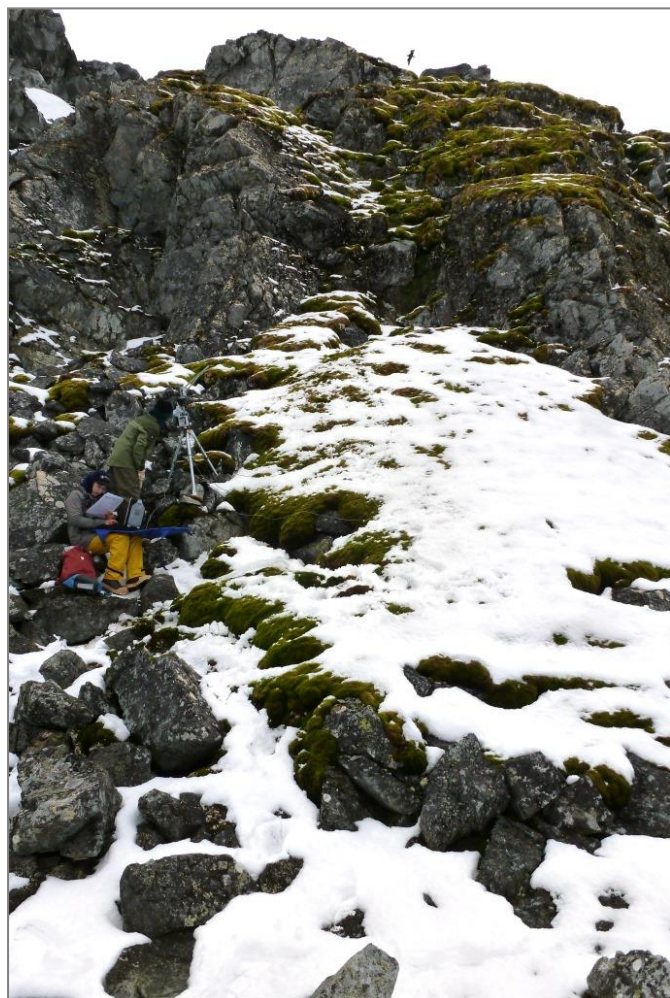


PALMER STATION MONTHLY SCIENCE REPORT

MARCH 2015



Palmer Science Support staff service and download dataloggers for an ongoing peatbank study on Litchfield Island headed by Dr. Zicheng Yu and Dr. David Beilman (G-094-P). The project will assess the response of carbon accumulation in moss peatbanks to climate changes over the last 2500 years. The team maintains two monitoring stations that record solar radiation and moss peatbank temperatures and moisture on different exposures.

(Image Credit: Carolyn Lipke)

NEWS FROM THE LAB

Carolyn Lipke, Summer Laboratory Supervisor

The end of March marks the conclusion of a very successful summer research season at Palmer Station. Over the season we hosted 9 research groups on station, and 12 projects running out of the Terra Lab. At the end of the month we welcomed the incoming ASC Winter staff. The *ARSV Laurence M. Gould* (LMG) also brought us our bi-annual station fuel resupply. Staff worked for the better part of a day to transfer almost 60,000 gallons of Antarctic Diesel from the

LMG holding tanks to the Palmer Station bulk tank. The newly arrived winter lab staff are already working to prepare for the three incoming science groups that will come to station on the next ship on April 11th.

MARCH 2015 WEATHER

Mark Dalberth and Lance Roth, Research Associates

March's weather remained nice, with temperatures cooling slightly compared to February. A few storms brought occasional snow flurries and some rain during the end of the month.

Occasional fog on some mornings soon evaporated with the rising sun.

We saw 62.2 mm of melted precipitation which includes 27 cm of snow. All the snow melted and did not accumulate as temperatures did not remain below freezing. The maximum temperature was 8.9 C (48 F) on March 24th, and the minimum temperature was -4.1 C (24.6 F) on March 21st. The average wind speed was 10 knots while the highest five second gust was 61 knots recorded on the 12th.

