

# PALMER STATION MONTHLY SCIENCE REPORT

DECEMBER 2013



Ducklow and Schofield LTER field teams (B-045-P and B-019-P) water sampling at Station B. After weeks of sampling from the sea water intake on station, science groups were happy to finally be out on the water when the sea ice started to clear this month. *(Image Credit: Shellie Bench)*

## NEWS FROM THE LAB

By Carolyn Lipke, Assistant Supervisor of Laboratory Operations

For most of December Palmer Station remained locked in by sea ice. Scientists made the best of things by devising various ways to collect water samples from shore, and continuing their incubation experiments in the aquarium room. Finally, at the end of the month our luck changed. The ice blew out, and stayed out for the remainder of the month. The exit of the sea ice initiated a flurry of activity in the local scientists and wildlife alike. Leopard seals were frequently sighted in the local boating area, and penguins started to pop up all over the shores of Gamage Point. One minke whale was observed in Arthur Harbor on the 26<sup>th</sup>. Two humpback whales were sighted outside of the boating area on Dec 30<sup>th</sup>.

We kicked off the cruise ship season this month with one station visit, three small yacht visits, and two off-shore lectures. Our artists in residence also hosted a book making workshop and a Palmer Station art show. Arts and crafts of all varieties were exhibited, revealing hidden talents of many on station. Mid month we said goodbye to the Roberts (O-215-P) and Amaral-Zettler (B-228-P) science groups, as well as our artists in residence Allyson Comstock and April Surgent (W-492-P and W-489-P).

For the holidays the Palmer Station chefs prepared an amazing dinner, and an even more amazing spread of festive desserts. Solstice was marked with an annual polar plunge, which about half of station participated in. It's hard to believe that the summer season is already half over. We wish everyone a safe and happy 2014.

## **DECEMBER 2013 WEATHER**

**By Glenn Grant, Research Associate**

Winds from the west strongly influenced Palmer's weather during December, pushing sea ice against the southwest shore of Anvers Island while keeping temperatures low and conditions dry. The average temperature for the month was -0.2 C (32 F); for comparison, the 25-year historical average is 1.2 C (34 F). A record low for the month of December was set on the 3rd, -8.9 C (16 F); the previous record was -5.4 C (22 F), set in 2005. Prevailing winds came from the west, northwest or southwest for 19 days during the month, almost all during the first three weeks. On the 23rd the prevailing winds changed direction, coming from the north and east -- and temperatures jumped up. The high for the month, 8.2 C (47 F), was on the 28th. The month's strongest wind gust, 47 knots, came the next day. Overall, the average wind speed was a relatively light 5 knots.

Fresh snow totaled 20 cm. Total melted precipitation was very light, 7.9 mm, most of it falling as snow; December's historical average precipitation is 36.8 mm. Aside from lingering snow patches, the ground was mostly bare: the maximum accumulated snow stake depth was 5cm, and it all melted by the next day. Sea ice coverage was generally 7/10ths or greater until the winds shifted late in the month. December ended with open water off station, bands of brash ice and bergy bits, and impressive icebergs on the horizon. The sea water temperature at the pier rose as the ice moved out, reaching a maximum of 1.4 C (35 F) near the end of the month.

For the year, total melted precipitation was 562 mm, well below the historical average of 665 mm but within one standard deviation ( $n=24$ ,  $\sigma = 174.5$ ). The lower precipitation continues a 24-year downward trend ( $m = -14.1$  mm/yr,  $R^2 = 0.32$ ). Total measured snowfall, 336 cm, was slightly below the historical average of 343 cm. Average temperatures, binned on a quarterly basis, started out normally but became progressively colder as the year went on; the spring quarter (Sep-Oct-Nov) average was -4.1 C (25 F) versus the historical average of -2.5 C (28 F).

