

# PALMER STATION MONTHLY SCIENCE REPORT

NOVEMBER 2015



**An adult *Flabellum impensum* deep water coral in the Palmer Station aquarium. Dr. Rhian Waller's group (B-248-P/L) is studying stress responses of coral larvae to elevated temperature conditions. Image Credit: Adam Rivers, ASC**

## NEWS FROM THE LAB

Carolyn Lipke, Summer Laboratory Supervisor

As anyone who has worked at a field research station knows, a season is filled with highs and lows. This month we've asked grantees and support staff to contribute their high and low moment for November, and you'll find them scattered throughout the report. Personally, it's easy to think of the highs, harder to remember the lows. This is such an amazing place, what seems like a low one day is quickly overwritten by a positive experience, which is probably why so many of us keep coming back.

In November the *ARSV Laurence M. Gould* (LMG) came and went a few times, supporting maintenance of the Kohut (B-005-P/L) CODAR stations and installing a permanent remote weather station in the Wauwerman Islands along the way. The Paznukhov team, who is studying the ionosphere (A-373-P), completed the installation of their antennas in the backyard that will detect signals sent from Vernadsky Station. We hosted the second bi-annual Palmer Station Amateur Science Fair, which featured fun experiments by both Palmer and LMG staff and grantees. There were preserved snowflakes, electricity from lemons, and of course the requisite baking soda volcano. On LMG15-10 we welcomed the Gao group (O-231), who is studying atmospheric iron, and Susan McCarthy (W-488) a writer who is here to observe a bird near and dear to our hearts, the snowy sheathbill. At the end of the month we celebrated Palmer Thanksgiving with an incredible spread prepared by our amazing chefs Brian Tamm and Sarah Swan.

**Personal high:** A spectacular evening outing on November 18. The non-existent wind and the pre-bloom crystal clear water made for some spectacular reflections and underwater viewing. We saw balls of krill that would disperse when we got close, some of them even leaping out of the water, and I spotted my first Wilson's storm petrel of the season.

**Personal low:** The nasty cold that descended upon my apparently inferior immune system just as LMG15-10 was arriving. Being knocked flat during a busy week really reminds you how much activity happens during a port call, and how behind you can get if you aren't operating at peak efficiency.

## NOVEMBER 2015 WEATHER

Mark Dalberth, Research Associate

<b>Temperature</b>
<b>Average:</b> -1.5 °C / 29.2 °F
<b>Maximum:</b> 4 °C / 39.2 °F on 28 Nov 05:46
<b>Minimum:</b> -9.1 °C / 15.62 °F on 3 Nov 09:30
<b>Air Pressure</b>
<b>Average:</b> 977.5 mb
<b>Maximum:</b> 998.3 mb on 4 Nov 21:16
<b>Minimum:</b> 945.4 mb on 11 Nov 15:07
<b>Wind</b>
<b>Average:</b> 13.7 knots / 15.8 mph
<b>Peak (5 Sec Gust):</b> 59 knots / 68 mph on 1 Nov 15:23 from N (10 deg)
<b>Prevailing Direction for Month:</b> N
<b>Surface</b>
<b>Melted Precipitation (Rainfall and melted snow):</b> 50.3 mm / 1.98 in

