

PALMER STATION MONTHLY SCIENCE REPORT
February 2011



With the help of tenders, divers from B-022-P prepare for their cold work.
Image Credit: Jackie Salm

NEWS FROM THE LAB

By Phil Spindler, Science Support Supervisor

February began with the departure of the *RV Laurence M. Gould* (LMG). This also marked the end of the summer field season for two science groups, B-026-P (Matt Cottrell) and B-391-P (Mark Moline), who went north with the ship.

We welcomed the LMG back to station mid-month with B-022-P (Amsler/Baker/McClintock). Three geology groups were also on board, preparing for their field season via ship operations around James Ross Island (MacPhee/G-170-E, Barbeau/G-432-E, and Kirschvink/G-436-E). We hosted a great science talk by Dave Barbeau during the port call.

The month wrapped up with normal operations and a successful start for the dive group despite the foul weather we've been having.

FEBRUARY WEATHER

By Brian Nelson, Research Associate

February has been a grey month of wind and rain. The average wind speed of 12 knots belies the fact that one quarter of the days in February were too windy for boating activities. The maximum gust this month was 76 knots. Rain fell rampantly, totaling 101mm, and besting the February average by 30mm. Occasional flurries didn't stick to the ground for long, but totaled 8cm.

Temperatures were normal again this month between 0 and 5 °C, averaging 2.4 °C. Maximum and minimum temperatures were 7.2 °C and -0.3 °C, respectively. Aside from a few outliers, sea surface temperature was steady at 1 °C.

The glacier continues to calve at a steadfast pace, pushing brash out of Arthur Harbor and choking the parking lot when the winds are northwesterly.

B-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: Jennifer Blum, Kelsey Ducklow, Marc Travers

February was marked by the return of the Laurence M. Gould at the beginning of the month at the conclusion of the LTER cruise. Shawn Farry and Kristen Gorman returned to station for a brief time before departing for the season, along with Donna Patterson-Fraser. The remaining bird crew continued work throughout the month, but several periods of high winds delayed field operations, and wet weather delayed specific work requiring handling of downy chicks.

The adelic penguin work continued this month, highlighted by the chicks fledging. Adélie chick counts and measurements of chicks about to fledge were obtained on local islands until all of the chicks departed. The penguin breeding chronology monitoring concluded mid-month with a trip to the Joubins in which a census of adelic, chinstrap, and gentoo penguin chicks was completed on the known penguin-breeding islands. Our adelic penguin radio transmitter study on Humble Island will continue into March.

Skua work continued with monitoring and banding of brown skua chicks on local islands as well as on Dream Island. Chick growth measurements and diet sample collections continue on Shortcut Island for south polar skuas. Monitoring of the blue-eyed shag colony on Cormorant Island continued and concluded at the end of the month. Our giant petrel satellite transmitter work finished up this month with the retrieval of all of our transmitters. A giant petrel chick census was conducted on multiple islands of the Joubins during our mid-month trip there. Growth measurements of giant petrel chicks continue on Humble Island.

Monitoring of marine mammals continued, highlighted by the exponential increase of fur seals on many of the area islands. Sediment trap samples from Avian Island were processed and dried.

Torgersen Island sediment trap samples were retrieved and processed, and repairs were made to one of the traps. Lab work continued with skua scat analysis and prepping samples for shipment on LMG11-02. Data analysis projects continue as well.

RPSC continued to provide great support this month. Field volunteers were incredibly helpful during the adelic fledgling period; many thanks to Phil Spindler for coordinating this volunteer schedule. Also a special thanks to Ken Keenan for his continued hard work this month, particularly in his efforts to repair some chronic issues with one of our F470s. Ken's attentiveness to safety with regard to the condition of our boats has been appreciated, and we are quite sorry to see him depart early this year.

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

Principle Investigator: Oscar Schofield, Rutgers University and Matt Oliver, University of Delaware

Personnel on station: Kaycee Coleman and Mike Garzio

At the end of the LTER cruise our personnel switched around a bit. Mike Garzio returned to station for the rest of the season and Matt Oliver went back north. The new team of two will finish up the rest of the season for B-019.