## **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: Ben Cook, Shawn Farry, Carrie McAtee, and Madison McConnell

As in November, the activities of B-013 in December were dictated by ice. Heavy pack ice during the first three weeks of December severely restricted boating allowing access to nearby Torgersen Island on only 2 occasions. However, north winds finally arrived on December 24<sup>th</sup> allowing boating locally and to Biscoe and Dream Islands through the end of the month.

Once free of ice we were able to continue monitoring breeding chronology of selected Adélie penguin nests on Humble and Torgersen Islands and maintain regular censuses of the local Adélie colonies. The open water also allowed several visits to both Dream and Biscoe Islands to initiate penguin and skua studies. A peak egg census was completed for chinstrap penguins on Dream Island and for gentoo penguins on Biscoe Island. Preparations for the Humble Island Adélie penguin radio transmitter project continued; equipment was installed on Humble Island and data collection/transfer was tested. Deployment of satellite transmitters and dive depth recorders on Adélie and gentoo penguins will begin in early January.

Skua work got underway this month as we began checking nests for newly hatched brown skua chicks on local islands as well as on Dream and Biscoe Islands. Our south polar skua mark-recapture and breeding monitoring study on Shortcut Island began with nest initiation checks, band resighting, and scat collection. Our censuses of the blue-eyed shag colony on Cormorant Island continued along with kelp gull surveys of all local colonies as well as on Dream Island. Foraging ecology studies of giant petrels continued with satellite transmitter deployments at Kristie Cove as well as on Shortcut Island. We completed the first round of our all-island census of giant petrels; new nests were identified and new breeders were banded. The census will continue into January.

Our monitoring of marine mammals continued this month recording sightings of seals and whales. While iced in we conducted lab work including processing of skua scat and regurgitate samples as well as processing limpet samples from kelp gull colonies. LTER cruise preparations continued throughout the month. The month ended with the arrival on December 31st of new B-013 team member Madison McConnell.

## **B-018-P: MOLECULAR ASSESSMENT OF PHYTOPLANKTON COMMUNITY DYNAMICS AND METABOLISM IN THE WEST ANTARCTIC PENINSULA**

Dr. Shellie Bench, Principal Investigator, Stanford University, CA

Personnel on station: Shellie Bench (PI and Post-Doctoral Research Fellow)

For much of the month, the sea ice persisted and made boating impossible. During weeks when sea-ice prevented boating, I collected water once or twice weekly from the sea-water intake (SWI) or near-shore close to the intake pipes. I sampled on days when the LTER groups (B-019-P, and B-045-P) were also conducting many of their suite of chemical and biological assays on SWI samples. On days when I collected water from near-shore using a portable submersible pump (rather than the SWI) the LTER groups included the near-shore water as a second “sample” in their assays. Their willingness to provide this support will provide crucial environmental data for any molecular data that I generate from the near-shore samples, and will also allow comparison of the two sampling sites and methods. To that end, on December 9<sup>th</sup>, I processed water for downstream molecular work that was collected using both methods on the same day.

On December 12<sup>th</sup>, the ice cleared long enough for zodiac sampling, but returned quickly. Finally on December 24<sup>th</sup> the ice moved out for what seems to be the long term. This allowed three more boat-sampling days in the last week of the month. Because the near-shore sampling is a 2-3 person endeavor, and when boat-sampling I need to use a separate boat from the LTER groups,

I've been assisted on sampling days throughout the month by a few people. These include, in particular the boating coordinators Jullie Jackson and Meredith Helfrich (ASC support staff), as well as Joanne Feldman (ASC support staff), Allyson Comstock (W-492-P), and Abigail Bockus (B-068-P).

In total, I collected and processed 9 samples during the month, including 3 near-shore samples, 2 SWI samples, and 4 water column samples collected from a zodiac. As described last month, my processing of each sample included filtering multiple replicates for RNA and DNA, as well as preparation of samples for microscopy and flow cytometry.

In the last few days of December, I have also been preparing inventories, laboratory supplies, and protocols for use during the LTER annual cruise when the B-045 group will be processing samples for my project at up to 12 of the LTER grid stations.

