

PALMER STATION MONTHLY SCIENCE REPORT

OCTOBER 2015



Palmer Station, as seen from the sea ice in Arthur Harbor. A safe ice route was established for skiing or snowshoeing to Amsler Island for most of October.

(Image Credit: Adam Rivers, ASC)

NEWS FROM THE LAB

Carolyn Lipke, Summer Laboratory Supervisor

After three months of long and icy winter the *ARSV Laurence M. Gould* (LMG) returned to Palmer Station carrying the incoming summer ASC staff, and a much loved delivery of fresh fruits and vegetables for the winter-overs. During the port call two members from the Cold Regions Research and Engineering Lab (CRREL) performed a LiDAR and thermal IR image survey of the three main buildings on station. The facilities staff here at Palmer was also able to perform some major maintenance on the seawater pump house, which should improve water flow to the aquarium room.

After the LMG's departure, the sea ice around station was still stable enough in October to allow for sea ice travel over to Amsler Island; a big treat for the incoming summer folks. One Weddell seal pup was observed mid-month, along with the arrival of the first Adélie penguins on Torgersen Island. At the end of the month the LMG returned with the first of the summer science groups, LTER (C-013, C-019, C-045), Waller (B-248), and Paznukov (A-373). The labs are again bustling with activity, although we are still locked in by sea ice.

OCTOBER 2015 WEATHER

Mark Dalberth, Research Associate

Temperature
Average: -2.8° C / 27° F
Maximum: 5.2° C / 41.36° F on 5 Oct 03:03
Minimum: -12° C / 10.4° F on 13 Oct 02:43
Air Pressure
Average: 988 mbar
Maximum: 1005.4 mbar on 14 Oct 21:03
Minimum: 963.5 mbar on 30 Oct 15:04
Wind
Average: 10.3 knots / 11.9 mph
Peak (5 Sec Gust): 53 knots / 61 mph on 5 Oct 02:15 from NNE (20 deg)
Prevailing Direction for Month: NW
Surface
Total Precipitation (Rain/Melted snow): 102.9 mm / 4.05 in
Total Snowfall: 116 cm / 45.2 in
Greatest Depth at Snow Stake: 172 cm / 67.1 in
WMO Sea Ice Observation: Fast ice in Arthur Harbor with loose brash, bergy bits, and growlers beyond the ice edge.
Average Sea Surface Temperature: -1.71 °C / 28.9 °F

Fast ice has been in Arthur Harbor and Hero Inlet since the summer crew arrived on station. The LMG proved up to the challenge of breaking ice into the pier saving us a walk across the ice with our luggage. We hope to have a walking route on the ice for C-045-P and C-019-P to take water samples for as long as the ice is stable.

The highest temperature for this month, 5.2° C, was recorded on October 5 before the summer staff arrived. The lowest temperature (-12° C) occurred a few days after our arrival. The total snow fall as measured on our snow rail was 116 cm this month. This is considerably more than the snow fall in October 2014 which was only 46 cm. The greatest depth as measured at the snow stake for this month was 172 cm which is higher than any time in the last 10 years. For the ten year period, the maximum depth was only 109 cm. The average wind speed for the month, 10.3 knots, is in line with the historical average. We are looking for a major wind event to clear the fast ice from the area, so we can commence normal boating operations for the season.

T-940-P CRREL LiDAR/THERMAL SURVEY OF PALMER STATION BUILDING INFRASTRUCTURE

Renee Melendy, Principle Investigator, US Army Cold Regions Research and Engineering Lab, Hanover, NH

Personnel on Station: Elias Deeb and Adam LeWinter

During the *ARSV Laurence M. Gould* port call of 8-12 October 2015, Dr. Eli Deeb and Mr. Adam LeWinter of the Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH, performed a coordinated ground-based LiDAR and thermal survey of building infrastructure at Palmer Station. Their ongoing efforts are in support of initiatives funded through the National Science Foundation's Antarctic Infrastructure and Logistics (AIL) Program. Energy efficiency plays a significant role in operations at remote stations like Palmer and directly relates to fuel consumption and cost. With that in mind, the goal of this applied research is to generate three-dimensional thermal models of Palmer Station infrastructure to better characterize building envelope deficiencies and prioritize potential energy improvement activities. The LiDAR sensor is an active (transmit/receive) laser which creates a three-dimensional point cloud of the building surfaces at sub-centimeter resolution while the coordinated thermal camera associates each three-dimensional point with a value representing the temperature of that surface. If performed at night with no reflected thermal energy from the daytime sun, the resulting survey is a 3D model of the emitted thermal signature of the object. The CRREL survey at Palmer Station consisted of the following priorities: the Bio Lab, Garage/Warehouse/Recreation (GWR), and Terra Lab buildings; however, because the survey consisted of over 30 scan locations across the entire station, data from the majority of the Palmer Station infrastructure was collected and is available for analysis. For more information about the project and/or technology, please contact Eli Deeb (elias.j.deeb@usace.army.mil).

