

# PALMER STATION MONTHLY SCIENCE REPORT

MARCH 2017



**Keri Nelson and Sabrina Heiser, “Junior Birders,” continuing C-013-P (Fraser)’s Giant petrel chick monitoring project.** *Image Credit: Keri Nelson*

## NEWS FROM THE LAB

Emily Olson, Winter Laboratory Supervisor

With turnover complete and the arrival of a new grantee group on Station, April saw both ASC personnel and grantees settling in to new roles and preparing for some exciting research over the coming winter months.

When the ARSV *Laurence M. Gould* departed on April 3rd, only grantee groups C-024-P (Friedlaender) and B-022-P (Amsler) remained on station. B-036-P (O’Brien) arrived on April 19<sup>th</sup> on LMG17-04 and brought with them a bounty of Antarctic notothenioid fish. ASC personnel were on hand to assist with two extremely successful fish offload operations. LMG17-04 also brought the labs a new freeze-dryer which was immediately put to good use by B-022-P (Amsler). Continuing monitoring of giant petrel chick weights on Humble Island has been taken up by several permitted community members after the departure of C-013-P (Fraser), with data being collected and disseminated to the project PIs several times a week.

Towards the end of April the seasonal shift into winter began in earnest. Though we had a month of relatively balmy weather and more rain than snow, we saw a good 8 inches of snow fall overnight mid-month and have started to see some seriously strong winds come down from the North. The fur seals seemed to have disappeared almost overnight, leaving the more vocal and distinctly-scented elephant seals the primary occupants of our neighboring islands. Even the gentoo penguins have mostly dispersed in preparation of the coming season. Skuas, petrels, and gulls still buzz around above our heads, but the rhythm of life outside is getting noticeably slower as the days get noticeably shorter. But the science goes on, and so do we!