**Total Snowfall: 31 cm / 12.2 in**

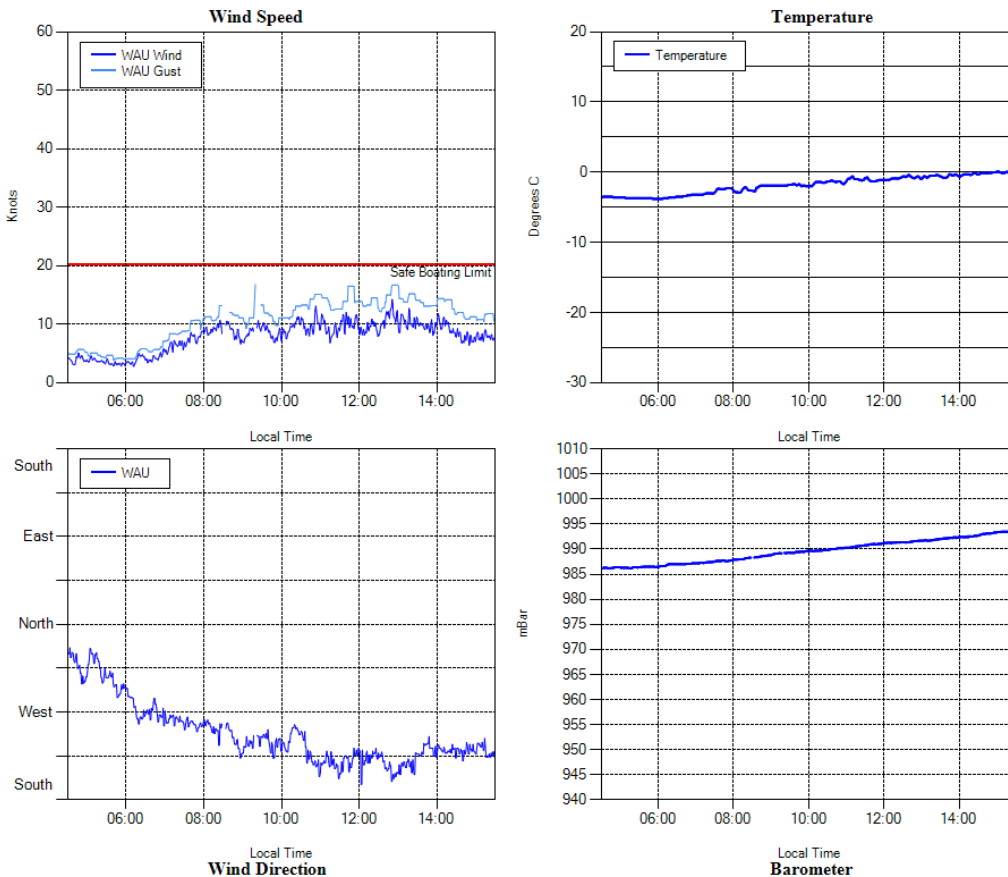
**Greatest Depth at Snow Stake: 159 cm / 62 in**

**Sea Ice Observation: Fast ice persists in the harbor, but it is not impeding boating operations.**

**Average Sea Surface Temperature: -1.35 °C / 29.6 °F**

While there has been (and still is) a lot of snow here at Palmer, the story for this month is the wind. We've had nine wind events with 2 min average wind speeds over 30 knots. There have been five days with 5 sec gusts over 50 knots. The winds blew away the floating ice, but the fast ice in Arthur Harbor has managed to survive throughout the month. The boat ramp cleared of ice on November 12 allowing boating operations to commence, but only after 30 knot winds on the 13<sup>th</sup>.

The minimum temperature of -9.1° C occurred on November 3 and the maximum of 4° C was on November 28. With the warmer temperatures the snow has been melting. At the end of the month, the depth at the snow stake was 1.54 meters- a loss of 18 cm from last month's maximum depth. We received 31 cm of snow which is considerably less than the snowfall last month when we had 116 cm. A lot of the shoveling that we've been doing this month is to combat drifting snow.



**Figure 1: Weather information from the new remote weather installation at Wauwerman Island.**

## **A-373-P: TROPOSPHERE-IONOSPHERE COUPLING VIA ATMOSPHERIC GRAVITY WAVES**

Dr. Vadym Paznukhov, Principal Investigator, Boston College

Personnel on station: Keith Groves and Vadym Paznukhov

### **HF system**

During the October-November 2015 trip to Palmer station a three channel HF system was installed. The entire HF radar includes a transmitter deployed at Vernadsky Station (installed earlier this year) and three receivers (based on USRP software defined radio) installed at Palmer Station during this visit. A major effort was erecting the HF loop antennas in the Palmer station “backyard”, which under heavy snow conditions turned out to be a challenging task (Figure 1). The installed antennas are connected with 140m long RG8U coaxial cables which were laid down on the snow and put inside a metal pipe in the location where regular foot and wheel traffic is present. During the summer time when the snow melts, the Palmer station FMC personnel will cover this pipe with some sort of metal sheet cover for better protection. Antenna cables were measured to the exact same electric length with the use of equipment and assistance from the LMG crew, particularly Austin McHugh for his guidance using the Riser Bond Time Domain Reflectometer.

Electronic units of the receive system were setup in a rack inside the Terra Lab (Figure 2). After the antennas were installed and connected, system phase calibration was performed with a specially designed procedure and with the use of a transmission from a probe HF source built on a IFR2947A Communications Service Monitor (borrowed from Chuck Kimball) and a “whip” antenna graciously provided by the B-005-P project team (Hank Statscewich and Colin Evans).

Unfortunately, because of the short time available for the visit, long term phase calibration needed to account for temperature effects was not possible to perform. After the completion of testing and calibration, routine data collection started on November 8, 2015. Currently, the HF sounding data (images) are being automatically transferred to Boston College file server and raw data are being accumulated at Palmer on external hard drives connected to the workstation computer.

The system is expected to require minimum routine maintenance. Palmer Research Associate Dr. Mark Dalberth provided primary support during the installation phase and has learned the principles of its operation. We are confident with his support and on-line access from Boston College that we can monitor performance and successfully troubleshoot issues with the system.