No sea ice was observed in the area. We did have some brash ice in the harbor, but not enough to affect boating operations. The tide gauge on the pier measured on average sea surface temperature of 0.0 C (32 F). The minimum sea temperature recorded was -1.0 C (30.2 F) on March 27th and the maximum sea surface temperature was 0.6 C (34.5 F) which was observed on March 13th.

B-005-P: COLLABORATIVE RESEARCH: IMPACTS OF LOCAL OCEANOGRAPHIC PROCESSES ON ADÉLIE PENGUIN FORAGING ECOLOGY

Dr. Josh Kohut, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences; Dr. William R. Fraser, Co-PI, Polar Oceans Research Group; Dr. Kim Bernard, Co-PI, Oregon State University; Chris Linder, Co-PI; Dr. Matt Oliver, Co-PI, University of Delaware; Hank Statscewich, Co-PI, University of Alaska Fairbanks; Dr. Peter Winsor, Co-PI, University of Alaska Fairbanks

Personnel on Station: Kim Bernard, Megan Cimino, and Shenandoah Raycroft

The B-005 group departed Palmer Station in early March.

B-018-P: MOLECULAR ASSESSMENT OF PHYTOPLANKTON COMMUNITY DYNAMICS AND METABOLISM IN THE WEST ANTARCTIC PENINSULA

Dr. Shellie Bench, Principal Investigator, Stanford University, CA

Personnel on station: Chris Grant

Prior to leaving station on March 11th, Chris collected and processed water on three sampling days. As is standard for this project, processing included preparing water for RNA and DNA, as well as microscopy and flow cytometry. In addition, he completed a second experiment for a collaborator at Lawrence Livermore National Laboratory (LLNL) as described in last month's

report. There are now two sets of samples from Palmer Station to contribute to the LLNL collaborator's work.

ASC staff and volunteers from other science groups continued to provide valuable assistance with the boating and sample collecting, and the LTER groups (C-019 and C-045) provided important information for assessing the status of the phytoplankton biomass.

The samples collected in early March were the final samples for this project. As such, in his last few days before leaving station, Chris spent a lot of time closing down the laboratory. This included returning Palmer-supplied equipment, taking inventory and packing up remaining laboratory supplies for cargo shipping, and preparing samples for shipping north.

During the three seasons of this project, a total of 85 water samples were collected and processed from water near Palmer Station during (32 sample days in 2014-2015, 28 in 2013-14, and 25 in 2012-13). In addition, 22 water samples were collected and processed on three coincident annual LTER cruises. This set of over 100 discrete water samples represents a valuable temporal and spatial record of the marine microbial community, a subset of which are already or will soon be undergoing sequence analysis. The remaining samples will be a considerable resource for future work as they represent a snapshot of the microbial community near Palmer Station. The samples are all the more valuable because of the wealth of contextual data collected concurrently by the LTER groups to describe the biological, chemical and physical environment.



Palmer Station on a clear night. *Photo Credit: Chris Gran*

B-068-P: COLLABORATIVE RESEARCH: SYNERGISTIC EFFECTS OF ELEVATED CARBON DIOXIDE (CO₂) AND TEMPERATURE ON THE METABOLISM, GROWTH, AND REPRODUCTION OF ANTARCTIC KRILL (*Euphausia superba*)

Dr. Grace Saba, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences; Dr. Brad Seibel, Co-PI, University of Rhode Island

Personnel on Station: Tracy Shaw and Monisha Sugla

The long-term experiment on krill growth and pH threshold values that we started in February continued into March. The krill had just started molting for the second time in the last days of February so I wanted to let the experiment run for as long as was logistically possible given that we were departing station on March 11. I finally ended the experiment on March 7 and commenced packing and cleaning in earnest. We had a number of krill that molted for a second time in the 3°C treatments and several krill molted for the second time in the 0°C treatments during the last few days before the experiment ended. There was very little mortality in any of the treatments and the data from the krill measurements show that the animals maintained approximately the same size over the course of the experiment. The krill were frozen individually for further analyses. This experiment design resulted in a data set with individual krill that had been exposed to six different pH and temperature treatments for periods from 2-22 days. Analyses of the frozen krill will provide interesting data on physiological responses over different time periods. Continuing issues with our alkalinity titrator prevented us from processing many samples on station but the samples were collected and preserved for analysis at Rutgers. We had a productive and enjoyable season at Palmer Station. Many thanks all the personnel on station for their support of our science, especially lab supervisor Carolyn Lipke and instrument technician Juliet Alla who got the brunt of our endless questions about where things were and how things worked.