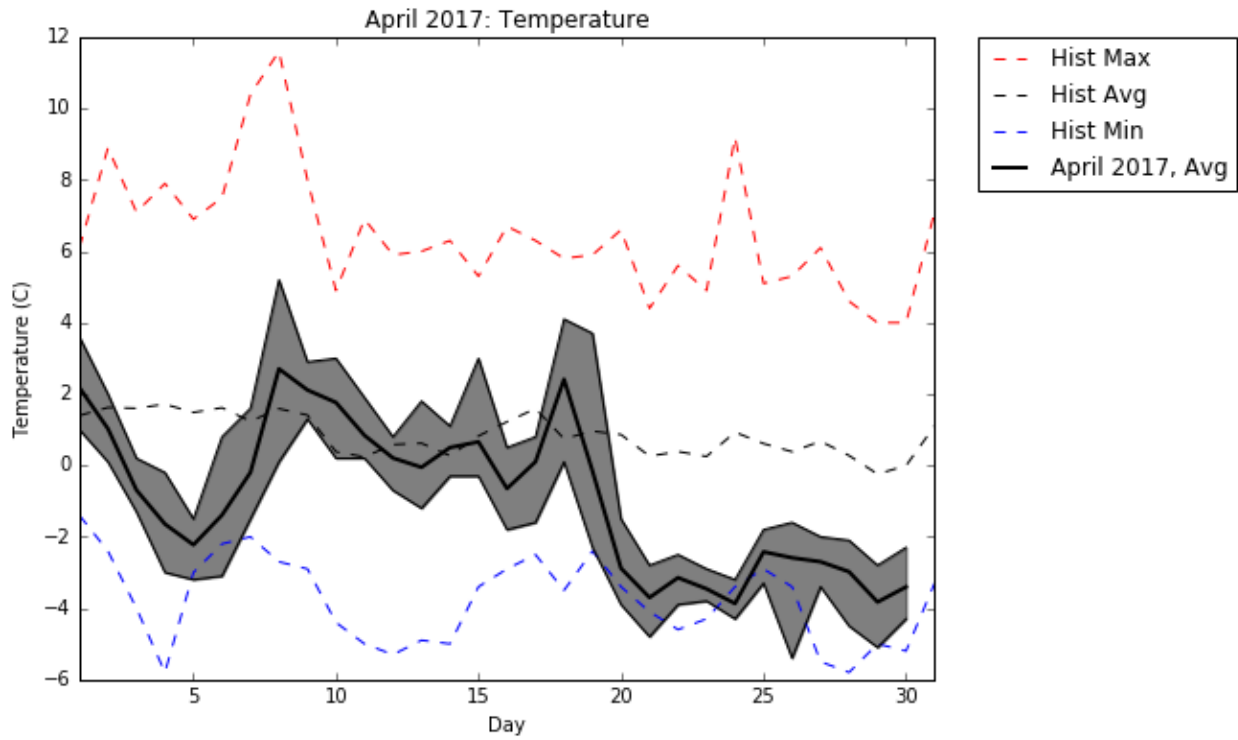
## MARCH 2017 WEATHER

Lance Roth, Research Associate

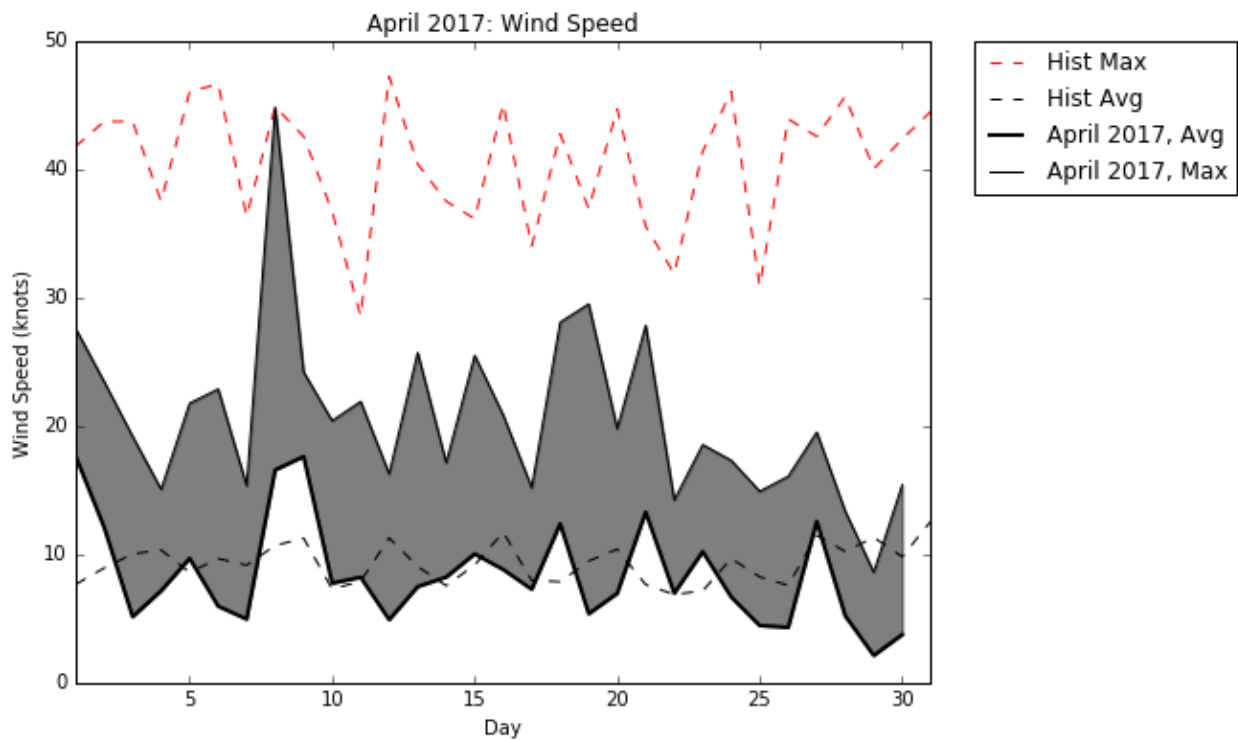
### Palmer Monthly Met summary for April, 2017

