.6, 2, 2.5, 3, 3.5, 4, 5, 6, 8, 10, 12.5, 14 m. The thermistors will be read in one year to determine whether or not permafrost exists in the Palmer area and at what depth.
- (2) Serviced soil climate station by installing a second 12 v, 155 amp-hour battery and larger 70 watt solar panel. We have collected hourly atmospheric and soil climate data for the periods 7 April-6 June 2011 and 7 October 2011-3 March 2012.
- (3) Downloaded time lapse photos of our snowstakes for modeling the effects of snow depth on active-layer dynamics.
- (4) Downloaded temperature data from and installed new iButtons in 10 shallow boreholes ranging from 1.0 to 1.6 m on Amsler and Hermit Islands and in the Palmer "Backyard" and installed one new borehole to 160 cm near the soil climate station on Amsler Island.

- (5) Installed mini-soil climate stations and iButtons on metal plates for estimating the N-factor, the ratio of the seasonal degree-day sum at the soil surface to that in the air at standard screen height for parameterizing the temperature regime at the ground surface, at seven of our borehole sites.
- (6) Installed iButtons at 10-cm intervals on three snow stakes in the valley for validating snow depths from the camera. An additional snow stake with iButtons was installed on the summit of Amsler Island for monitoring snow depth there.
- (7) Began preparing detailed soil, geomorphic, and vegetation maps of Amsler Island using a Trimble digital global positioning system and a high-resolution orthophotograph.
- (8) Sampled two additional soils from Amsler Island.

B-256-P: ROLE OF DEHYDRATION AND PHOTOPERIODISM IN PREPARING AN ANTARCTIC INSECT FOR THE POLAR NIGHT

Richard E. Lee, Jr. and David L. Denlinger, Principal Investigators, Miami University, Oxford, Ohio and Ohio State University, Columbus, Ohio.

Personnel on station: Yuta Kawarasaki

This month of February saw the turn over in our team's personnel; while the northbound *ARSV Laurence M. Gould* left on February 2nd with previous field members, **Error! Reference source not found.** arrived on the next southbound boat as the only person on our team to continue laboratory and field studies. With the generous and coordinated assistance by station personnel and other science groups, he was able to collect field samples several times each week.

One of the main goals for this season is to investigate changes in the midge's physiological states during the seasonal transition from summer to winter. Field-collected larvae were brought back to the laboratory and quickly processed to determine water content, temperature of crystallization, body composition, cold tolerance, and metabolic activity. Combined with the work conducted in January concerning their ability to respond to seasonal changes in photoperiod, these studies will determine whether midges enter a dormant state to endure the long winter of Antarctica and, if so, how this state is induced.

We are grateful to station personnel for their support. Especially, we thank Carolyn Lipke and Lily Glass for their prompt assistance in the laboratory. The field sampling would not have been possible without the boating support by Graham Colegrove and Ryan Wallace. Susie Chun, Lily Glass, and Kerry Kells helped with the collection of midge samples. We also thank Katie Brennan from science group B-019-P for her assistance in our fieldwork.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
February 2012
Neal Scheibe

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION.
Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

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). The Research Associate operates and maintains on-site equipment for the project.

A site visit was made by two representatives of USGS subcontractors to install new network hardware, new data collection computers, and a new sensor. Shortly after the departure of the visitors, power was lost in the seismic vault. The problem was found to be the sensitivity level of the input voltage to the hardware rack. This was adjusted, power was restored to the vault, and data collection resumed as normal.

A-109-P: ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY (ELF/VLF) OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION (LEP).

Robert Moore, Principal Investigator, University of Florida

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. The Research Associate operates and maintains on-site equipment for the project.

Data collection went as planned for the month. New backup hard drives were received and inventory of the project was taken.

A-132-P: FABRY-PEROT INTERFEROMETER (FPI)

Qian Wu, Principal Investigator, National Center for Atmospheric Research

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

The instrument ran well during the month. There were a couple of small lock up issues that were solved by power cycling the system.

O-202-P: ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC) SATELLITE DATA INGESTOR.

Mathew Lazzara, Principal Investigator, University of Wisconsin

The AMRC 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 Research Associate operates and maintains on-site equipment for the project.

The data ingestor operated normally through 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 help to determine rates of marine biological productivity and ocean mixing as well as 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. The Research Associate collects samples fortnightly from both TerraLab and the VLF Building.