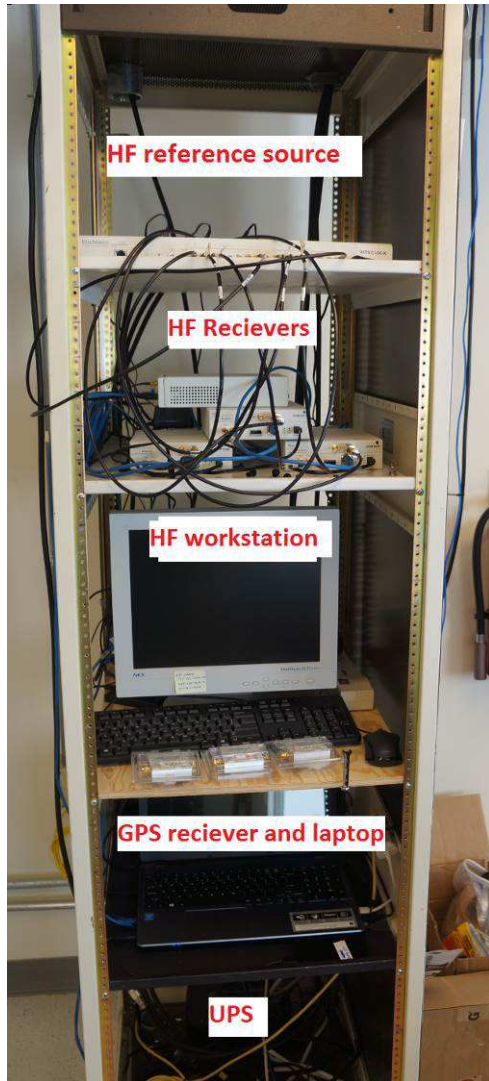
### **GNSS receiver**

The Septentrio GNSS receiver installed in June 2015 on the roof of the Terra Lab building has been stable and providing data continuously. In November 2015 the raw data were copied from the system and delivered to the Boston College database.



**Figure 1. Top: three antenna array installed in Palmer station “backyard”. Distance between the antenna pairs is approximately 25 meters, and antennas are leveled to 1-2 cm accuracy. Bottom: Antenna #2 close-up photo. Yellow reinforcement fiberglass poles were designed, prepared and installed by Joe Bissonnette and Adam Rivers, who also recommended upper and lower guy wires to secure the antenna under high wind conditions.**





**Figure 2.** Electronic equipment of the A-373-P project. Top three shelves are occupied with the HF system units, one shelf with the GPS receiver and the bottom one hosts UPS and power distribution cables.



**Figure 3.** Anchor installation crew led by Joe Bissonnette (right) and Jeff Keller (center). Guy bolts and antenna masts were mounted in rock with help from the big drill. P.I. Vadym Paznukhov (left) looks on.

## **B-005-P: COLLABORATIVE RESEARCH: IMPACTS OF LOCAL OCEANOGRAPHIC PROCESSES ON ADÉLIE PENGUIN FORAGING ECOLOGY**

Dr. Josh Kohut, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences; Dr. William R. Fraser, Co-PI, Polar Oceans Research Group; Dr. Kim Bernard, Co-PI, Oregon State University; Chris Linder, Co-PI; Dr. Matt Oliver, Co-PI, University of Delaware; Hank Statscewich, Co-PI, University of Alaska Fairbanks; Dr. Peter Winsor, Co-PI, University of Alaska Fairbanks

Personnel on Station: Colin Evans and Hank Statscewich

November 2015 was a maintenance and data recovery trip for the three site HF radar network deployed in November 2014. The purpose of the trip was to recover hard drives with raw data collected since the last visits to the sites in February 2015. Additionally the team was sent to inspect and repair, if possible, damage to the sites so the equipment could be secured until the planned recovery of all equipment in February, 2017.

The CONVERGE team first visited the Palmer Station site during the LMG port call. The site was in good condition with no damage to the antenna or cabling. Palmer site activities included backup of all spectra, radial, diagnostic and meteorological data. Following the Palmer Station port call, the CONVERGE team was able to visit the Wauwerman site from the LMG. The remote power module was inspected and repaired to maintain connection to the radar and met equipment. Damage to this site included the solar panels, wind turbines and electrical equipment inside the shelter. All spectra, radial, diagnostic and meteorological data were recovered and backed up. A new external hard drive was installed. We were also able to conduct an antenna pattern measurement (APM) to verify site calibration. The 2015 APM looks nearly identical to the APM conducted in 2014 indicating the site held calibration over the winter season. We installed the new APM and corrected the phase settings on the radial site. Unfortunately ice conditions prevented us from gaining access to the site located in Joubin Islands. Our remote connection indicates that this site is still operating as intended.