<b>Temperature</b>
<b>Average:</b> -.9 °C / 30.4 °F
<b>Maximum:</b> 5.2 °C / 41.36 °F on 8 Apr 17:16
<b>Minimum:</b> -5.4 °C / 22.28 °F on 26 Apr 01:39
<b>Air Pressure</b>
<b>Average:</b> 990.6 mb
<b>Maximum:</b> 1003.3 mb on 24 Apr 20:18
<b>Minimum:</b> 966.4 mb on 19 Apr 07:15
<b>Wind</b>
<b>Average:</b> 8.5 knots / 9.7 mph
<b>Peak (5 Sec Gust):</b> 48 knots / 56 mph on 8 Apr 10:08 from NNE (20 deg)
<b>Prevailing Direction for Month:</b> NNE
<b>Surface</b>
<b>Total Rainfall:</b> 46.7 mm / 1.84 in
<b>Total Snowfall:</b> 8 cm / 3.1 in
<b>Greatest Depth at Snow Stake:</b> 7 cm / 2.7 in
<b>WMO Sea Ice Observation:</b> No Sea Ice in sight, only ice of land origin, 1-5 bergs, with growlers and bergy bits.
<b>Average Sea Surface Temperature:</b> 0°C / 32 °F

The following two plots show the month's average temperature and wind speed plotted against the historical average (where the historical average goes back to November 30, 2001). Overall, temperatures were near or below average for the month of April, with a few record lows. Wind speeds were mostly consistent with historical averages. Arthur Harbor and Hero Inlet have been clear of sea ice, but have been occasionally filled with growlers and bergy bits from local glacier calving.



**Fig. 1** – Plot of daily temperature in April 2017. Shown in black/shaded gray are the daily average, the minimum, and the maximum for this year. The dotted lines on the graph indicate average, minimum, and maximum values for “historical values” for 2002 to 2016. (We thank Lance Roth for providing this data and the figure.)



**Fig. 2** – Plot of daily wind speed in March 2017. The daily averages are shown in black with grey shading indicating gusts. The dotted lines on the graph indicate average and maximum values for “historical values” for 2002 to 2016 (we thank Lance Roth for providing this data and the figure).

## **B-022-P: THE CHEMICAL ECOLOGY OF SHALLOW-WATER MARINE MACROALGAE AND INVERTEBRATES ON THE ANTARCTIC PENINSULA**

Charles Amsler and James McClintock, Principal Investigators, University of Alabama at Birmingham, Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Charles Amsler, Margaret Amsler, Bill Baker, Sabrina Heiser, Leucas Miller, Andrew Shilling, Santana Thomas

April was, oddly, simultaneously both frustrating and productive from the perspective of diving fieldwork. A long storm from the southwest that lasted most of the last week of March was continued by more moderate southwest winds that prevailed well into April. This combination maintained a pattern of moderately heavy seas coming from the west-southwest that lasted for much of the month. The duration of this pattern was very unusual if not unprecedented in our group’s experience at Palmer Station. Very few of our collection/study sites are protected from west-southwest seas and so this greatly limited our diving options for much of the month. That was the frustrating part. The productive part is that we still were able to complete 44 dives at the limited number of sites we could safely access, and we were prevented from diving anywhere on only three days during the month.

Our March collections of individuals of the red alga *Plocamium cartilagineum* and subsequent chemical characterization of them using the station gas chromatograph indicated that the spatial variation in their chemical diversity, which is one of the main focuses of our project, is occurring at a relatively small spatial scale. Consequently, we decided to perform a spatially-intensive series of transects at three locations before initiating a long-term transplant/common-garden experiment which will run until next year’s field season. These transects were anticipated in our proposal but we had not been certain that we would need the data from them to inform the choice of transplant experiment locations. Based on these data we are now prepared to set up the transplant experiment during our final weeks on station this season.

