

# PALMER STATION MONTHLY SCIENCE REPORT

April 2016



Station as seen from the snow covered glacier. *Image Credit: Stephen Dzur*

## NEWS FROM THE LAB

Ben Cournoyer, Winter Laboratory Supervisor

It's been a successful first month for the winter crew. Amid the flurry of activity early in the month we experienced nearly a week straight of beautiful sunny days. After a few scheduled upgrades the laboratories are ship shape and the winter research season is off and running at Palmer Station. Winter has fully engulfed the peninsula. Arthur Harbor is nearly crystal clear and wildlife is becoming sparser. As the penguins head north, the glacier has been covered with a base layer of snow. Snowshoes and skis have been flying out of GWR storage with many of our residents enjoying after work recreation. There has been a lot of activity at the pier. The *ARSV Laurence M. Gould* (LMG) is currently tied up after a successful fishing trip. It will depart for Punta Arenas after a few short trips in and around the peninsula.

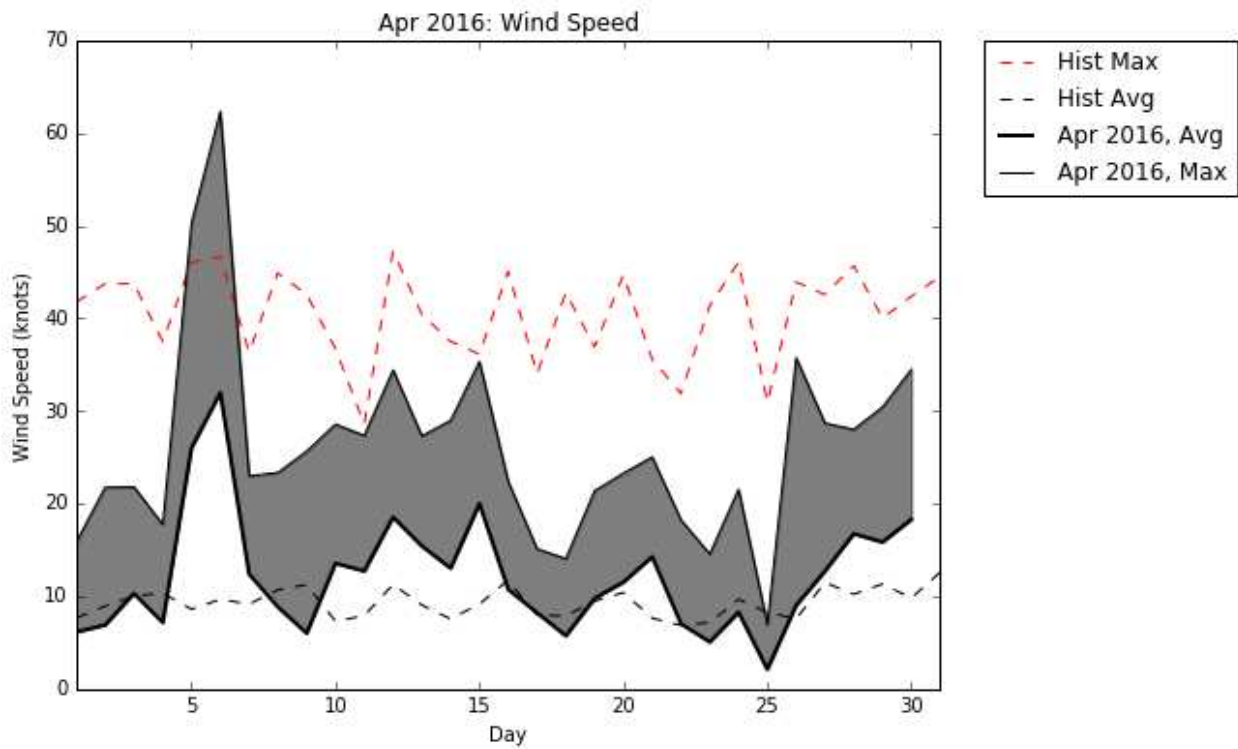
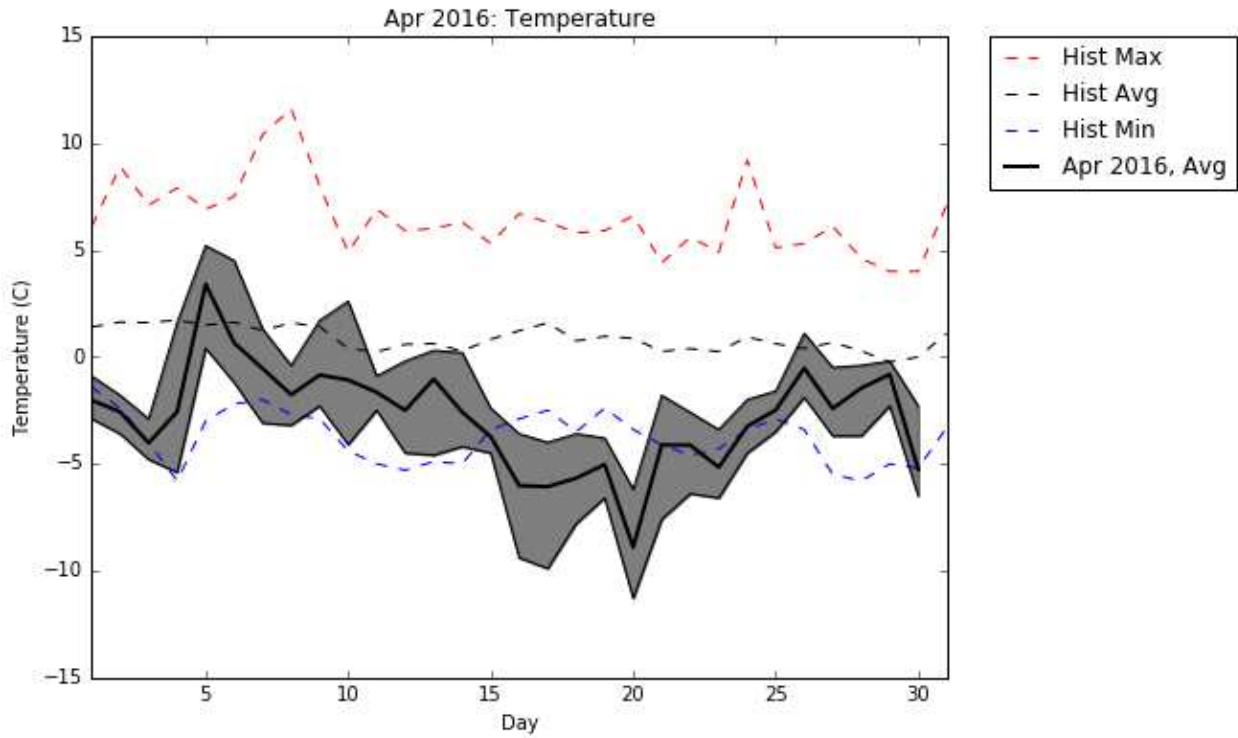
## April 2016 WEATHER

