

PALMER STATION MONTHLY SCIENCE REPORT

OCTOBER 2019



Approaching Palmer Station aboard the ARSV *Laurence M. Gould*. Image Credit: Randy Jones

NEWS FROM THE LAB

Randy Jones, Summer Laboratory Supervisor

The start of the Summer 2019-20 season is upon us! The ARSV *Laurence M. Gould* (LMG) arrived to Palmer Station on 7 October bringing a fresh crew of ASC support staff, and two grantees from the C-019-P (Schofield) grantee group, Kelly Faller and Rachael Young. As they set up their laboratory space and tested procedures and instruments, the science support staff team, Randy Jones (Lab Supervisor), Carolyn Lipke (Instrument Technician), and Marissa Goerke (Research Associate), got the laboratories ready for soon-to-be-arriving grantee groups. We're thankful to the efforts of the Winter 2019 crew in preparing the station for summer science activities. At month's end, the arrival of the LMG delivered two additional science groups enthusiastic and ready to start their science programs – C-013-P (Fraser) and C-045-P (Ducklow).

Winter weather conditions continued throughout the month, which meant heavy snow strong winds, ice cover, and snow accumulation. The opportunity to begin small boating and RHIB testing did arise for a short window during the middle of the month, but the sea ice returned shortly thereafter.

OCTOBER 2019 WEATHER

Marissa Goerke, Research Associate

Temperature
Average: -2.9 °C / 26.8 °F
Maximum: 5.4 °C / 41.7 °F on 24 Oct 14:48
Minimum: -13.0 °C / 8.6 °F on 5 Oct 10:38
Air Pressure
Average: 983.7 mb
Maximum: 1008.2 mb on 13 Oct 13:31
Minimum: 951.8 mb on 19 Oct 23:09
Wind
Average: 23 knots / 26.5 mph
Peak (5 Sec Gust): 100 knots / 115 mph on 21 Oct 17:16 from NNE (23 deg)
Prevailing Direction for Month: NNE
Surface
Total Rainfall: 160.0 mm / 6.3 in
Total Snowfall: 34.0 cm / 13.3 in
Greatest Depth at Snow Stake: 114.4 cm / 44.6 in
WMO Sea Ice Observation: Ship in open lead with floating ice in sight
Average Sea Surface Temperature: -1.52 °C / 29.3 °F

October was warm and stormy with temperatures rising to 41.7° F and averaging 26.8° F. Several storms cleared most ice from the region save for the back of Hero Inlet. On 21 October, high winds from the NNE gusted up to 115 mph. We accumulated 13.3 additional inches of snow at the snow stakes, raising our total snow depth to 44.6 inches.

C-019-P: PALMER, ANTARCTICA LONG TERM ECOLOGICAL RESEARCH (LTER): LAND-SHELF-OCEAN CONNECTIVITY, ECOSYSTEM RESILIENCE, AND TRANSFORMATION IN A SEA-ICE INFLUENCED PELAGIC ECOSYSTEM – PHYTOPLANKTON COMPONENT

Dr. Oscar Schofield, Principal Investigator, Rutgers University, Institute for Earth, Ocean, and Atmospheric Sciences

