

PALMER STATION MONTHLY SCIENCE REPORT

APRIL 2020



Antarctic hair grass (*Deschampsia antarctica*) amid the snow that has seeded out. Image Credit: Randy Jones

NEWS FROM THE LAB

Randy Jones, Summer Laboratory Supervisor

April saw the return of average temperatures dropping below freezing. Periods of lighter rain and transient snow cover characterized the first half of the month, with no substantial snow accumulation until a storm brought a few centimeters on 11 April. Any additional snow that fell in the days following was melted to bare rock and ground on 17-18 April, but new snow brought snow covers up to 5-8 cm on 19-21 April, and then to 10-15 cm through the last ten days of the month.

Glacial melt continued through the first 10 days of the month, but has subsided through the last 20 days of the month. Glacial stream flow is minimal, though glacial calving was occasional throughout the entire month. Depending on the wind direction, growlers and brash ice are present in dense concentrations in Hero Inlet and Arthur Harbor, especially through the second half of the month.

There are a number of elephant seals on various islands, but in smaller groups (congregations of 5-20 individuals) than in the past two months. Fur seal numbers are also reduced, and penguin populations are sparse. Flying blue-eyed shags (cormorants) have been observed in larger groups

over station of 20-120 individuals. Antarctic terns have been actively congregating on Bonaparte Point and in the Backyard.

The Covid-19 pandemic has affected much of the US Antarctic Program – the Palmer Station summer crew has remained beyond the typical early April turnover. As a result, we have been able to experience the seasonal transition into winter, the opening of many islands within the standard boating area for exploration, and have time for longer work and personal projects. The summer crew eagerly awaits the healthy and safe movement of the winter crew south as able.

APRIL 2020 WEATHER

Marissa Goerke, Research Associate

Temperature
Average: -0.4 °C / 31.3 °F
Maximum: 8.2 °C / 46.8 °F on 17 Apr 10:48
Minimum: -5.2 °C / 22.6 °F on 13 Apr 02:02
Air Pressure
Average: 983.3 mb
Maximum: 1007.9 mb on 24 Apr 18:24
Minimum: 959.9 mb on 10 Apr 16:29
Wind
Average: 14.3 knots / 16.5 mph
Peak (5 Sec Gust): 61.0 knots / 70.0 mph on 6 Apr 15:16 from NE (37 deg)
Prevailing Direction for Month: NNE
Surface
Total Rainfall: 106.7 mm / 4.2 in
Total Snowfall: 33.0 cm / 12.9 in
Greatest Depth at Snow Stake: 14.2 cm / 5.5 in
WMO Sea Ice Observation: 6-10 Bergs, bergy bits, growlers, brash, grease ice, and ice rind
Average Sea Surface Temperature: 0.51 °C / 32.9 °F

The high temperature in April was 46.8° F and averaged 31.3° F. Several shoulder season storms passed through the area bringing high winds, heavy precipitation, and colder temperatures. Sea ice was observed in various states of formation on several occasions near the end of the month. Twelve inches of snow fell but was followed by rain which diminished snow levels quickly.

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT

April 2020

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/VLF operated normally throughout the month.

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 successfully taken within one week of their target sampling dates due to boating operations and high winds.

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 this month. Bi-weekly absolute scans were completed as scheduled without complications.

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 remained in its 75% operational configuration while Sea Space continues to engineer a solution to the problem. Several requests for technical support were fulfilled to aid in the search for a solution.

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 survey points for the drone mapping ground truthing project were processed successfully.

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. Processed filters and sent logs 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. First nilas ice of the winter season was sighted.

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. The Joubins (AWS1) and Wauwermans (AWS2) were visited. Communication was restored to both weather stations. The shorter and darker days have led to remote station drop outs near the end of the month as would be expected.

Observations are archived on the AMRC website: <ftp://amrc.ssec.wisc.edu/pub/palmer/>.