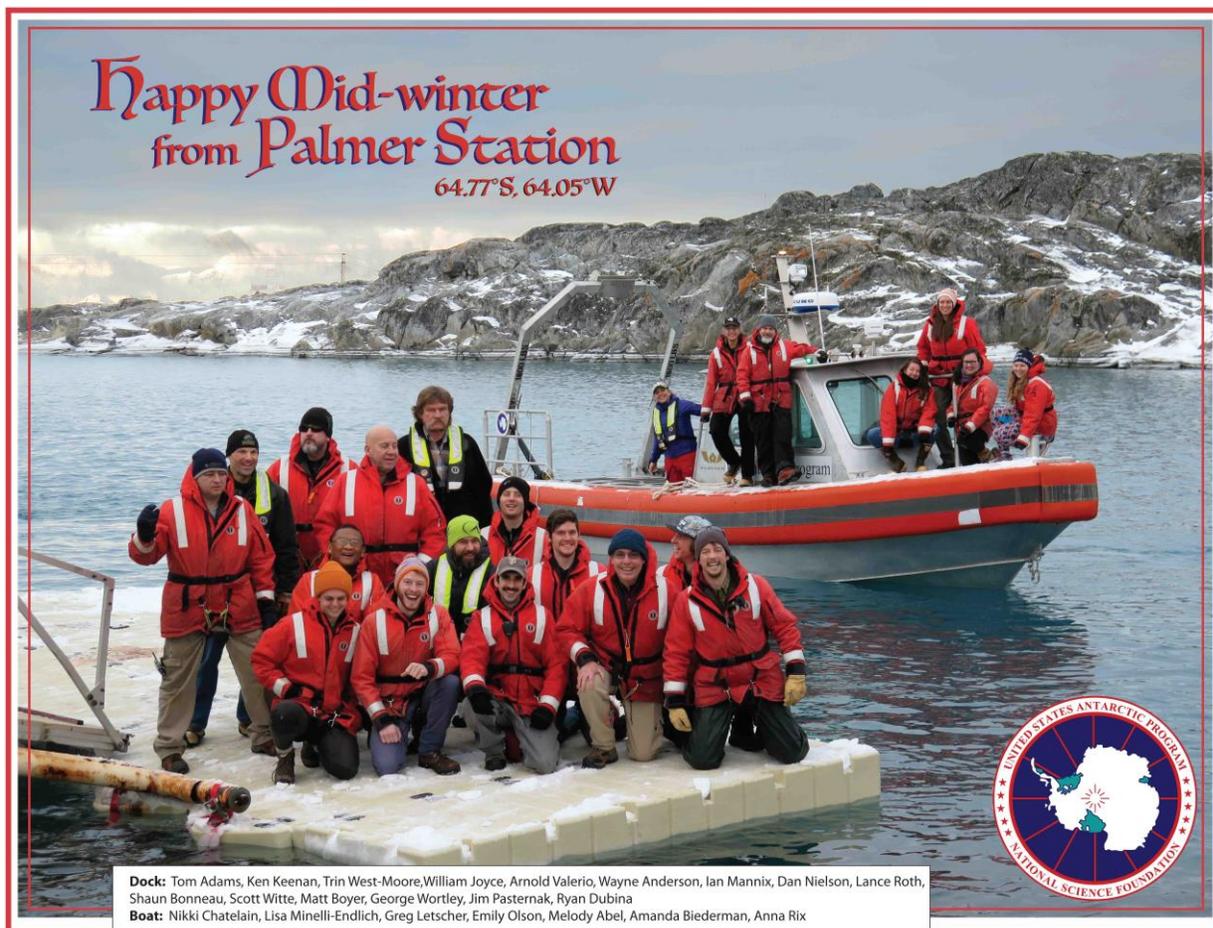


PALMER STATION MONTHLY SCIENCE REPORT

June 2017



Midwinter greetings from all of us at Palmer Station!

Image Credit: Ken Keenan

NEWS FROM THE LAB

Emily Olson, Winter Laboratory Supervisor

In comparison to April and May, June was a calm month at Palmer Station. With only one grantee group occupying the labs, B-036-P (O'Brien), we focused our full attention on supporting their scientific efforts. We also celebrated Midwinter on June 21st. We were happy to have 3 hours and 43 minutes of daylight, but we're looking forward to the lengthening days that are to come. The weather and limited daylight has been keeping most outdoor excursions to a minimum, but with all zodiac-based fieldwork completed for the season, science has not suffered. RHIB Rigil was launched several times over the past month for further field testing in preparation for its active upcoming summer season.