Season-long studies measuring growth of the amphipod *Paradexamine fissicauda*, which commonly associates with and eats *P. cartilagineum*, on different chemical groups of *P. cartilagineum* were ongoing throughout the month. This involves daily maintenance of the experiment and periodic photographs of the individual amphipods to track their growth. Studies of short term feeding rates of *P. fissicauda* on the different chemical groups were also initiated in April.

Analysis of *Himantothallus grandifolius*-associated gastropods (primarily snails) in March allowed us to move on to manipulative experiments in outdoor mesocosm tanks looking at the degree to which the algae provide the gastropods with a refuge from fish and sea star predation. Additional collections of algal-associated gastropods on other large or otherwise ecologically-important macroalgal species continued through April with the gastropods being preserved for

shipment to our home institutions for analysis after the field season. These data also set the stage for longer-term mesocosm tank experiments to be initiated early in our 2018 field season.

We are grateful for the generous and professional assistance of numerous ASC staff supporting our activities. Emily Olson, Matt Boyer, Nikki Chatelain, and Rosemary McGuire deserve special thanks for facilitating our laboratory and field efforts.

**C-024-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT, WHALE COMPONENT**

Dr. Ari Friedlaender, Principal Investigator, Oregon State University, Newport, OR

Personnel on Station: James Fahlbusch and Kelvin Rushworth

For the month of April the whale research team stationed at Palmer as part of the LTER project C-024-P (Friedlaender) continued cetacean photo ID/biopsy sampling in the Palmer Station area. It was a transitional month, with the departure of Logan Pallin on the LMG17-03 turnover cruise and the arrival of Kelvin Rushworth on LMG17-04. The team spent a total of 38 hours on the water surveying and collected an additional 7 biopsy samples from humpback whales this month, bringing the total to 99 (including 6 Minke whale samples from the months prior). The current team (Kelvin Rushworth and James Fahlbusch) has begun preparations for their upcoming cruise aboard the RV Laurence M. Gould (LMG) where the primary objective will be to deploy satellite tracking tags on humpbacks as well as collect biopsies and photo ID. The satellite tags will provide location data for the tagged individuals for several weeks to months, and will provide insight into habitat usage and seasonal migration routes. While underway on the Gould the team will collect cetacean sighting data as conditions and daylight permit and will help contribute to the projects of the other research teams. We are grateful for the support of the staff of both Palmer Station as well as the crew of the LMG for making our science this year a great success.



**Fig. 3.** Humpback whale fluke sighted near Norsel Point at Palmer Station, to be used for photo identification.



**Fig. 4.** Humpback whale spy-hopping in brash ice near Palmer Station.

## **B-036-P: THE PHYSIOLOGICAL AND BIOCHEMICAL UNDERPINNINGS OF THERMAL TOLERANCE IN ANTARCTIC NOTOTHENIROID FISHES**

Kristin O'Brien, Principal Investigator, University of Alaska Fairbanks, Lisa Crockett, Principal Investigator, Ohio University

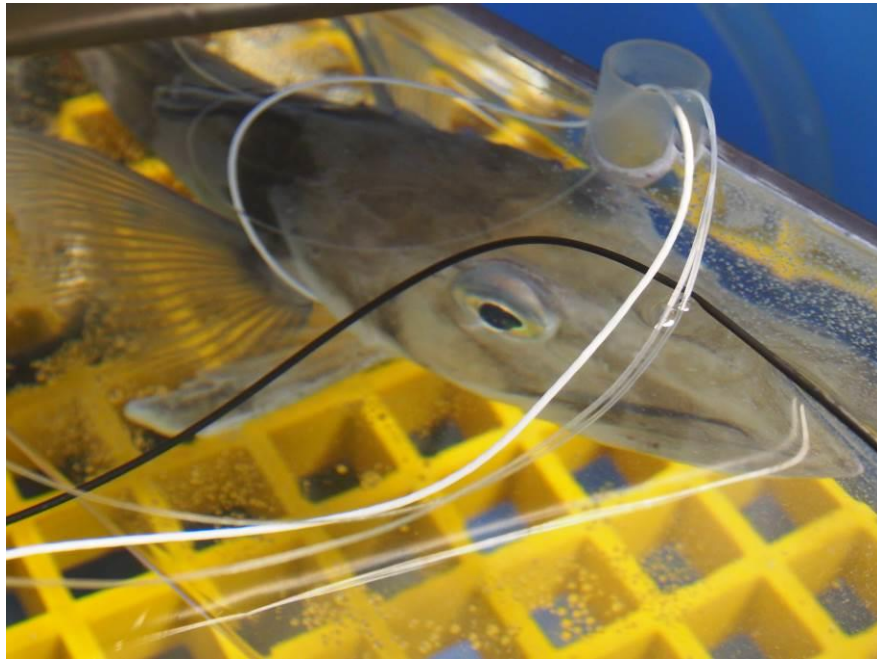
Personnel on station: Lars Axelsson, Amanda Biedman, Lisa Crockett, Elizabeth Evans, William Joyce, Anna Rix