C-013-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, APEX PREDATOR COMPONENT

Dr. William R. Fraser, Principal Investigator, Polar Oceans Research Group, Sheridan, MT

Personnel on Station: Ben Cook, Shawn Farry, Donna Patterson-Fraser, and Carrie McAtee

Adélie penguin work concluded this month with the end of the presence/absence radio transmitter study on Humble Island. Gentoo penguin breeding was slightly behind Adélie penguins this year with work during March focused on obtaining adult diet samples as well as obtaining chick fledging weights.

Brown skua work also concluded this month with nest monitoring and growth measurements ending with the fledging of our last study chick. For the fourth year South polar skuas failed to fledge any chicks within our Shortcut Island study area, however scat collections and band observations continued throughout March.

Giant petrel chick banding on local islands was completed this month while growth measurements of giant petrel chicks continued on Humble Island.

Marine mammal monitoring continued with observations of large numbers of fur seals, rapidly declining elephant seal numbers, sporadic leopard seal and crab-eater seal sightings and a return of a few Weddell seals to the area.

Sediment trap contents were collected from Adélie colonies on Torgersen Island, gentoo colonies on Biscoe Island and chinstrap colonies on Dream Island. Palmer area sediment trap samples as well as Avian Island samples were all processed this month. Limpet trap contents were also collected from kelp gull colonies on four local islands. Project gear and supplies were cleaned, inventoried and crated in preparation for shipment north.

ASC continued to provide great support this month and we'd like to thank everyone on station for their efforts throughout the entire summer. Special thanks to Carolyn Lipke for providing great support all season, Resident Marine Technicians Rosemary McGuire and Carmen Greto for keeping us on the water and to Birder Assistants Jason O'Brien and Bridget Kearsey for assisting with end of season giant petrel monitoring.