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

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

Personnel on station: Christina Haskins, Oliver Ho, and Austin Melillo

During the month of December the sea ice trend prevailed preventing us from sampling regularly. Change however was in the air and we were able to sample a total of four times during the month. One of these sampling events included us getting out to Station E for the first time this season. On December 24<sup>th</sup> a change in wind direction and velocity led to the sea ice all being blown out. This started a new trend of ice-free boating; at this time we also discontinued sampling the pump house located at Palmer Station. All remaining field members from B-019 and B-045 completed the boating two course, allowing for more versatile sampling and boating operations. With the disappearance of the sea ice we noticed a sharp decrease in visibility very rapidly. The week of Christmas yielded visibility of about 14m, the following week it had dropped to about 6m. We are looking forward to starting our regular sampling regime and capturing the spring phytoplankton bloom as well as other changes in the water column. We are also finally able to start discussing glider operations. Sea ice imagery for the immediate Anvers Island area is looking promising and we hope to have gliders in the water for early January.

### **B-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER) STUDY, MICROBIAL / BIOGEOCHEMICAL COMPONENT**

Dr. Hugh Ducklow, Principal Investigator, Lamont-Doherty Earth Observatory, Columbia University, New York, NY

Personnel on station: Jamie Collins and Sebastian Vivancos

With sea ice finally in retreat to the south and west of Anvers Island, B-045 began routine sampling for the LTER study on Dec. 12. We conducted sampling at both LTER stations B and E for the first time on Dec. 27, using the intervening time to take samples from the station's

seawater intake. In addition to the twice-weekly LTER sampling effort, we will continue sampling from the seawater intake on a weekly basis until mid-February, extending a microbial diversity time series that B-228 initiated this winter.

In conjunction with our weekly seawater intake sampling on Dec. 20, we participated in Ocean Sampling Day, a coordinated international effort to produce an annual “snapshot” of microbial diversity in the world’s oceans. We collected several liters of water onto filters of different pore sizes, which we preserved for genomic sequencing. Colleagues with the British Antarctic Survey station at Rothera also participated.

In December, we also conducted two experiments using water collected from the station seawater intake to measure lipid peroxidation and bacterial exoenzyme activity induced by ultraviolet-B radiation. As part of this effort, we continued to make measurements of underwater irradiance using our assigned outdoor aquarium. The results of these experiments will eventually be part of Jamie’s doctoral thesis in the MIT/WHOI Joint Program

On Dec. 30, we deployed the PHOTOSynthesis, Respiration, and Carbon Yielding System (PHORCYS) from a bottom mooring in Arthur Harbor. The PHORCYS is an incubation-based device developed at Woods Hole Oceanographic Institution that allows us to measure rates of primary productivity and community respiration under *in situ* conditions and with very high temporal resolution.

Finally, we continued collection of water samples for  $\delta^{18}\text{O}$  analysis by Dr. Mike Meredith of the British Antarctic Survey; Dr. Meredith will use the samples to examine the contribution of glacial meltwater to the coastal ocean.

**B-068-P: COLLABORATIVE RESEARCH: SYNERGISTIC EFFECTS OF ELEVATED CARBON DIOXIDE (CO<sub>2</sub>) AND TEMPERATURE ON THE METABOLISM, GROWTH, AND REPRODUCTION OF ANTARCTIC KRILL (*Euphausia superba*)**

Dr. Grace Saba, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences; Dr. Brad Seibel, Co-PI, University of Rhode Island

Personnel on station: Abigail Bockus



**B-019 field team members Oliver Ho (left) and Austin Melillo (right) assist B-045 with water collection from the Palmer seawater intake on Ocean Sampling Day. Ho and Melillo are students at Rutgers University.**