The main focus in the month of February was our Ocean Acidification experiment. This experiment was conducted once on the Long Term ecological research (LTER) cruise and twice at Palmer station. The experiment ran for twelve days, sampling on days 0, 2, 4, 7, and 12. We sampled several aspects of the water, such as: nutrients, chlorophyll, bacteria, microzooplankton, viruses and more. Three different gas concentrations were used (180ppm, 385ppm, and 750ppm) to simulate pre-industrial, current, and predicted future atmospheric concentrations. Our experiment was conducted in order to find what changes in gas concentrations would do to the biogeochemistry, and community of organisms living in the Antarctic coastal marine habitat.

Meanwhile we continued our biweekly sampling at stations B and E. Due to rough weather events our sampling was minimized. Currently our focus is on running chlorophyll samples from the LTER cruise, biweekly sampling, and from our Ocean Acidification experiment. We will continue to sample at B and E biweekly as long as weather allows. Additionally, we have started a small survey using the AC-9, our bio-optics instrument, and collected surface water for chlorophyll and HPLC analysis. Our sites were chosen by sea floor topography and some initial results from Matt Oliver and Mark Moline's AUV work during January. We have selected five sites where the sea floor ranges from 80 to 100 plus meters. These sites are located at stations G and F, as well as close to the islands Janice, Christine, and Cormorant. We have completed this survey only twice thus far due to weather restrictions, yet we plan to sample in these areas at least two more times before our sampling season is over. Additionally we plan to sample out near Outcast Island for this survey. We hope to find differences between these sites and our usual sampling sites of station E and B if they are indeed different.

B-020-P: PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, ZOOPLANKTON COMPONENT

Dr. Deborah K. Steinberg, Principal Investigator, Virginia Institute of Marine Science, VA

Personnel on station: Kim Bernard, Kate Ruck, Lori Price

We returned from a very successful LTER cruise in early February. Kate Ruck and Lori Price joined the zooplankton team on station, bringing our numbers up to 3. Since our return we have been busy processing samples collected during the cruise, as well as conducting research in the waters within the 2 mile boating limit off Palmer Station.

Kim Bernard and Kate Ruck are working on macro- and mesozooplankton (>2000 μm and 200-2000 μm , respectively). Kate's work focuses on elemental and lipid composition of major zooplankton taxa and Kim is working on *E. superba* distribution patterns, determined with bioacoustics, and zooplankton grazing impact (from the cruise). Gut fluorescence, lipid and CHN samples collected during the cruise are currently being processed and/or analyzed in the lab. Regular zodiac sampling trips are being carried out, weather permitting, using the DT-X echo sounder and the 1m ring net with the aim of catching zooplankton, specifically *Euphausia superba* and *Salpa thompsoni*. Stations that have been regularly sampled are B to G, G to F and F to E, with others added as and when needed. Unfortunately, we have not had too much success in catching zooplankton; both *E. superba* and *S. thompsoni* have been very sparse in our catches. We have, however, been observing relatively large patches of what appears to be *E. superba* on the DT-X echo sounder, and these data combined with tide data made available on station are proving to be very interesting. Our preliminary results suggest that the diurnal tides might be associated with an increase in *E. superba* densities within the 2 mile boating limit area. Further investigation in this respect is needed.

The few *Salpa thompsoni* that have been caught are being used to produce fecal pellets which will later be analyzed for individual carbon and nitrogen content. All other zooplankton caught during our sampling trips are being processed either CHN (specifically the pteropod, *Limacina helicina*) or lipid analysis, which will be conducted back in the States at the Virginia Institute of Marine Science (VIMS).

Lori Price is working on microzooplankton (<200 μm), in particular, she is conducting grazing experiments, known as "dilution experiments" with the aim of estimating how much pressure microzooplankton are able to exert on the phytoplankton and bacterial standing stocks in the region. Five dilution experiments have been conducted with water collected from Station B. Preliminary results from the first four experiments show measurable grazing rates on phytoplankton in two of the experiments and measurable grazing rates on bacteria in all four experiments. Lori is also running Fluorescently Labeled Bacteria experiments to measure cell-specific grazing rates of the microzooplankton on bacteria. Samples for microscopic identification of microzooplankton have been collected from different depths at Station B. The microscope work will be conducted in the laboratory at VIMS.