B-036-P (O'Brien) field team members arrived at Palmer Station on April 19. Amanda Biederman, Anna Rix, William Joyce, and Lisa Crockett departed on April 21 aboard the ARSV *Laurence M. Gould* for pot-fishing and trawling off Low Island and North of Dallmann Bay, before returning to Palmer Station in the early morning of April 25.

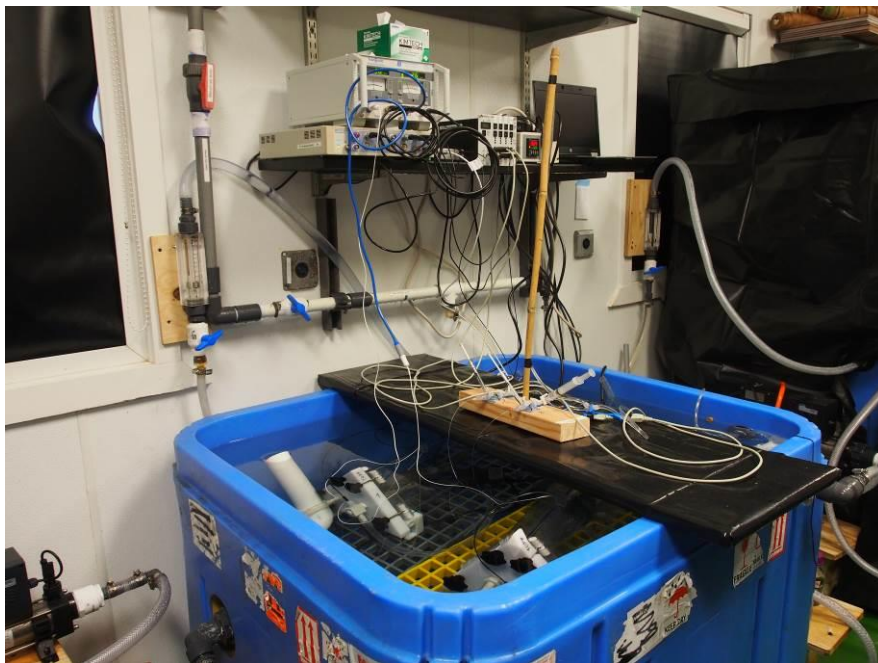


**Fig 1.** Checking the flow rate in a tank holding Antarctic notothenioid fishes at Palmer Station.

While most of the B-036-P (O'Brien) team was fishing, Elizabeth Evans and Michael Axelsson stayed at Palmer Station, and began setting up laboratory and aquarium systems, with particular attention to the indoor large circular and smaller Xactics tanks that will be used for experiments involving either long-term temperature acclimation or acute warming. With the excellent support of FMC personnel, all the necessary tanks were plumbed and heaters mounted. B-036-P (O'Brien) personnel then determined for each system, maximum flow rates at which the heaters could maintain the desired “warm” temperatures (i.e., temperature significantly elevated from ambient). We determined that our large capacity heaters can maintain temperatures of 5°C even with flow-through seawater at a rate of 7 gallons/minute. This flow rate will ensure optimal water quality, an important factor in maintaining the animals at Palmer Station. These temperature experiments will enable us to gain a greater understanding of what physiological and/or biochemical process(es) limit thermal tolerance in Antarctic notothenioids, and also will help elucidate the extent to which these fishes have the capacity for maintaining cardiovascular and cellular systems with a warming challenge.