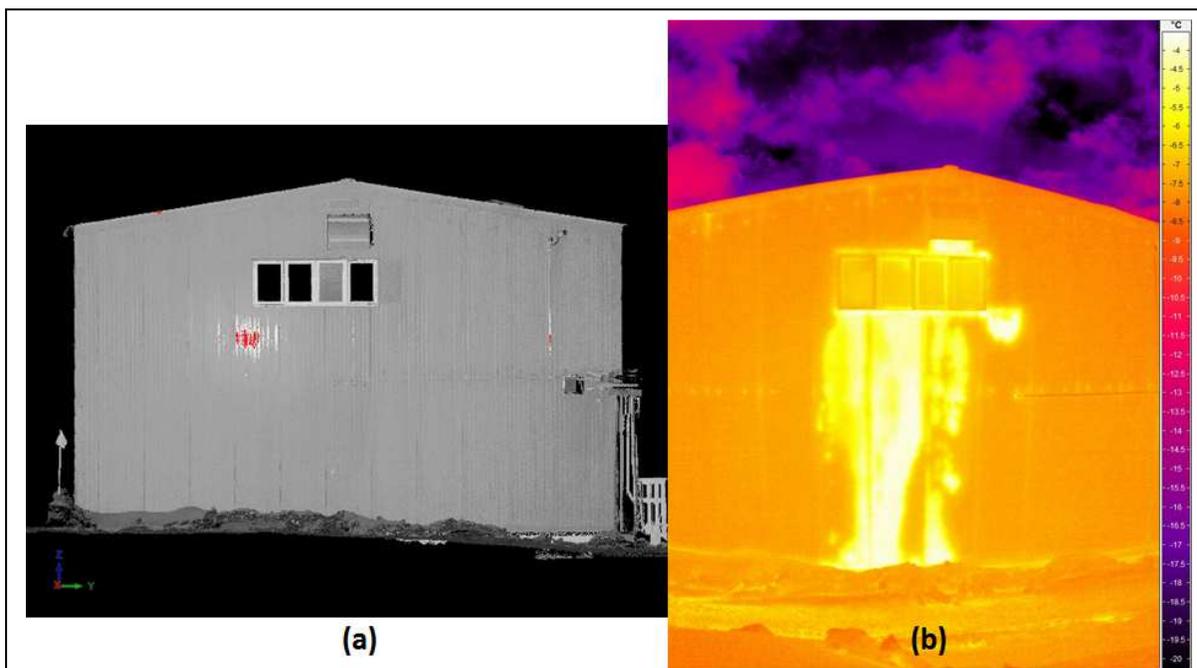


Figure 1. Example of the raw (a) LiDAR point cloud and (b) thermal image of a surface from the GWR building depicting variations in the thermal conditions below a bay of windows perhaps due to water leakage and insulation damage. Thermal variation to the right of the bay of four windows may also reveal heat loss from previous construction where a window may have been removed.

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

Mark Dalberth and W. 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.

Members of the Kohut group came to station on LMG15-09. They are here to perform maintenance on the system. They have gotten out to the Wauwermans site and it is now on line again.

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 and the ELF functioned normally this month. The hard drives were changed on October 25th.

**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 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.

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 (N₂O) 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 the carbon cycle project. There were no flasks on hand to sample for HATS during October. However, the flasks did arrive on LMG15-09.

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 is not running off of its UPS and so will shut down if there is a power outage. The group has been notified of this.

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. The temperature sensor of the Bonaparte Point station is several degrees lower than the sensor on Gamage Point. The Principal Investigator was informed of this.

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 throughout the month and was used to locate antenna positions for A-373-P (Paznukov).

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.

Tracking issues persist, so some scans have dropped lines.

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 is currently not functioning. A new computer is being sent to us that should fix the problem.

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 Principal Investigator arrived on LMG15-09 to install the next phase of this project. Three new antennas will be erected and electronics added to receive signals from them.

B-466-P: FLUORESCENCE INDUCTION AND RELAXATION (FIRE) FAST REPETITION RATE FLUOROMETRY (FRRF)

Deneb Karentz, Joe Grzymalski, 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.

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. Provided tide information to members of B-037 (Detrich).

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 Old PalMOS and PalMOS have been operating in parallel for the entire month. The remote weather station has been installed on the Wauwerman Islands and the data has been received and logged by the base station in Terra Lab.