Phytoplankton samples have been collected at various stations within the 2 mile boating limit for Dr. Rebecca Dickhut at VIMS.

B-022-P: THE CHEMICAL ECOLOGY OF SHALLOW-WATER MARINE MACROALGAE AND INVERTEBRATES ON THE ANTARCTIC PENINSULA

Charles Amsler and James McClintock, Principal Investigators, University of Alabama at Birmingham,

Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Bill Baker, Charles Amsler, Margaret Amsler, Bill Dent, Ruth McDowell, Jackie Salm, Kate Schoenrock

B-022 arrived at Palmer on the morning of 18 February with LMG11-02. Initial efforts centered on setting up our lab space, dive locker, and our portion of the aquarium building as well as on mandatory boat training. We began our diving equipment check out dives on 20 February.

From February 20-28 our group completed 10 dives including checkout dives off the Pier and several dives to collect organisms for laboratory studies. Because of unseasonably bad weather, all but two of these dives were made in relatively protected waters near station. However, the collections were sufficient to begin planned laboratory work

We are grateful for the generous and professional assistance of numerous RPSC staff. Phil Spindler, Ken Keenan, Christina Hammock, Carolyn Lipke, and Brian Nelson deserve special thanks for facilitating our laboratory and diving operations.

B-045-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, MICROBIAL ECOLOGY COMPONENT

Hugh Ducklow, Principal Investigator, Marine Biological Laboratory, Woods Hole Massachusetts

Personnel on station: Alice Alpert, Edgar Woznica

B-045 continued collecting water to measure bacterial abundance, bacterial productivity, dissolved organic carbon and nutrients throughout February. As summer comes to a close, the weather has been challenging but we were able to capitalize on weather windows. We were able to run live samples on the flow cytometer throughout the month in addition to running preserved samples from January when the flow cytometer was not on station. We observed a marked decrease in bacterial productivity beginning in the third week of February, corresponding to a drop in Chlorophyll production. Also in February we ran a second mesocosm experiment investigating the response of marine microorganisms to ocean acidification. These results can be compared to those of the first mesocosm experiment, which we carried out in the beginning of the summer season. Our field team leader, Alice Alpert, departed Palmer station at the end of the month, and Edgar Woznica will complete the field season for B-045.

B-239-P VIRAL CONTRIBUTIONS TO SUMMER BLOOM DYNAMICS IN THE WESTERN ANTARCTIC PENINSULA

Grieg Steward, Principal Investigator, University of Hawai'i at Manoa

Personnel on station: Alexander Culley, Jaclyn Mueller

A significant reduction in productivity appeared to take place in the water column at station B and E during the latter part of February. Despite worsening weather conditions, we were able to continue our sampling regime uninterrupted during this transitional period. With the samples we have collected in February, we will be able to determine the total abundance of marine viruses, the diversity of the viroplankton, the dynamics of specific viral phylotypes and the mortality due to viral infection within the prokaryote and phytoplankton communities. We are particularly interested in characterizing the changes in the virus community as the phytoplankton transitions from one dominated by diatoms to one dominated by flagellates.

We are happy to report that it appears we have isolated a virus that infects a gymnodinium-like dinoflagellate. If this result is confirmed, to the best of our knowledge, this will be the first virus that infects this type of dinoflagellate ever brought into cultivation. Jackie Mueller has joined the project and is now heading the viral component of the third ocean acidification experiment that is scheduled to conclude at the end of March. These data will give unprecedented insight into viral dynamics under varying CO₂ levels.

Our sampling regime is coming to an end at Palmer Station, and we are excited by the productivity of our first season here. Our success is in large part due to the other scientists and support staff. In particular, we thank Kaycee Coleman and Mike Garzio of the Schofield group (B-019-P) and Alice Alpert and Edgar Woznica from the Ducklow lab (B-045-P) for deftly executing the third ocean acidification experiment, the science support duo of Carolyn Lipke and Phil Spindler, and Ken Keenan for his supreme competence as boating coordinator.

B-256-P: ROLE OF DEHYDRATION AND PHOTOPERIODISM IN PREPARING AN ANTARCTIC INSECT FOR THE POLAR NIGHT

Richard E. Lee, Jr. and David L. Denlinger, Principal Investigators, Miami University, Oxford, Ohio and Ohio State University, Columbus, Ohio.