December marked our project's arrival at Palmer station and preliminary preparation for the upcoming field season. Much of the month was spent constructing large flow-through seawater systems that will be used to regulate the temperature and CO<sub>2</sub> concentration for our treatment water. Palmer support staff provided much assistance with the electrical rewiring and small construction jobs accompanying this set-up. Time was also spent troubleshooting the many issues commonly accompanying any group's first field season, such as space and equipment logistics, and software malfunctions. The flow-through system is currently operational and equipped with feedback probes that allow it to self-regulate temperature and CO<sub>2</sub> to desired levels. Other preparatory activities this month included laboratory set-up for the many metabolic assays proposed for this season and running trial samples to improve the resolution and accuracy of these experiments. Our group also performed vertical and horizontal net tows in Arthur Harbor to try and collect preliminary experimental specimens. Unfortunately, no organisms were captured. Optimal experimental parameters will continue to be measured before the rest of the B-068 group's arrival January 4<sup>th</sup>. Preparation will conclude in early January and the start of the LTER cruise will provide collection of the first of our two batches of experimental krill.

### **B-228-P: COLLABORATIVE RESEARCH: MICROBIAL COMMUNITY ASSEMBLY IN COASTAL WATERS OF THE WESTERN ANTARCTIC PENINSULA**

Dr. Linda Amaral-Zettler, Principal Investigator, Marine Biological Laboratory, Woods Hole, MA; Dr. Jeremy Rich, Co-PI, Brown University, Providence, RI

Personnel on station: Sharon Grim, Sean O'Neill, and Monica Stegman

December was a short and busy month for the B-228 science group. It began with the well-deserved departure of Sean O'Neill from station aboard the National Geographic Explorer. Sean was an invaluable member of the team and his time, effort and input were essential to the smooth execution of the project. We wish him well on his next adventure.

Early December saw the completion of the second sea ice experiment. This experiment utilized sea ice with visible microbial growth in 50L carboys to examine the effects of sea ice on the microbial communities in seawater. This experiment lasted eight days to mimic the experiment conducted earlier in the season.



**50L carboys waiting to be filled for the final DOM experiment.**

In addition to the sea ice experiment, B-228 completed the fourth DOM experiment of the season. These experiments were examining controls on seasonal changes by conducting seawater carboy experiments (50L) amended with diatom exudates. This final DOM experiment was started at the end of November for the best chance of capturing a phytoplankton bloom that traditional occurs around this time.

Weekly sampling continued from the seawater intake pipe on station. These samples were collected weekly throughout the entire season (June-Dec) to examine the seasonal changes in the bacterial community. This sampling will be

continued by B-045 (James Collins and Sebastian Vivancos) and B-019 (Tina Haskins, Austin Mellilo, and Oliver Ho) for the remainder of the summer season. Station B remained elusive to B-228 as the ice conditions did not change until the majority of the instruments were already packed. We did get out on the water to help B-018 (Shellie Bench) with a sampling trip and to set up the Penguin webcam.

In mid-December the lab was shut-down and Sharon and Monica headed home on the LMG13-12. The Palmer Station support staff and grantees have been wonderful to work with, and have been extremely helpful in setting up our 50L carboys during the DOM and sea ice experiments. We are very grateful for all of Palmer Station's staff for their support in and outside the lab, helping us accomplish so much despite the various challenges that have presented themselves.

### **W-489-P: 21ST CENTURY ANTARCTICA – THE SCIENCE AND LANDSCAPE OF PALMER STATION**

April Surgent, Glass Engraver, Seattle, WA

Personnel on station: April Surgent

While we remained ice bound into December, I continued my work of photographing the station and interviewing researchers about their respective work. My attention focused on the LTER projects.

Pleased with the results from the pinhole cameras, I dedicated the first few days of the month to making and setting out eight new cameras. Bringing the total number of pinhole cameras to twenty-three. Exposure times from station cameras ranged from two to forty-five days. A camera left on the L.M. Gould from October 27 to December 20 (first and last day of my deployment) served as the longest exposure at fifty-five days. In all, I ended up with seventy-seven exposures during my eight weeks of deployment.



nine day exposure

Excursions with the B-013 group took me to Kristie Cove where I learned more about the southern giant petrels and to Torgersen and Humble Islands where I observed Adélie penguins, brown skua and elephant seals. While on these excursions I started preliminary drawings of my observations of both the birds and the surrounding geography. I am currently working on and finishing these drawings at my studio.