We would like to thank the support on board the LMG as well as station staff. We recognize the significant logistical support required for our project, including zodiac support, cargo, and Information Technology.

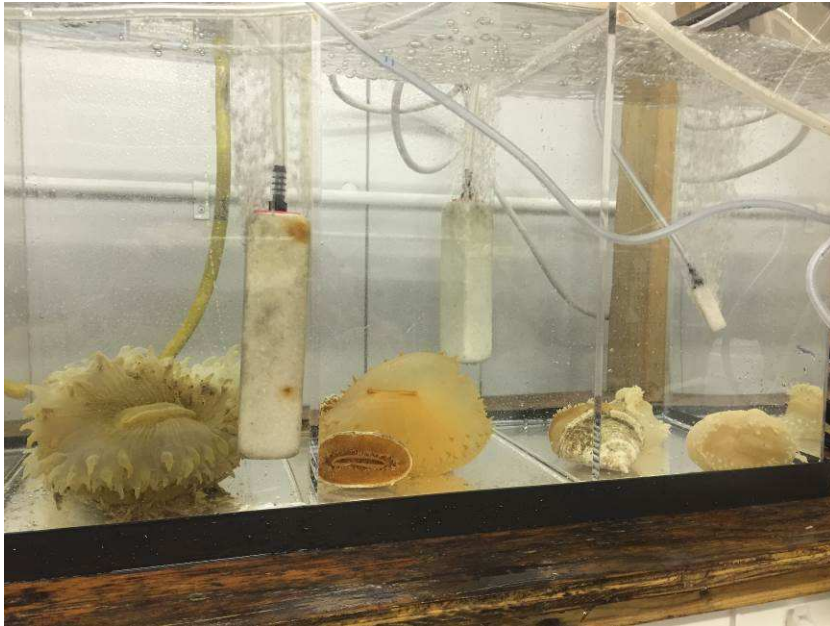
### **B-248-P: Cold Corals in Hot Water – Investigating the physiological responses of Antarctic coral larvae to climate change stress**

Personnel on Station: Caitlin Cleaver, Maggie Halfman, Jay Lunden, and Rhian Waller

November has been a very busy month for the deep-sea coral group working at Palmer Station this summer. Prior to arriving at station on October 29<sup>th</sup>, we collected over 100 adult *Flabellum impensum* solitary cup corals and over 2000 liters of seawater from 540 m depth onboard the LMG. Immediately upon arrival on station, we used the seawater and adult corals to set up 2 major experiments aimed at investigating the physiological responses of larval forms of *F. impensum* to ocean warming and ocean acidification with 4 temperature treatments and 2 acidification treatments. Following experimental setup, Rhian and Cait headed North on the LMG and Jay and Maggie stayed on station to monitor the experiment. They are sampling larvae every 5 days, preserving them for advanced microscopy methods (scanning and transmission electron microscopy, SEM/TEM) and cell-sorting flow cytometry. The ultimate goal of this work is to evaluate health status and stress levels in the larvae of this deep-sea Antarctic coral to projected increases in ocean temperatures and acidity. This experiment will run until mid-December, at which point Jay and Maggie will pack up, head home on the LMG, and begin analyzing the samples in Maine.

**Personal high:** Starting our long-term incubations on November 1, the culmination of months of preparation.

**Personal low:** We hit a road block in mid-November with a troublesome incubator, but solved it thanks to the ASC staff especially Jeff Keller.



**Figure 1. Adult specimens of *Flabellum* cup corals in aquaria at Palmer Station, prior to extraction of larvae for use in temperature and acidification experiments.**

We are incredibly thankful to the ASC science support staff on both the LMG and at Palmer Station for helping with shipboard operations and for implementation of the experiments, especially every one that has helped with the HVAC challenges that arise from doing temperature-sensitive work here in the Antarctic.

### **C-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 Matthew Porter

C-013-P personnel arrived at Palmer Station on October 29<sup>th</sup> however due to ice we were unable to boat or conduct field work until November 13<sup>th</sup>. Ice conditions improved during the latter half of November and brief weather windows allowed for boating and field work on 14 days. Field work also allowed us to test Palmer Stations new Solas Rigid Hulled Inflatable Boat (RHIB) which has thus far been an exceptional platform for navigating early season ice.