Personnel on Station: Kelly Faller, Kasey Walsh, and Rachael Young

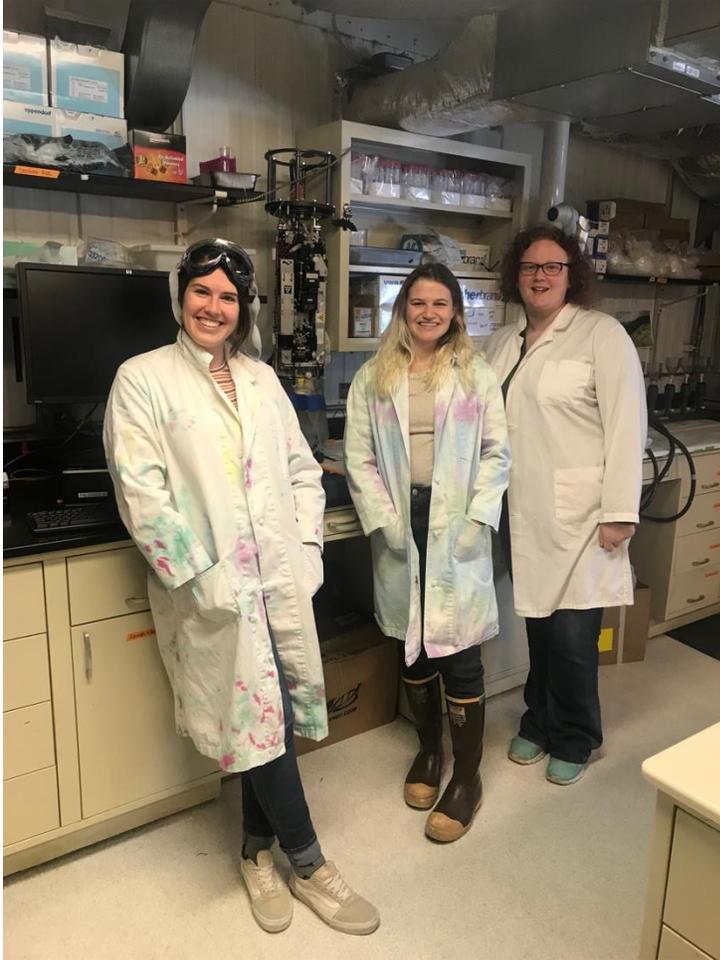
The C-019-P (Schofield) lab is excited to return to Palmer Station for its 12th season studying the phytoplankton component of the LTER. Phytoplankton are incredibly important organisms since they form the basis of the Antarctic food web. Rachael Young, a recent Rutgers University graduate, has been to Antarctica previously aboard the RVIB *Nathaniel B. Palmer* studying zooplankton in the Ross Sea, however, this is her first time to Palmer Station. She is excited to be back in Antarctica for a full season to investigate how phytoplankton interact with physical and biological factors. Kelly Faller is a Rutgers student in the Ecology, Evolution, and Natural Resources department minoring in Marine Sciences, where she has focused primarily on terrestrial species, so she is happy to be at Palmer exploring life below the surface of the water. This is Kasey Walsh's first time on the ice. She is a Rutgers University student majoring in Marine Biology. Rutgers graduate students, Schuyler Nardelli and Quintin Diou-Cass, and University of Delaware graduate student, Katherine Hudson, will be arriving towards the second half of the season.

Welcomed by beautiful weather, calm winds, and thick sea ice, the ARSV *Laurence M. Gould* arrived to Palmer Station in early October. In the first couple of weeks, Rachael and Kelly set up the lab and calibrated instruments. In late October, Kasey joined us and assisted us in our preparations for sampling. Unfortunately, at first the sea ice was preventing us from sampling, but now it has shifted to the extremely high winds. Once the weather allows us to go out on the boats and conduct our science safely, we will get to begin sampling.

Dating back to 1991, the LTER dataset has persisted to illustrate how phytoplankton community compositions at Stations B and E have changed over time. In order to understand the seasonal and interannual changes in phytoplankton, the C-019-P (Schofield) lab collects water samples along with biophysical conditions in the water, including light, salinity, and temperature. To collect these water samples and parameters, we deploy optical instruments including a C-OPS and CTD bi-weekly. Our water samples then get processed in the lab using a fluorometer, HPLC analysis, and the FIRE fluorometer to measure the size, species, and photosynthetic efficiency in phytoplankton communities. Additionally, the Imaging Flow Cytobot takes an even deeper look into what phytoplankton species are present by taking pictures of individual plankton and running them through an automated species ID program. Finally, we perform ¹⁴C experiments to analyze phytoplankton primary productivity and growth.

As in the previous season, we are looking forward to participating in collaborative projects with the C-045-P (Ducklow), C-020-P (Steinberg), C-013-P (Fraser), and C-024-P (Friedlaender) labs. Our group will conduct acoustic surveys with an EK80 acoustic echosounder along with CTD deployments. By working with the other science groups in the extended boating area and in Palmer Canyon, we can help reveal the interactions between the mixed layer depth, krill distributions, and penguin foraging patterns.