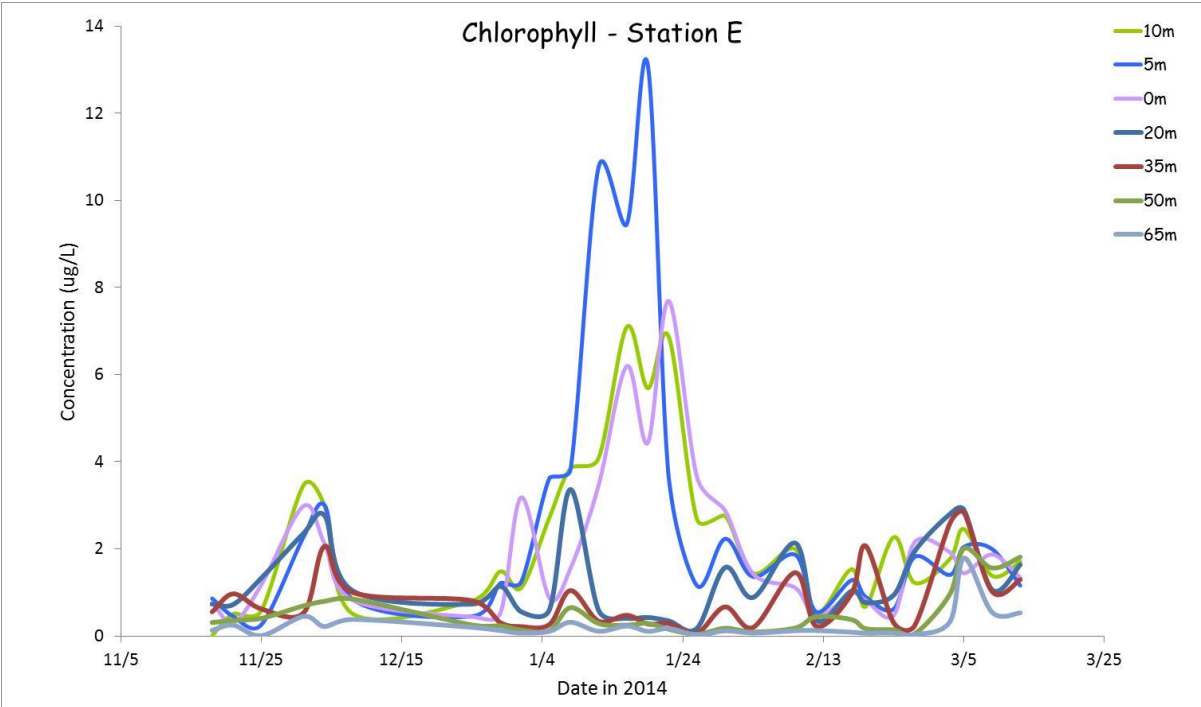
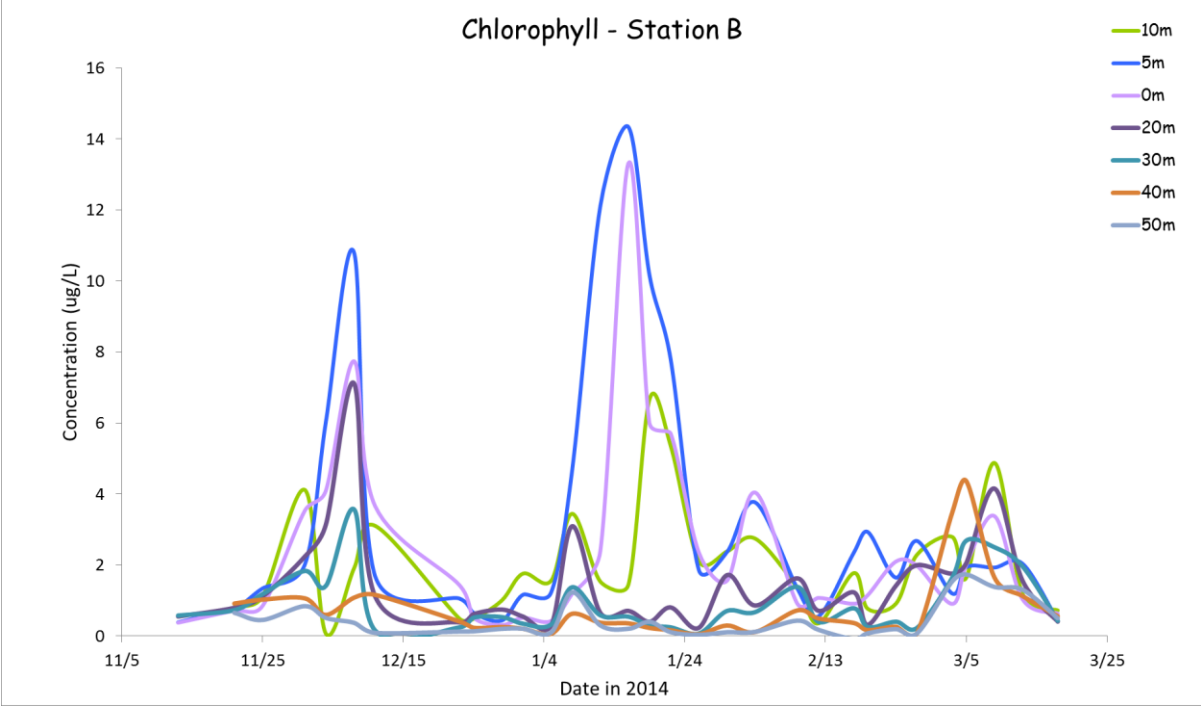
C-019-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, PHYTOPLANKTON COMPONENT

Dr. Oscar Schofield, Principal Investigator, Rutgers University, Institute for Marine and Coastal Sciences

Personnel on Station: Jim Fiorendino

The Schofield group continued sampling through most of March, completing 5 sampling events despite difficult weather conditions, and concluded sampling on March 18. In addition to our normal sampling and processing, we also completed analyzing the last of the chlorophyll a samples taken during the LTER cruise in January.