On the 16<sup>th</sup> I departed station on board the *ARSV Laurence M. Gould* for my return to Punta Arenas. I set out five more pinhole cameras for the four-day passage.

Very grateful for my opportunity to work at Palmer Station and am looking forward to contextualizing my observations through a body of work focused on what I have learned and experienced. My sincerest thanks to all who helped me with my research.

### **W-492-P: ANTARCTICA: MICRO, MACRO AND IN-BETWEEN**

Allyson Comstock, Paper maker and visual artist, Opelika, AL

Personnel on station: Allyson Comstock

During the first two weeks of December (and the final two weeks of my stay at Palmer) I continued to work on a drawing. I was also able to complete the on-location part of my project. This was centered on taking photographs to create a library of images for future drawings. My particular focus during this period was on obtaining photographs of views at close range which are significant to the overall success of my project because they will connect broad landscape views with microscopic views.

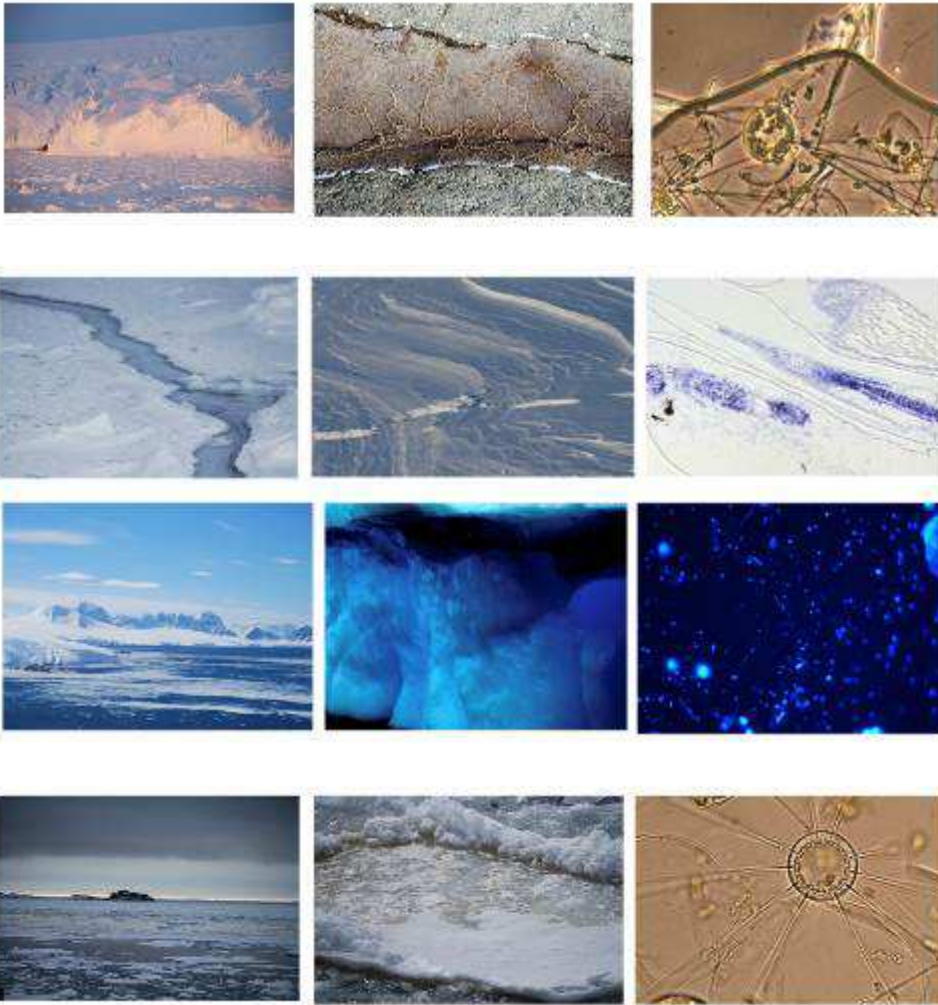
I was fortunate to make two trips to Kristie Cove with one of the LTER groups (B-013-P). These trips proved particularly beneficial because I was able to take photographs of Giant Southern Petrels. I was specifically interested in securing a photo of a bird in flight to use for one drawing and this was accomplished. I was also able to make one boating trip with the birder group to Torgersen and Humble Islands and take photographs of the penguin colonies. On the following day, I made a second trip to Torgersen with Palmer personnel and took additional photographs of the penguin colonies. I also took photographs of close up views that will correlate with distant and micro views. Additionally on this trip I was able to take photographs while on the Zodiac thereby adding broad landscape views from vantage points other than those around Palmer Station.