We are extremely happy to be here and look forward to a fun, productive, and collaborative experience this season! Without the support staff and other science groups, we wouldn't have the help we need to gather this amazing dataset. We appreciate and recognize everyone at Palmer and on the LMG for their ongoing support with our lab considering their own busy schedules.



Pictured from left to right: Kelly Faller, Floyd (our IFCB), Rachael Young, and Kasey Walsh.
Image Credit: Schofield group

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT

October 2019
Marissa Goerke

A-111-P: THE NEXT GENERATION OF GEOSPACE RESEARCH FACILITIES AT PALMER STATION

Dr. Andrew Gerrard, Principal Investigator, New Jersey Institute of Technology

The ionosphere-thermosphere-magnetosphere (ITM) region of Earth's atmosphere, which is part of the larger geospace environment, is the portal through which the solar wind can enter and impact our planetary system. Though space weather research over the past decades has greatly increased our understanding of a wide variety of phenomena associated with ITM physics, the sum of these individual processes occurring in the geospace environment does not replicate the rich diversity and scope of this complex region. Thus, a more holistic approach to ITM research is necessary, one that integrates clustered instrumentation at multiple locations to simultaneously look at the interactions within the entire system. Using coordinated and collaborative instrumentation currently installed in Antarctica, researchers will study interrelated ITM phenomena observed at high latitudes. The goal of this research effort is a better understanding of the energy transfer and modulation of the geospace system.

Both the ELF/VPF operated normally through the month.

A-119-P: CONTINENTAL-SCALE STUDIES OF MESOSPHERIC DYNAMICS USING THE ANTARCTIC GRAVITY WAVE INSTRUMENT NETWORK (ANGWIN)

Dr. Michael Taylor, Principal Investigator, Utah State University

The Antarctic Gravity Wave Imaging Network (ANGWIN) is a cooperative effort of six international Antarctic programs to collect continent-wide gravity wave measurements. This network capitalizes on existing optical and radar measurement capabilities at McMurdo, Palmer, South Pole, and six other research stations: Halley (UK), Syowa (Japan), Davis (Australia), Rothera (UK), and Ferraz (Brazil). Infrared (IR) all-sky mesospheric OH (hydroxyl) imagers are installed at Davis, McMurdo, and Halley stations. The network quantifies the properties, variability, and momentum fluxes of short-period (less than one hour) mesospheric gravity waves and their dominant sources and effects over the Antarctic continent. An all-sky near-IR imager is also installed at Palmer Station to augment the existing instrumentation and create a capability for studying gravity wave properties at each site.

The camera and laptop have been shipped to Logan, UT for repair during the summer season.

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION

Mr. 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.

O-264-P: A STUDY OF ATMOSPHERIC OXYGEN VARIABILITY IN RELATION TO ANNUAL DECADAL VARIATIONS IN TERRESTRIAL AND MARINE ECOSYSTEMS

Dr. 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 successfully taken twice this month.

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

Mr. Don Neff and Dr. Steve Montzka, Principal Investigators, National Oceanic and Atmospheric Administration / Global Monitoring Division

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 once a week during favorable winds and HATS Air samples were taken every other week.

O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK

Dr. James Butler, Principal Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division

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 with the occasional gap in data due to issues with the wavelength definition. Bi-weekly absolute scans were completed as necessary.

R-938-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 system operated normally throughout the month.

T-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Mr. 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. The Palmer Station Research Associate processed the glacier terminus survey data from this past austral summer and created an updated glacier retreat graphic.

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. The Palmer Station Research Associate sent a requested filter north on LMG19-08, as well as processing filters as needed.

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.

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 and emailed to the National Weather Service for entry into the Global Telecommunications System.

The local weather station (PAWS) operated normally throughout the month. Observations are archived on the AMRC website: <ftp://amrc.ssec.wisc.edu/pub/palmer/>.