Looking back at all of the chlorophyll data we collected this season, two chlorophyll peaks are apparent at Station B occurring in late November/early December and mid-January, mainly at 0 and 5 meters, though high levels of chlorophyll were seen at 20 meters in early December and at 10 meters in January. At Station E, a less dramatic spike in chlorophyll concentration occurred in late November/early December while a peak similar to that seen at Station B occurred in mid-January. Smaller peaks occurred at both stations near the end of the season with the chlorophyll maximum appearing deeper in the water column. As of our last sampling event, chlorophyll concentration at Station B was around 0.5 ug/L for all depths while chlorophyll concentration at Station E varied between 0.5 and 2 ug/L.



C-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: MICROBIAL / BIOGEOCHEMICAL COMPONENT

Dr. Hugh Ducklow, Principal Investigator, Columbia University, Lamont Doherty Earth Observatory

Personnel on Station: Rachel Kaplan, Naomi Shelton, and Conor Sullivan

The end of March marks the successful conclusion of the eleventh sampling season for the Microbial Biogeochemistry component of the Palmer LTER project. Despite difficult weather conditions the last few weeks, we managed to continue sampling twice a week until our final sampling day on the 25th. However, we were frequently forced to modify our field schedule in a given week, and twice were only able to sample at Station B due to dangerous conditions at Station E.

Looking back over this season's preliminary data, we can see that despite high bacterial abundance relative to past years, especially at Station E, bacterial production (using leucine incorporation as a proxy) at both stations was low (Fig. 1). Two peaks in bacterial production in December and February appeared concurrently with bacterial abundance peaks at Station B. However, bacterial production and abundance at both stations were low during January, a month of historically high bacterial production values. The mid-December ice-in may have impacted the microbial communities, resulting in the decreased production and abundance values we observed mid-season.

Seasonal bacterial abundance and production are out of phase with phytoplankton abundances as measured by flow cytometry (Fig. 2). Overall, phytoplankton abundance declined steadily from the beginning of the season through the end of January. A large bloom began in February, peaked in early March, and fell to slightly below the levels seen at the beginning of the season at the end of March. Prokaryotes drove total phytoplankton abundance and were one or more orders of magnitude more abundant than other groups we measured. These other two groups, Picoeukaryotes and Nanophytoplankton, each had a single significant bloom during the season, Picoeukaryotes from December through January, and Nanophytoplankton following the autofluorescent Prokaryote bloom from the beginning of February to the end of March. They also each had a minor bloom during the primary bloom of the other.

In addition to our normal LTER sampling, we also engaged in several other projects during this month. First, we redeployed soil temperature loggers at various distances from the toe of the Marr Ice Piedmont for Dr. Natasja van Gestel at North Arizona University. During this process, we measured 8m of glacial recession since January 2014, in line with current estimates of glacial recession in this area. We also collected soil samples at the nearest and farthest logger locations for microbial community analysis. Second, we again took to the glacier, but this time to collect several samples of cryoconites, basal ice, and regular ice for dissolved organic carbon analysis. We are interested to see if the melting glaciers and adjacent soils are a source of microbes and DOC for the coastal ocean. We also continued to collect Oxygen-18 samples to determine the glacial vs. sea ice inputs of fresh water to the coastal region.