Life outside the station mimicked the slowed rhythm inside, with wildlife sightings getting more scattered and less diverse here in the dead of winter. Perhaps by the time we once again see the bright orange hull of the Gould pointed into Arthur Harbor, we will find the sun riding on its bow and know for sure that we are finally headed towards spring.

Palmer Monthly Met summary for June, 2017

Temperature
Average: -3.4 °C / 25.8 °F
Maximum: 3.9 °C / 39.02 °F on 1 Jun 23:54
Minimum: -12.2 °C / 10.04 °F on 23 Jun 04:38
Air Pressure
Average: 983.2 mb
Maximum: 1013 mb on 14 Jun 16:08
Minimum: 950.6 mb on 28 Jun 11:50
Wind
Average: 13 knots / 15 mph
Peak (5 Sec Gust): 55 knots / 63 mph on 7 Jun 00:07 from NNE (18 deg)
Prevailing Direction for Month: NNE
Surface
Total Rainfall: 16.3 mm / .64 in
Total Snowfall: 60 cm / in
Greatest Depth at Snow Stake: 36 cm / in
WMO Sea Ice Observation: No Sea Ice in sight, only ice of land origin, 1-5 bergs, with growlers and bergy bits.
Average Sea Surface Temperature: -1.25 °C / 29.8 °F

It finally feels like winter. Temperatures dropped during the month of June and we received 60 centimeters of snow. The average temperature was below freezing and wind speeds averaged 13 knots with peak speed of 55 knots on June 7th. 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.

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: Amanda Biederman, William Joyce, Anna Rix

In the month of June, the focus of our research on *in vivo* cardiovascular physiology has shifted from the hemoglobinless icefishes (primarily *Chaenocephalus aceratus*) to their red-blooded relatives, the black rockcod (*Notothenia coriiceps*). Previous research by our group at Palmer Station has demonstrated the latter species is more tolerant of acute warming. Our goal is to determine whether this can be explained by various physiological adjustments (e.g., superior cardiovascular performance, thermal plasticity of mitochondrial function, and/or maintenance of

cardiac and neuronal membrane integrity), and to investigate if heat tolerance can be further increased in the rockcod by acclimating a subset of our individuals to a higher temperature.

We are currently in the ninth week of a 10-11 week acclimation of a cohort of *N. coriiceps* to an elevated temperature of 5 °C. These animals will be used to determine the thermal plasticity of cardiac performance, mitochondrial function and membrane fluidity.

Additionally, we set up another set of acclimation tanks with a shorter term acclimation. We are currently in the fourth week of this study, and we will harvest the animals after a minimum of five weeks. We will determine whether this shorter term acclimation yields similar results to the initial cohort, which have been acclimated for more than twice as long to elevated temperature.

In addition to caring for the animals at Palmer Station, we are presently conducting a series of behavioural/functional studies using a treatment of environmental hypoxia. These experiments have been designed to tease apart the effects of thermal change from hypoxia since warming reduces environmental oxygen content. We have practiced and developed several techniques that will be conducted on the acclimation animals in July. We tested protocols for preparation of neuronal membranes (synaptic membranes, mitochondria, and myelin) from brain tissue of *N. coriiceps*. Additionally, we are currently working on measuring cardiac output and other hemodynamics, along with oxygen consumption, on *N. coriiceps* (these techniques were refined in *C. aceratus* earlier this season). In both 0 °C- and 5 °C- acclimated *N. coriiceps*, we will soon investigate the cardiovascular response during an acute temperature ramp. We eagerly look forward to the comparisons it will provide between species (icefish vs *N. coriiceps* held at ambient temperature) and within a species (in individuals held at ambient temperature and acclimated to 5 °C).



***Nototothenia coriiceps* mouthing off to the camera in their acclimation tank.** Image Credit: Amanda Biederman

**PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
June 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.

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 magnetometer was operational all month, but is no longer on the Network and waiting 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 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 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 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 (N₂O) 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.

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 Orbital Elements were updated on the Terascan system. More maintenance needs to be done on the antenna before the images improve.

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.

One of the UPS batteries failed and was removed. The system operated normally throughout the month.

OCEANOGRAPHY

Daily observations of sea ice extent and growth stage are 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. The observations and tide data are now archived on the AMRC website : <ftp://amrc.ssec.wisc.edu/pub/palmer/>

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 are offline due to the lack of solar power.



Our SOLAS aluminum hulled inflatable boat tied up to Christine Island. *Image Credit: Emily Olson*