I am deeply appreciative of all the scientists and support personnel at Palmer for their generosity and help in making it possible for me to accomplish the first part of my project. I now look forward to the second part, many months of work in my studio making the drawings and then to exhibiting the completed artwork.



## Photo layouts for future drawings





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**RESEARCH ASSOCIATE MONTHLY REPORT**  
**December 2013**  
Glenn Grant

**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 150+ 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.

The system operated normally during the month.

**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.

The ELF/VLF system collected data normally.

**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 by measuring the wind-induced Doppler shift in the air's nightglow emissions. The Research Associate operates and maintains on-site equipment for the project.

The system operated normally. Data collection is suspended for the summer season and will resume when there are more hours of darkness.

**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 throughout 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 O<sub>2</sub> (detected through changes in O<sub>2</sub>/N<sub>2</sub> 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 CO<sub>2</sub> 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 Terra Lab and the VLF Building.

Air samples were collected throughout the month.

**O-215-P: IN-SITU OBSERVATIONS OF MARITIME SOURCES/SINKS OF AEROSOL AND CLOUD CONDENSATION NUCLEI AT PALMER STATION, ANTARCTICA: PAEROS PILOT PHASE.**

Gregory Roberts, Principal Investigator, Scripps Institution of Oceanography

A miniaturized aerosol package (PAEROS) has been deployed at Palmer Station Antarctica for the austral summer to measure aerosol physical properties, cloud condensation nuclei (CCN), radiative fluxes and meteorological parameters. The Research Associate assists the grantees with maintenance of the system.

The Research Associate supported periodic maintenance of the system. One portion of the PAEROS instrument, the short-column CCN counter, malfunctioned. The RA cleaned and recalibrated the CCN and re-installed it in the PAEROS enclosure.

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

James Butler, Principal 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. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon sampling were completed as scheduled.

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

James Butler, Principal 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. A BSI GUV-511 filter radiometer, an Eppley PSP Pyranometer, and an Eppley TUVR radiometer also continuously measure hemispheric solar flux within various spectral ranges. The Research Associate operates and maintains on-site equipment for the project.

Data was collected normally throughout the month.

**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 University of Wisconsin's 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 system operated normally.

#### **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 station collected data normally throughout the month.

#### **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 weather and ice imagery is used for both research and station operations.

Satellite passes were captured, recorded, and distributed normally throughout the month.

#### **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 is installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

Weekly cleaning of the instrument and data downloads were performed as scheduled.

#### **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 system collected data normally during the month. A battery module in the RASA's UPS overheated and was removed from operation.

### **OCEANOGRAPHY**

Pending the installation of a new tide gage system with salinity and sea water temperature sensors, the Research Associate takes daily readings of sea water temperature. Daily observations of sea ice extent and growth stage are also recorded.

### **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 National Weather Service for entry into the Global Telecommunications System.

The system collected data normally throughout December. The Present Weather Sensor continues to malfunction, reducing the weather reporting capabilities of the PalMOS system.