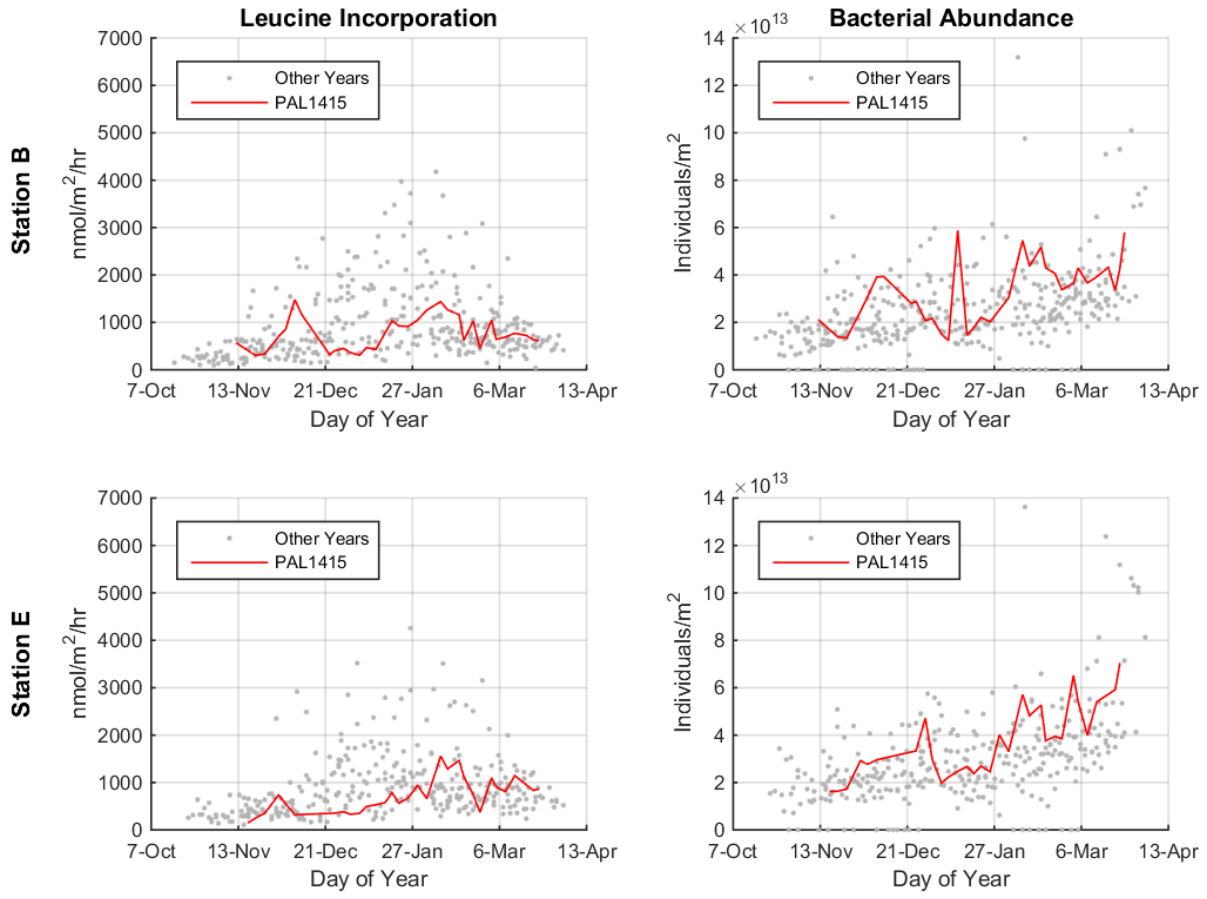


Figure 1 – Depth integrated leucine incorporation and total bacterial abundance data from the last thirteen years of Palmer sampling at Stations B (to 50m) and E (to 65m). Sampling commenced in 2002-03, and there were no samples in 2006-07 and 2007-08.