Sampling occurred regularly 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 (N₂O) and halogen containing compounds. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon sampling occurred normally during the month.

O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK

James Butler, Principle Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; Boulder, CO

A Biospherical Instruments (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. Also collecting light spectra is a BSI GUV-511 filter radiometer, an Eppley PSP pyranometer, and an Eppley TUVR radiometer. The Research Associate operates and maintains on-site equipment for the project.

The UV monitor collected data normally for the month. The old PSP sensor and housing was shipped back to NOAA for refurbishing.

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

Mathew Lazzara, Principal Investigator, University of Wisconsin

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 Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point.

The weather station ran normally during the month.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Joe Pettit, Principal Investigator, UNAVCO

Continuous 15-second epoch interval GPS data files are collected at station PALM, compressed, and transmitted to the NASA-JPL in Pasadena, CA. The Research Associate operates and maintains on-site equipment for the project.

The GPS operated normally for the duration of the month. The roving GPS unit was used extensively for T-434-M/P around the Palmer Station boating limits and G-239-P data collection on Amsler Island.

A-336-P: ELF/VLF OBSERVATION OF LIGHTNING DISCHARGE, WHISTLER-MODE WAVES AND ELECTRON PRECIPITATION AT PALMER STATION.

John Gill, 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 and magnetosphere. The Research Associate operates and maintains on-site equipment for the project.

The primary data collection computer began suffering from noise and lockup issues associated with failure to lock on to a good signal from the rack-mounted TrueTime GPS. The computer was eventually swapped out with a spare and data collection resumed as normal.

T-312-P: TERASCAN SATELLITE IMAGING SYSTEM

The TeraScan system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. The Research Associate operates and maintains on-site equipment for the project.

The TeraScan system operated normally for 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 Ultra Low Frequency (ULF) waves and the remote sensing of mass density in the inner magnetosphere during geomagnetically active periods. The 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

Seawater is pumped continuously through a thermosalinograph (TSG) sampling system, recording the temperature, conductivity, salinity, and fluorescence. The data and webcam images are sent to a mirror site (<http://4dgeo.whoi.edu/tsg/>) at Woods Hole Oceanographic Institute, a collaborator on the project.

The thermosalinograph operated normally during the month.

T-434-M/P: POLAR GEOSPACIAL CENTER

Paul Morin, Principal Investigator, University of Minnesota

The Polar Geospatial Center provides geospatial support (in the form of mapping, data delivery, and GIS analysis) to science and logistics communities of the U.S. Arctic and Antarctic programs. The Research Associate has been requested to collect ground control points in the Palmer area throughout the 2011-2012 season.

Ground control points were collected on the Hermit Island and Outcast Islands.

B-466-P: FLUORESCENCE INDUCTION AND RELAXATION (FIRE) FAST REPETITION RATE FLUOROMETRY (FRRF)

Deneb Karentz, Joe Grzyski, Co-Principal Investigators, University of San Francisco

The focus of this project is to identify and evaluate changes that occur in genomic expression and physiology of phytoplankton during the transition from winter to spring, i.e., cellular responses to increasing light and temperature. A Fast Repetition Rate Fluorometer (FRRF) with a FIRE (Fluorescence Induction and Relaxation) sensor was installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

The FRRF was cleaned weekly and operated normally through the month.

T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE COMPREHENSIVE NUCLEAR TEST BAN TREATY ORG. (CTBTO)

Managed by General Dynamics

The IMS Radionuclide Aerosol Sampler and Analyzer (RASA) is part of the CTBTO verification regime. The automated RASA continually filters ambient air and tests for particulates with radioisotope signatures indicative of a nuclear weapons test. The Research Associate operates and maintains the instrument.

The RASA operated normally for the duration of the month. The seismic data-handling computers were changed out during a site visit by G-090-P site visitors during the month.

TIDE GAGE

Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. The Research Associate operates and maintains on-site equipment for the project.

The tide gauge operated normally during the month.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. 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 at the Gamage Point tower. Weather updates and satellite imagery were forwarded to the *ARSV Laurence M. Gould*. Updates were made to the software controlling the weather display in the Palmer Station radio room in conjunction with the previous month's move of the PalMOS computer. Microsoft Excel is no longer being used and now all data flows through MATLAB.