**Figure 1: November Boating near Palmer Station - Birders approaching Humble Island**

Field work this month began with censuses of local Adélie penguin colonies on Torgersen, Humble, Cormorant and Christine Islands as well as on Biscoe and Dream Islands. Breeding chronology studies were initiated on a subset of Adélie nests on Torgersen and Humble Islands and Adélie adult and egg morphometric data was collected at the 1-egg stage. A peak egg census was also completed for Adélies on all local islands. In addition to our Adélie monitoring, we also began monitoring gentoo colonies on Biscoe and Chinstrap colonies on Dream.

The Penguin Cam <http://www.usap.gov/videoclipsandmaps/palwebcam.cfm> was also set up on Torgersen Island (64°46'S, 64°04'W), off the coast of Anvers Island. This camera is seasonal and operates primarily from November to February, the Adélie breeding season.

November also saw the start of our mark-recapture and breeding chronology studies of brown skuas on Torgersen, Humble, Cormorant, Christine, Litchfield, Dream and Biscoe Islands and south polar skuas on Shortcut Island. Population monitoring of the small blue-eyed shag colony on Cormorant Island also began this month. An early-season census of giant petrel nests on Humble and Shortcut Islands was also completed in preparation for our larger Palmer area giant petrel census that will begin in December.

Marine mammal censuses of seals and whales also began this month, the highlight of which was the observation of a pod of orcas during our first day in the field. While orcas are not uncommon along the peninsula they are a rare sighting in the local Palmer area. Seal sightings this month included several Weddell, crab-eater and leopard seals; however the dominant species in the Palmer area during November was elephant seals including numerous recently weaned pups as well as several nursing mother pup pairs.



**Figure 2: Orcas sighted near Palmer Station in November, 2015.**

During weather days in November we conducted lab work and were able to complete the processing of all samples collected during the 2014 season.

### **C-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: Nicole Couto, Chelsea Farischon, and Ashley Goncalves

Nicole Couto is a PhD student pursuing her degree in Oceanography at Rutgers University in New Jersey. Chelsea Farischon is a recent Rutgers graduate with a B.A. in Genetics and Ashley Goncalves is a current Rutgers senior majoring in Marine Science. The three of us arrived on station on October 29<sup>th</sup> and have had an enjoyable and productive month.

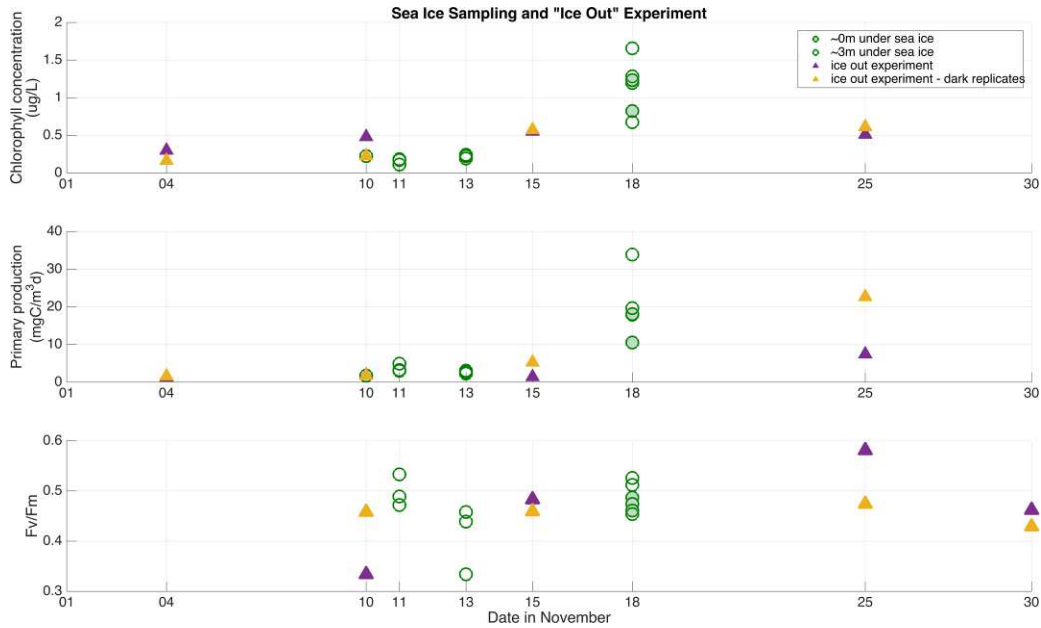
This month at Palmer we have had ice upon ice! Heavy brash ice at the beginning of the month prevented the LTER sampling groups (C-019-P and C-045-P) from getting out on the water to sample our usual oceanographic sites at stations B and E. However, with the sea ice in Arthur Harbor holding fast and remaining over a meter thick, we were able to establish a sea ice station from which we've been collecting samples of water beneath the ice.