Lance Roth, Research Associate

The following table gives the weather data for the month of April. The times are in UTC.

<b>Temperature</b>
<b>Average:</b> -2.8 °C / 26.9 °F
<b>Maximum:</b> 5.2 °C / 41.36 °F on 5 Apr 03:23
<b>Minimum:</b> -11.3 °C / 11.66 °F on 20 Apr 06:23
<b>Air Pressure</b>
<b>Average:</b> 983.1 mb
<b>Maximum:</b> 1012.6 mb on 25 Apr 10:15
<b>Minimum:</b> 942.9 mb on 6 Apr 03:27
<b>Wind</b>
<b>Average:</b> 12.1 knots / 14 mph
<b>Peak (5 Sec Gust):</b> 70 knots / 81 mph on 5 Apr 23:02 from N (360 deg)
<b>Prevailing Direction for Month:</b> SSW
<b>Surface</b>
<b>Total Rainfall:</b> 42.4 mm / 1.67 in
<b>Total Snowfall:</b> 79 cm / 30.8 in
<b>Greatest Depth at Snow Stake:</b> 41 cm / 16 in
<b>WMO Sea Ice Observation:</b>
<b>Average Sea Surface Temperature:</b> -1.1 °C / 30 °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.). The last half of April was quite cold. From the 10th to the 25th the temperature remained below 0 Celsius and below the monthly average. April was windier than average. The daily average wind was higher than the historical average for most of the month and exceeded the historical maximum on April 5th.



## **B-037 ANTARCTIC NOTOTHENIOID FISHES: SENTINEL TAXA FOR SOUTHERN OCEAN WARMING**

H. William Detrich, Principal Investigator Marine Science Center, Dept. of Marine and Environmental Sciences, Northeastern University

Personnel on Station: H. William Detrich, Jake Daane, Thomas Desvignes, Nathalie Le François, and John Postlethwait

Our field season began on 2 April with the arrival of B-037-L/P participants H. William Detrich (PI) and Nathalie Le François (Biodôme de Montréal) at Palmer Station [08:00 local time (LT)] after a smooth crossing of the Drake Passage on board the *ARSV Laurence M. Gould* (LMG16-03). We unpacked our supplies, set up our laboratory, and assembled and tested our purpose built embryo incubation system (Aquamerik, Quebec, Canada) in Environmental Room 1 of the Palmer Station Aquarium.