Personnel on station: Yuta Kawarasaki

In contrast to the favorable conditions of January, this month's weather was more challenging for fieldwork. After the Laurence M. Gould left on February 6th, Yuta Kawarasaki was the only remaining person on our team to continue laboratory and field studies. However, with the coordinated help from station personnel and other science groups, he was able to sample on the average three times a week.

The microhabitat substrate samples were collected from different islands to monitor the moisture content. The diverse types of microhabitat substrate, from sandy soil to moss detritus, are hypothesized to affect the overwintering state of the midges differently. In concert with laboratory experiments, we aim to make further inferences about the relationship between the microhabitat environment and the overwintering strategies of the midges.

We are grateful to station personnel for their support. Especially, we thank Phil Spindler, Carolyn Lipke, and Christina Hammock for their prompt assistance in the laboratory. The frequent sampling would not have been possible without the coordination and support by Ken Keenan. Diane Curran, Bob DeValentino, John Evans, Nándor Kovats, Carolyn Lipke, Brian Nelson, Micaela Neus, and Rebecca Shoop, all helped with the collection of midge samples. We also thank to personnel from science groups B-013-P and B-239-P for their eagerness in providing transportation between islands.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
February 2011
Brian Nelson

G-295-P GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Bjorn Johns, Principal Investigator, UNAVCO

The Research Associate operates and maintains on-site equipment for the project. Throughout the month, 15-second epoch interval GPS data files were collected continually at station PALM, compressed, and transmitted to the NASA-JPL in Pasadena, CA.

The GPS operated normally for the duration of the month. The roving unit was used to measure the glacier terminus.

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

Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

The Research Associate operates and maintains on-site equipment for the project. Station PMSA is one of more than 143 sites in the GSN monitoring seismic waves produced by events worldwide. Real-time telemetry data is sent to the U.S. Geological Survey (USGS).

Data collection occurred normally during the month.

A-132-P FABRY-PEROT INTERFEROMETER

Qian Wu, Principal Investigator, National Center for Atmospheric Research

The Research Associate operates and maintains on-site equipment for the project. The Fabry-Perot Interferometer observes mesospheric and thermospheric neutral winds and temperatures at Palmer Station.

The Fabry-Perot Interferometer continues to require power cycling to reset the focus mechanism. The problem seems to be software related and the grantees are working on a fix.

**O-202-P ANTARCTIC METEOROLOGICAL RESEARCH CENTER (AMRC)
SATELLITE DATA INGESTOR.**

Mathew Lazzara, Principal Investigator, University of Wisconsin

The Research Associate operates and maintains on-site equipment for the project. The AMRC SDI 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 ingestor operated normally for the duration of the month.

O-204-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 aid in determining rates of marine biological productivity and ocean mixing. The results are also used to help determine the 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. Palmer Station is especially well situated for resolving signals of carbon cycling in the Southern Ocean.

The Research Associate collects samples fortnightly from both TerraLab and the VLF Building. A goal is that all sampling will eventually be moved to TerraLab. Samples taken from the station are sent to Scripps where the analysis of O₂ and CO₂ content takes place.

Sampling equipment and operations were per plan throughout the month.

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

James Butler (Principle Investigator), 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.

Palmer Station is one of many sites around the world providing data to support these projects. The Research Associate collects weekly air samples for Carbon Cycle Greenhouse Gases Group and fortnightly samples for Halocarbons & other Atmospheric Trace Species Group.

Carbon Cycle and Halocarbon sampling occurred normally during the month.

O-283-P ANTARCTIC AUTOMATIC WEATHER STATIONS (AWS).

Mathew Lazzara, Principal Investigator, University of Wisconsin

The Research Associate monitors data transmissions for the project and performs quarterly maintenance on the station at Bonaparte Point. AWS transmissions from Bonaparte Point are monitored using the TeraScan system and the Data Ingestor system. Data collected from this station is freely available from the University of Wisconsin's AMRC website.

The weather station ran normally during the month.

A-109-P ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION.