**Figure 1: Jeff Bowman (C-045-P), Jamie Collins (C-045-P), and Chelsea Farischon at the sea ice station**

We also designed a joint experiment with C-045-P to simulate the conditions that the under-ice phytoplankton and bacterial communities would experience if the sea ice suddenly broke up. We incubated 9 carboys of under-ice water (3 sets of 3 replicates) under light conditions typical of the 10 m light level in the open ocean. At 24 hours, 72 hours, and 8 days after the initial water collection and measurements, we measured the chlorophyll concentration, primary production,

and variable fluorescence of 3 of the carboys. On the final sampling day, we also made the same suite of measurements on 3 additional carboys that had been kept under low light to simulate the under-ice environment from which the samples originally came.



**Figure 2: Sea ice sampling and primary production experiment**

As expected, the chlorophyll concentration and primary production increased exponentially throughout the experiment under increased light conditions. Meanwhile, the community under the sea ice in Arthur Harbor grew at a slower rate.

By mid-November the brash ice opened up enough to allow us to start sampling at stations B and E. High winds have prevented us from getting out as often as we'd like, but we were able to sample twice at E and three times at B during November.

Finally, this month Nicole put out a mooring at station E equipped with an upward-looking current profiler and a CTD. The mooring will record current speed, direction, temperature, and salinity at Station E until the end of the LTER cruise in February. This data will become an important component of Nicole's PhD thesis and she'd like to take this opportunity to thank all the ASC support staff for their help in the deployment!

Thanks also to the support staff for all your help in setting up the lab, and thanks especially to Mark Dalberth and Nándi Kováts for getting us out on the sea ice and helping us establish our sampling hole!

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

Dr. Hugh Ducklow, Principal Investigator, Columbia University, Lamont Doherty Earth Observatory

Personnel on Station: Jeff Bowman, Jamie Collins, Ribanna Dittrich, Colleen Hansel-Wankel, and Conor Sullivan

For the Microbial Biogeochemistry group, November 2015 was among the busiest station openings in recent memory. Despite a series of strong storms, landfast sea ice continued to linger on much of Arthur Harbor. While this ice would normally have kept us ashore to await the start of boating operations, we instead took advantage of the first opportunity in nearly a decade to conduct regular ice sampling operations from Palmer Station. The stable, healthy ice cover (between 75 and 100 cm in thickness) allowed us to make five sampling visits to a station we established on November 4.

Working with members of the C-019-P (Schofield) project, we collected water samples at two depths for several core LTER study parameters, including bacterial production, analysis of dissolved organic carbon and nutrients, and microbial community composition via flow cytometry. In addition, Jeff Bowman conducted in situ pumping operations to collect cell material for extraction of DNA and RNA. Jamie Collins collected samples for analysis of lipids and a class of oxidized lipids called oxylipins. We used GoPro cameras, donated by Abercrombie & Kent tours, to collect some unique video under the ice (Fig. 1); the ice bottom was highly heterogeneous in both form and thickness. Jeff, who has conducted sea ice sampling around McMurdo and at several locations in the Arctic, gave a station science talk where he put the current sampling operations in context. With C-019-P, we also designed and conducted a 10-day experiment here on station to observe the effects of a simulated ice retreat on the microbial community currently living in the relative darkness (Fig. 2) beneath ice-covered Arthur Harbor.

While the ice remained on the northern section of the harbor, we were able to begin regular open water sampling operations at LTER stations B and E on November 17. While we await the arrival of a new photo-optical profiling instrument, we have been making water column and under-ice (Fig. 2) profiles of photosynthetically active radiation (PAR) with two basic LI-COR sensors that are kept in inventory here on station.

We express our sincere gratitude to the station manager and two members of the station's Glacier Search and Rescue Team, whose exceptional support allowed us to take advantage of the unique ice sampling opportunity.