The second contingent of B-037 team members, Jake Daane (Harvard University), Thomas Desvignes (Univ. of Oregon), and John Postlethwait (Univ. of Oregon), departed Punta Arenas, Chile, on *LMG* Cruise 16-04 on 17 April. En route to Palmer Station, two days of fishing in ASPAs 152 (Western Bransfield Strait) and 153 (Eastern Dallmann Bay) by trapping and trawling were conducted in support of our project. Significant numbers of the Bullhead notothen, *Notothenia coriiceps*, and the Blackfin icefish, *Chaenocephalus aceratus*, were collected; they will serve as broodstock for production of embryos by *in vitro* fertilization. *LMG* Cruise 16-04 arrived at Palmer Station at 08:30 LT on 23 April, and we off-loaded our fish to the Palmer Station Aquarium with the excellent assistance of *LMG* and *ASC* personnel. Congratulations on a job well done!

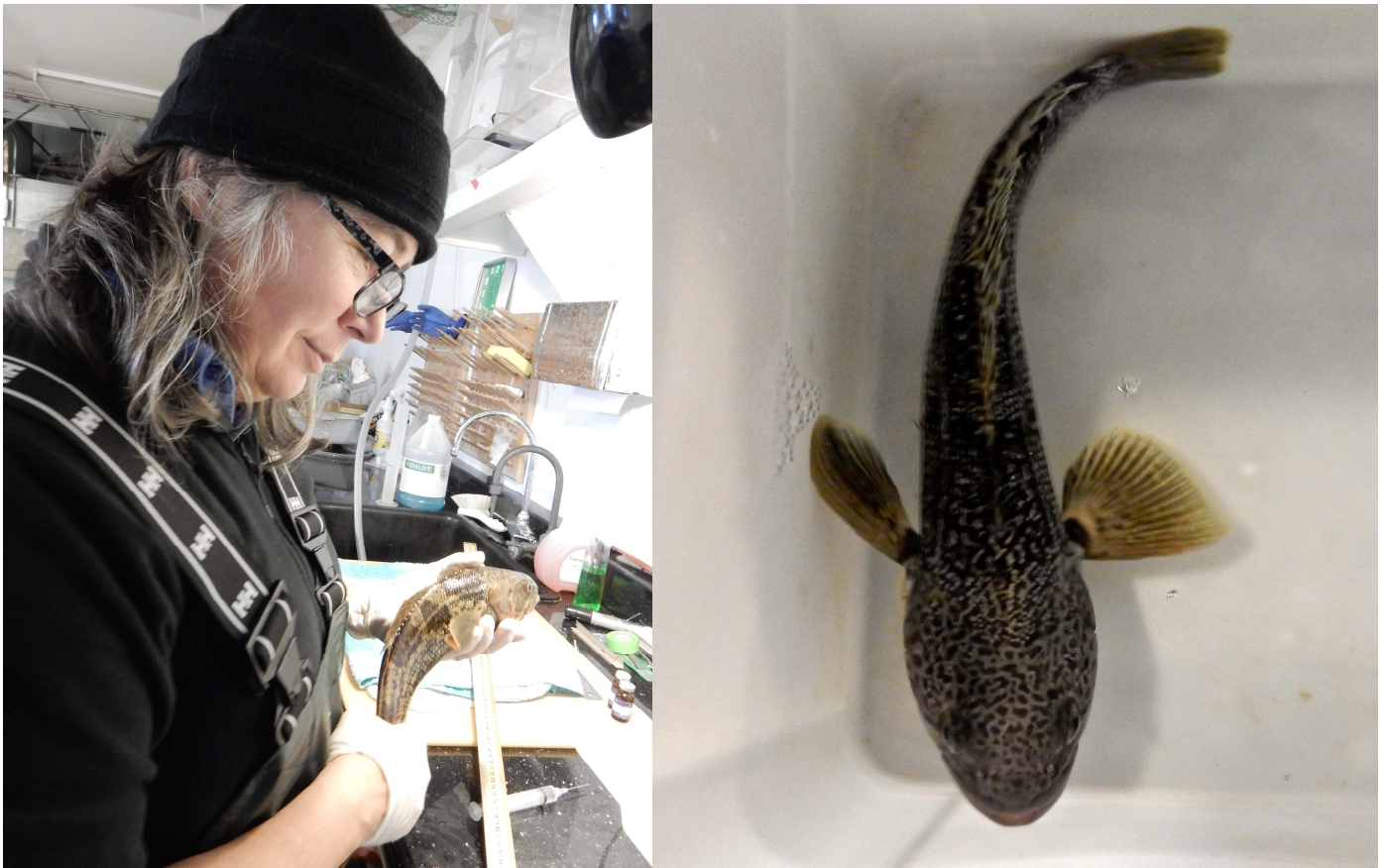
Antarctic notothenioid fishes have evolved a remarkable suite of characters, including the acquisition of macromolecular antifreezes by most species and the loss of red blood cells and hemoglobin by the “white-blooded” icefish family, as the Southern Ocean (SO) cooled to the freezing point of seawater ( $-1.9^{\circ}\text{C}$ ) over the past 25-40 million years. Today, these cold adapted stenotherms are threatened by rapid warming of the SO, the temperature of which is likely to increase by  $2-4^{\circ}\text{C}$  over the next two centuries. The long-term goal of my research program is to assess the molecular and organismal consequences of this warming by analysis of the effects of elevated temperature regimes on gene expression in developing embryos of red- and white blooded Antarctic notothenioids.