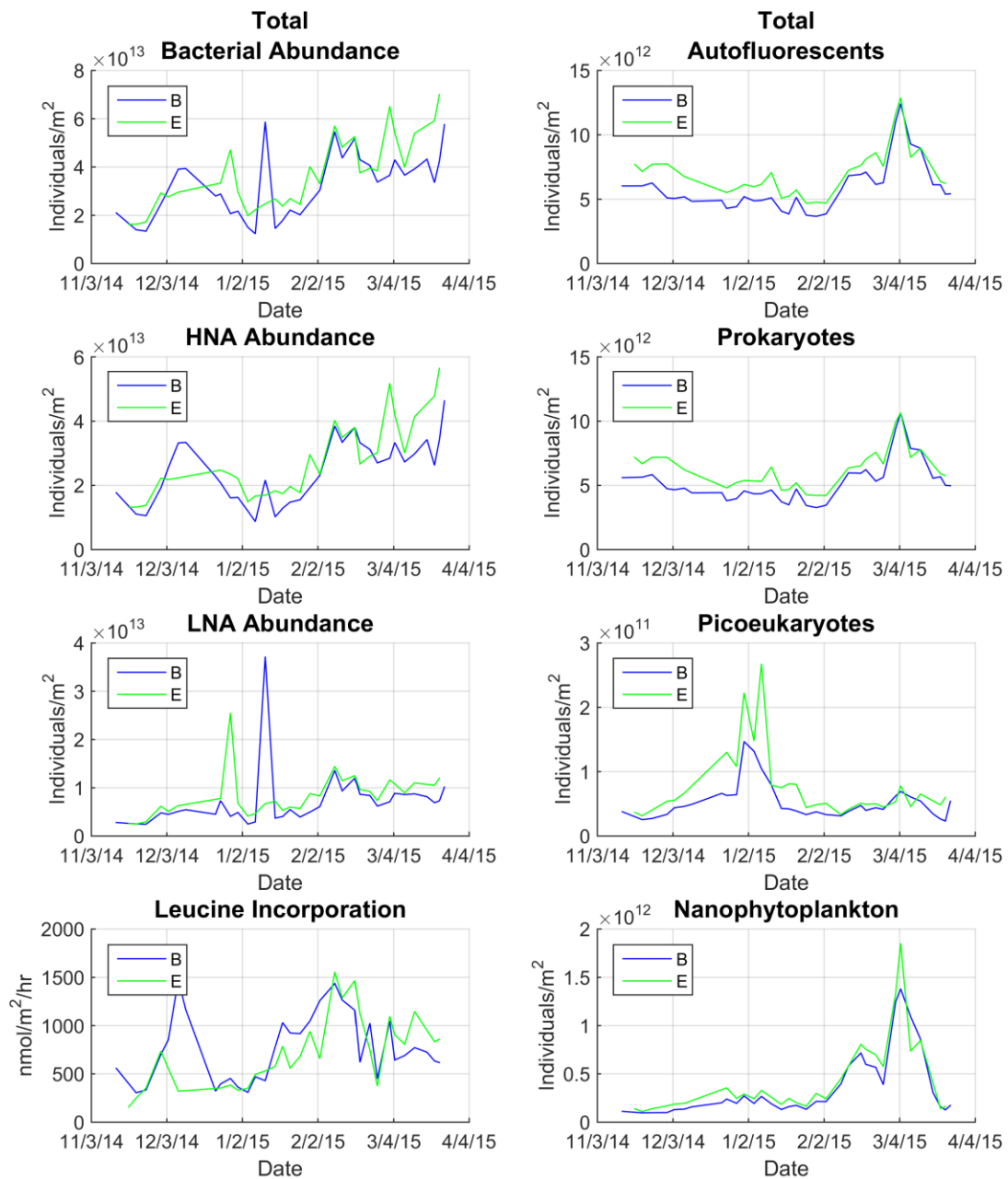


Figure 2 – Depth integrated abundance of microbial populations we collect via flow cytometer (bacteria and phytoplankton, or autofluorescents) as well as leucine incorporation data from this season’s sampling at Stations B (to 50m) and E (to 65m).

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

Mark Dalberth and 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 system has been operating normally.

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 seismograph operated without any problems this 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 functioned normally this month. I checked the antenna every two weeks, and I replaced the external hard drives on March 20. The foundation of for the ELF antenna was completed this 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 stopped working towards the end of the month. The backup was brought online a few days after the primary machine crashed. The simplest solution was to transfer the hard drives from the primary system into the backup.

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 every two weeks. New flasks came in on LMG15-03.

**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 and the halocarbon and trace species projects. A crate of sampled flasks for the HATS project has been shipped north on LMG15-03.

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 TUVB 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. The field engineer arrived on LMG15-03 to perform maintenance on the system. Currently, the UV monitor is back up and running.

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. Daily quality checks of the downloaded data were performed as scheduled.

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. Last month, I tested the Trimble GPS in Post-Processed Kinematic mode. This month I tested it in Real-time Kinematic mode. It worked fine.

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 system has operated normally 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 has functioned normally this month.

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

Deneb Karentz, Joe Grzyski, 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.

Daily instrument checks, weekly cleaning and data downloads were performed as scheduled.

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 was installed on March 9. So far, I have not seen any problems with the new gauge. The errors that intermittently stopped data from the old gauge have not occurred.

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.

PalMOS has operated normally. I have written up the changes that I've made to the chart plotting software in the Research Associate's Operating Procedures. I wrote a document with details of the new weather station (PalMOS 2). Construction of the new weather station will start this austral winter.