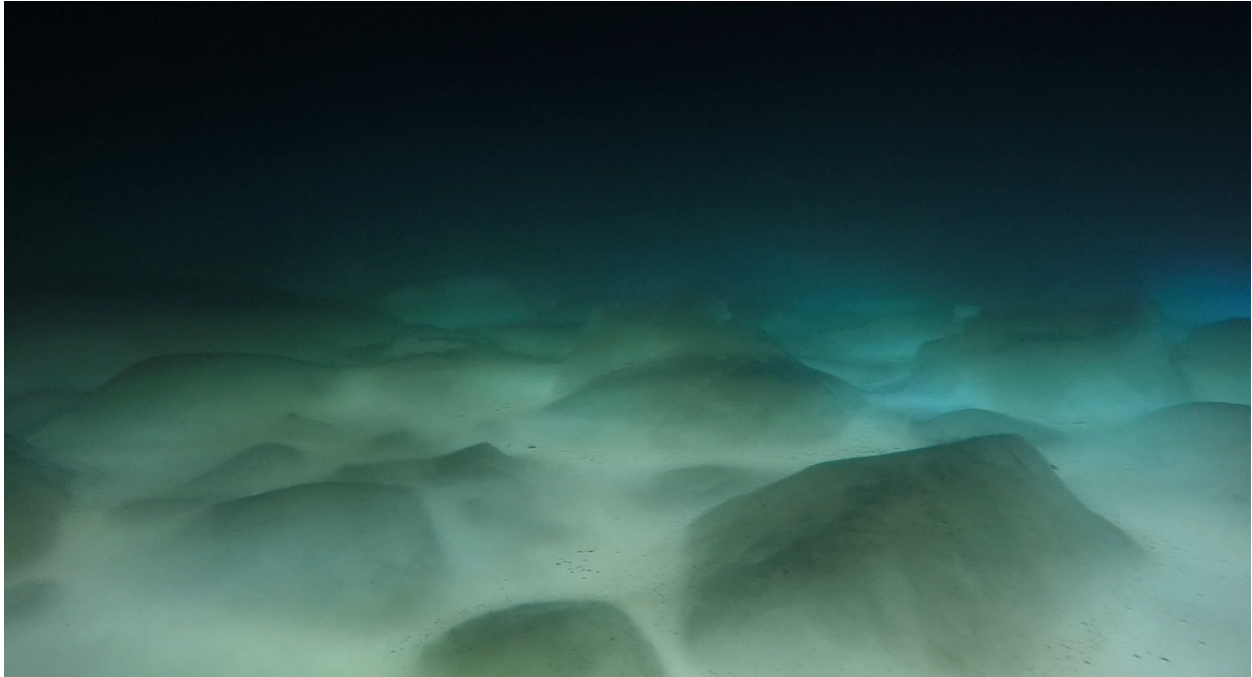


Figure 2. Image of the underside of the landfast sea ice currently covering Arthur Harbor. GoPro still image by Jeff Bowman.

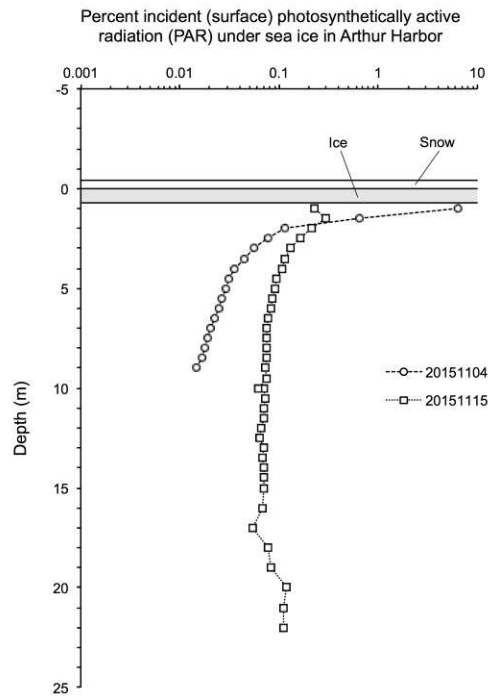


Figure 2. Profiles of photosynthetically active radiation (PAR) under sea ice in Arthur Harbor, relative to intensity at the snow surface. The sea ice blocks a large but variable fraction of the incoming solar radiation; for comparison, nearly 84% of incoming PAR made it to 1 m depth in the open water column at station B on November 17.



## **O-231-P: QUANTIFYING ATMOSPHERIC IRON PROPERTIES OVER WEST ANTARCTIC PENINSULA**

Dr. Yuan Gao, Principle Investigator, Rutgers University

Personnel on Station: Yuan Gao, Shun Yu, and Wancheng Zhou

The goal of this project is to quantify atmospheric iron properties and its deposition through the field measurements of aerosols and precipitation. The efforts include intensive atmospheric sampling in austral summer to be made in two successive field seasons and inter-annual measurements for a two-year period. An air sampling platform was erected in the Palmer backyard to support atmospheric measurements. The Rutgers group arrived at Palmer during the last week of November for the 1st intensive measurements in the 2015-2016 field season.



**Figure 1: The O-231-P air sampling instrument platform on the first day of full operation.  
Photo by Yuan Gao.**

## **W-488-P: OBSERVING THE SNOWY SHEATHBILL AND ITS BEHAVIOR**

Ms. Susan McCarthy, Principle Investigator, San Francisco, CA; Ms. Terri Nelson, Collaborator, Portland, OR

Personnel on Station: Susan McCarthy

Half our team arrived late this month, with the other half to arrive in early January. Getting here this early has enabled me to observe the behavior of the birds as they go around in pairs. They're unable to nest yet because of snowy conditions.