Robert Moore, Principal Investigator, University of Florida

Extremely Low Frequency/Very Low Frequency (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. Lightning source currents are estimated or directly measured by experimental observations of individual natural and rocket-triggered lightning flashes in North America. Together, the North American and Antarctic data sets are used to experimentally identify and analyze the components of lightning and the effects of lightning, such as lightning-induced electron precipitation, that are observed in the Antarctic, more than 10,000 km distant.

Data collection was halted throughout the month. See A-306-P below for more details.

A-306-P GLOBAL THUNDERSTORM ACTIVITY AND ITS EFFECTS ON THE RADIATION BELTS AND THE LOWER IONOSPHERE.

Umran Inan, Principal Investigator, Stanford University

Stanford University has been operating a Very Low Frequency (VLF) receiver antenna at Palmer Station since the 1970's. By receiving naturally and manmade signals between 1 and 40 kHz, the Stanford VLF group is able to study a wide variety of electromagnetic phenomenon in the ionosphere (uppermost layer of the atmosphere ionized by solar radiation) and magnetosphere (the area surrounding the earth dominated by the Earth's magnetic field and particles trapped by it). Many of these studies relate to the energetic releases associated with lightning. For example, Palmer Station's unique location enables it to pick up small bits of radiation from lightning strikes as far away as Africa, the USA, or the Pacific Ocean.

After much troubleshooting, several corroded connectors were replaced along the VLF antenna cable, as well as fuses in one of the power supplies. Water in the lines is still shorting the power supply intermittently, so troubleshooting continues. A plan has been established to move the antenna back into the safe flagged area of the glacier during the site visit in late March.

T-312-P TERASCAN SATELLITE IMAGING SYSTEM.

The Research Associate operates and maintains on-site equipment for the project. Throughout the month, the TeraScan system collected, archived, and processed DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. A weekly 85GHz SSM/I ice concentration image was produced and transferred to UCSB for B-032-P (Smith).

The system operated normally during 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. Palmer's magnetometer is also a conjugate to the Canadian Poste de la Baleine station, allowing the study of conjugate differences in geomagnetic substorms and general auroral activity. The station Research Associate maintains the on-site system.

The system collected data normally during the month.

B-390-P: THERMO-SALINOGRAPH

Vernon Asper, Principal Investigator, University of Southern Mississippi

Sea water is pumped continuously through a thermosalinograph (TSG) sampling system, recording the temperature, conductivity, salinity, and fluorescence. The real-time data, including graphs and web camera images of the ocean in the vicinity of Palmer Station, are compiled by a local server into web page format and relayed to a mirror site at Woods Hole Oceanographic Institute, which is a collaborator in the project. The URL for the WHOI mirror site is <http://4dgeo.who.edu/tsg/>.

The thermosalinograph operated normally during the month.

T-998-P: IMS RADIONUCLIDE MONITORING

Managed by General Dynamics

The International Monitoring System (IMS) radionuclide sampler is part of the Comprehensive Test Ban Treaty (CTBT) verification regime. The automated Radionuclide Aerosol Sampler and Analyzer (RASA) unit pumps air continuously through a filter for 24 hour periods, collecting particulates in the .2-10 micron range. The filter is then tested for particulates with radioisotope signatures indicative of a nuclear weapons test. The station Research Associate operates and maintains the instrument.

The system operated normally throughout the month. A specially requested sample was collected and packaged for shipment on the next northbound cruise.

ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK (UVSIMN)

A 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, while the sun is above the horizon. A BSI GUV-511 filter radiometer, which has four channels in the UV and one channel in the visible for measuring Photosynthetically Active Radiation (PAR), is located next to the SUV-100.

The UV monitor collected data normally for the month and all scheduled calibrations were carried out.

TIDE GAGE

The Research Associate operates and maintains on-site equipment for the project. Tide height and seawater temperature are monitored on a continual basis by a gauge mounted at the Palmer Station pier. Although salinity (conductivity) is also recorded by the tide gauge, the measurements are incorrect and should not be used. Correct salinity data can be found on the TSG system.

The tide gauge operated normally during the month.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. At the end of the month a summary report is prepared and sent to interested parties. 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 NOAA for entry into the Global Telecommunications System (GTS).

Scheduled inspections were carried out at the Gamage Point tower. Weather updates and satellite imagery were forwarded to the R/V LAURENCE M. GOULD and the R/V NATHANIEL B. PALMER.