**Fig. 2.** An instrumented icefish, *Chaenocephalus aceratus*, in one of two respirometers.



**Fig. 3.** Xactics tank containing respirometers with recording equipment on the shelving above tank.

One of the Xactics tanks has been set up for *in vivo* experiments to determine the thermal plasticity of cardiac performance. After completion of the plumbing work on the tank and installation of the heater, two large respirometers with their respective pumps were set up with recording equipment installed on a shelf above the tank (photo left). In addition to quantifying cardiovascular function (*e.g.*, cardiac output, dorsal and ventral aortic pressures during acute



warming), the team will utilize intermittent flow-through respirometry to quantify whole animal respiration rates at 3°C temperature intervals.

On April 27, the first two fish were placed in the respirometers for measurements. We also set up a surgery table in the environmental (cold) room, to ensure the fish stay cold during surgery. The first fish, *Chaenocephalus aceratus*, (an icefish, photo right) was instrumented for measurements of cardiac output, dorsal aortic blood pressure and central venous pressure. This is the first in a series of cardiorespiratory measurements that will be made during this field season. We also have been making stock solutions for preparations of organelles (mitochondria and nuclei) from heart ventricles, and biological membranes, specifically mitochondrial membranes from heart tissues and synaptic membranes, mitochondria, and myelin from the brains of notothenioid fishes.



**Members of B-036-P (O'Brien) and ASC personnel assisting in fish offload.** *Image Credit: George Wortley*

**PALMER STATION**  
**RESEARCH ASSOCIATE MONTHLY REPORT**  
**April 2017**  
W. Lance Roth

**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 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/ELF system has operated well throughout the month.

**A-119-P: DEVELOPMENT OF ANTARCTIC GRAVITY WAVE IMAGER.**

Michael Taylor, Principal Investigator, Utah State University

The Gravity Wave Imager takes images of the night sky in the near infrared, observing the dynamics of the upper atmosphere. The camera takes one 20-s exposure image every 30s of a very faint emission originating from a layer located at ~55 miles of altitude.

The IR camera has operated well throughout the month. Some adjustments to the lens were made to improve focus and image quality.

**A-357-P: EXTENDING THE SOUTH AMERICAN MERIDIONAL B-FIELD ARRAY (SAMBA) TO AURORAL LATITUDES IN ANTARCTICA**

Eftyhia Zesta, Principal Investigator, University of California Los Angeles

The three-axis fluxgate magnetometer is one in a chain of longitudinal, ground-based magnetometers extending down though South America and into Antarctica. The primary scientific goals are the study of ULF (Ultra Low Frequency) waves and the remote sensing of mass density in the inner magnetosphere during geomagnetically active periods. The Research Associate maintains the on-site system.

The magnetometer was operational all month, but is no longer on the Network and awaiting a new RSP.

**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 hung and had to be rebooted once but operated well throughout the month.

**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 DECADAL VARIATIONS IN TERRESTRIAL AND MARINE ECOSYSTEMS.**

Ralph Keeling, Principal Investigator, Scripps Institution of Oceanography

The goal of this project is to resolve seasonal and interannual variations in atmospheric O<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.

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.

CCGG samples were taken regularly and HATS Air samples were taken twice 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 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 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 was removed this month and will be sent north.

#### **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 well 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.

The Terascan system worked well throughout the month.

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

**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.

Observations of sea ice around station were made daily and the tide gauge worked well throughout 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 once per 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 local weather station (PAWS) is working well. The Joubin and Wauwerman sites have been experiencing outages due to the lack of sun.



**Iceberg parked off of Humble Island.** *Image Credit: Keri Nelson*