I've been greatly helped by people on station. Jeff Otten's deep familiarity with sheathbill behavior has been tremendously useful. Adam Rivers' photographs of a pair of sheathbills, documenting their facial characteristics, lead us to hope we'll be able to recognize individual birds even out of context.

When Project Sheathbill is able to travel to other areas, we hope to observe sheathbills in settings other than the station itself. We're also hoping to record sheathbills in areas with less anthropogenic noise, for the Macaulay Library at the Cornell Lab of Ornithology.



**Figure 1: Snowy Sheathbills at Palmer Station. Photo by Susan McCarthy.**

**Personal high:** seeing fascinating sheathbill behaviors.

**Personal low:** rushing to get a camera, whereupon sheathbills imitate inert lumps of snow.

**PALMER STATION  
RESEARCH ASSOCIATE MONTHLY REPORT  
NOVEMBER 2015**

Mark Dalberth

**Personal high:** Getting chocolate in the silver trunk from my friend Megan

**Personal low:** ELF system developing a short in the line carrying power to the pre-amp.

**B-005-P: IMPACTS OF LOCAL OCEANOGRAPHIC PROCESSES ON ADELIE PENGUIN FORAGING OVER PALMER DEEP: COASTAL OCEAN DYNAMICS APPLICATIONS RADAR (CODAR)**

Josh Kohut, Principal Investigator, Rutgers University

The CODAR system consists of three transmitters/receivers located on Anvers Island, Wauwerman Island and on Howard Island in the Joubins. The data from all three transmitters is compiled on computers in Terra Lab and plots of the surface currents over the Palmer Deep are generated.

The CODAR system functioned well throughout the month. Tests were performed by the grantees to determine if the CODAR HF signal was interfering with the transmission from Vernadsky for A-373-P.

**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 well throughout 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 VLF functioned normally this month. The ELF stopped working when the wire supplying 24V power to the pre-amplifier shorted to ground. It was determined that the short was between the second junction box and the ELF shelter. Most of the cable is buried beneath snow and ice presently, but the parts that were exposed were checked for signs of damage. Nothing was found, and troubleshooting is continuing.

**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 computer system has been operating normally all month.

**O-264-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 Terra Lab.

The air samples were taken twice this month.

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

Don Neff and Steve Montzka, Principal Investigators, 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.

Samples were collected for both the CCGG and the HATS projects two times this month.

**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.

The system operated well throughout the month. Absolute Scans were performed as scheduled. The system has been plugged into its UPS.

#### **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 Antarctic Meteorological Research Center (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 throughout the month. In addition to the low readings of the temperature sensor, I noticed that some of the time stamps of data displayed at the AMRC website were off. The PI was notified.

#### **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 system operated normally. A new computer arrived that will be used for a backup.

#### **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.

The tracking problems that have been an issue have been fixed with remote help from Sea Space Corporation. The fix was a re-alignment of the antenna performed through software. We are monitoring the images to see that alignment remains good since this could be a hardware problem.



**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. The Research Associate maintains the on-site system.

The new computer for the system should come down on LMG16-01.

**A-373-P: TROPOSPHERE-IONOSPHERE COUPLING VIA ATMOSPHERIC GRAVITY WAVES**

Vadym Paznukhov, Principal Investigator, Boston College

The goal of this project is to enhance the comprehensive research understanding of troposphere-ionosphere coupling via Atmospheric Gravity Waves (AGWs) in the Antarctic region. Both experimental and modeling efforts will be used on the Antarctic Peninsula to investigate the efficiency and main characteristics of such coupling and will address several questions remaining in the current understanding of this coupling process.

The system is installed and collecting data.

**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.

The instrument has been sent back for repair.

**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 operated normally throughout the month for the most part. There was an unplanned power outage and it was noticed that a router lost power that should have been running off a UPS. It turned out that the router was not plugged into the UPS. This was rectified on November 30.

## **OCEANOGRAPHY**

Daily observations of sea ice extent and growth stage are also recorded, along with continuous tidal height, ocean temperature, and conductivity at Palmer's pier.

Daily observations of the ice around station were made. The new tide gauge is operating normally.

## **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.

Old PalMOS and "backyard" PalMOS have continued to operate in parallel. The weather station that will be installed in the Rosenthals is running out on Gamage point. I made a chart of the met data from the Wauwerman Islands weather station to assist with boating operations, especially south to Biscoe. I'm continuing to debug and improve programs used for weather reporting.