To initiate the production of embryos, we injected male and female specimens of *N. coriiceps* (red-blooded) and *C. aceratus* (white-blooded) with gonadotropin to stimulate spermatogenesis and oogenesis. After these individuals reach reproductive maturity, we will express milt from males and eggs from females, mix the gametes, and activate fertilization by addition of seawater. Zygotes (fertilized eggs) will be placed in our incubators. Control embryos from each species will be incubated at  $-1^{\circ}\text{C}$ , whereas experimental embryos will be raised at  $+5^{\circ}\text{C}$ . Embryos will be sampled at intervals during the 6-7 months required to reach the hatching stage. Control and experimental embryos will be analyzed for potential perturbation of gene expression by highthroughput RNA sequencing (RNAseq) at our home institutions.

On Thursday, 28 April, Detrich and Postlethwait participated in live video presentations from Palmer Station, Antarctica, as part of the NSF Division of Polar Programs event, “Take Your Sons and Daughters to Work.” We enjoyed the enthusiasm of our student audiences! We spoke to three age groups: elementary, middle, and high school. We introduced our research to each group of students and answered questions from the students. We greatly appreciated the extensive preparation and help for this event that were provided by Palmer Station Information Technology specialist Jeff Otten and by Peter West and the IT staff of NSF.

On 30 April, Detrich, Daane, and Desvignes departed Palmer Station on board the *LMG* to conduct our second fishing trip.

We thank the ship and station personnel for their exceptional help in making our early field season a great success.



**Left) Nathalie Le François Dr. Nathalie Le François readies a bullhead nootthen (*Notothenia coriiceps*) to be measured. Right) Marbled rockcod, *Notothenia rossii*.**  
*Image Credit: John Postlethwait*

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

Yuan Gao, Principal Investigator, Rutgers University

The PI returned to Palmer on LMG1604 later this month to work on an aerosol sampling instrument that should operate through this winter but failed to operate. The PI installed a new motor in the sampler and had the instrument re-calibrated, and the sampler is now operating well on the platform at Palmer backyard. Sincere thanks to Lance Roth, Dan Nielson and Adina Scott who helped a lot with this task! The current task is to solve technical issues with the weather station that is part of the whole atmospheric sampling system on the platform. On the other hand, atmospheric deposition sampling has been continued since the start of this project at Palmer Station.

**PALMER STATION  
RESEARCH ASSOCIATE MONTHLY REPORT  
April 2016  
Lance Roth**

**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 seems to be working well, but some of the files are not updating. The grantee has been informed.

**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. Dooyoung Kim is here upgrading the computer system and calibrating both the ELF and VLF antennas.

**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.

Samples were collected this month. A new inlet tube was installed on the sampling system.

**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 is operating fine and survived two power outages on its own UPS on April 16<sup>th</sup> from 1934-1943 and 2258 – 2305 UTC. The absolute scans were delayed due to high winds, but went well.

**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.

**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. The power outage on April 16<sup>th</sup> from 1934-1943 and 2258 – 2305 UTC shut the system down, but it came back without any issues.

**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. Kathryn Rowe was able to update here BB so that it is resilient towards unexpected power outages. It still needs to be tested.

**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. Waiting to hear back from Grantee about swapping out a hard drive.

**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. During the power outage on April 16<sup>th</sup> from 1934-1943 and 2258 – 2305 UTC the blower did shut down, but everything came back online once generator was functional.

## **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 the ice around station were made daily and the tidegauge 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) and the three remote stations are all working fine. Five new snow accumulation stakes were placed in the backyard this month and are in close agreement with the historical stake found near the aquariums.