

PALMER STATION MONTHLY SCIENCE REPORT November 2010



National Geographic Explorer in Arthur Harbor
Image Credit: Tracey Baldwin

NEWS FROM THE LAB

By Tracey Baldwin, Manager Science Support

The month of November was fast and furious at Palmer Station. We were visited by the RSV *Laurence M. Gould* (LMG) and other vessels. The LMG brought multiple site visitors and three new science groups to station this year. We had our first whale sighting and finally, we got some good weather to help us celebrate a scrumptious Thanksgiving holiday.

The LMG visited station twice in November. The first visit commenced after a successful Cape Shirreff camp opening and lasted 9 days. That extended port call allowed for longer site visits to audit the station's information security, review the station facilities and infrastructure by a representative from the National Science Foundation, and to install a new Fabry Perot Interferometer (FPI).

The installation of the FPI is an addition to the Geophysical projects maintained year round by the Palmer Station Research Associate. Read more about this project in the Research Associate's monthly report below for project A-132-P, Qian Wu, Principle Investigator.

The tour ship season started off this month with a visit from the *National Geographic Explorer*. The enthusiastic passengers toured station amid the smell of our cooking Thanksgiving turkey. The timing of this visit coincided with station personnel's preparation for the following day's holiday. As usual, the station chefs created an amazing meal that left many of us wondering how we got so lucky to be invited to such a wonderful event. The overall pie count was high and the quality was extraordinary.

The LMG returned to station just after the Thanksgiving holiday to drop off a few more station residents. These new residents included the NSF funded poet Katherine Coles and the Marine Biological Laboratory's science journalism fellows. Stand by for December's monthly report to read about their exciting activities!

NOVEMBER WEATHER

By Brian Nelson, Research Associate

October's foul weather continued into November, but steadily lost steam throughout the month. The final two weeks brought a few much-needed nice days. Wind averaged 14 knots, with a peak gust of 55 knots on the first of the month.

A mid-month snow squall contributed half of November's total 50cm of snow, more than doubling the average (21cm). At 316cm, year-to-date snowfall remains near average.

The mean temperature was slightly warmer than normal at 0.9 °C. Maximum temperature was 6.1 °C and minimum temperature was -4.0 °C. Sea surface temperatures slowly trended upward during November, but remain just below zero Celsius.

The berg just beyond DeLaca Island became dislodged late in the month. It turtled, spun and drifted, but remains in basically the same location.

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

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

Personnel on station: Jennifer Blum, Marc Travers

November weather conditions were improved from October; however, a handful of field days were still missed due to persistent high winds, and some long-distance field work was delayed. We continued with our regular censuses of Adélie colonies on Torgersen, Humble, Cormorant and Christine Islands, as well as with Gentoo colonies on Biscoe Island. Breeding chronology and egg production were monitored on a subset of Adélie nests on Torgersen and Humble Islands. A portion of nests were sampled at the 1-egg stage to obtain adult body size, mass, and egg measurements. Timing of the peak egg census for Adélie penguins was determined and completed for Adelies on all local islands as well as on Dream and Biscoe Islands. The Gentoo peak egg census began in November and will continue into December. The chinstrap penguin peak egg census will be completed in December. We have also been monitoring the number of depredated eggs from all 3 penguin species on all islands.

We have continued our brown skua band resighting and have begun to monitor nesting areas for all brown skuas in the Palmer area, as well as on Dream and Biscoe Islands. South polar skuas began arriving in the middle of the month; we began our band resighting and nest monitoring study of them on Shortcut Island. Counts of the blue-eyed shag colonies on Cormorant Island continued, as did monitoring of marine mammals. Satellite transmitters for giant petrels were tested and deployed, thus beginning our work with this species. An early-season census of giant petrel nests was completed on Shortcut Island. Databases were set up for more of our upcoming giant petrel work. Lab work has continued with the processing of blue-eyed shag boli and south polar skua scat and diet samples. Gear and equipment preparations have begun for the LTER cruise. The first cruise ship of the season visited this month, and we greeted guests on Torgersen Island to answer questions. Science journalists for the LTER outreach program arrived at the end of the month and we will be coordinating with them during their few weeks on station.

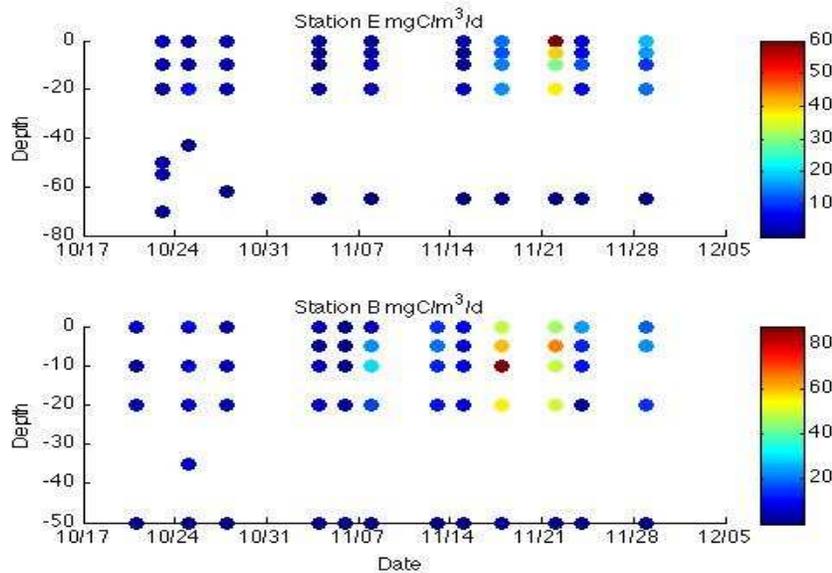
RPSC has continued to provide great support for our project this month. Special thanks to Lily Glass for her hard work maintaining our boats and to Dave Ensworth for modifying some field tools for our group.

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

Oscar Schofield, Principle Investigator, Rutgers University

Personnel on station: Kaycee Coleman, Travis Miles, Michael Garzio

The coordinated twice-a-week sampling efforts at station E and B, between B-045 and B-019, have become more efficient. With the addition of better weather conditions this month, we have been able to decrease our time on the water when sampling by half. Our hyperspectral radiometer has been decommissioned from our sampling routine due to an internal problem that must be repaired by the manufacturer. Our other bio-optical instrument, the AC-9, has been working regularly and is consistently used during our Monday, Thursday sampling regime as well as whenever there is an opportunity to go out. Looking at preliminary primary productivity data, it appears that we had a phytoplankton bloom around the 18th to the 22nd of November.



This month B-019 spent a good deal of time preparing for a mesocosm experiment that studies the affects of ocean acidification on aquatic biota. This includes acid washing lab equipment, labeling bottles and tubes, finding the necessary equipment and chemicals, as well as the set up of the experiment. The research will take place in one of the aquarium tanks outside, where 9 carboys will be incubated for up to 15 days. There will be three different gas treatments being applied across the carboys. Carbon dioxide concentrations of 180 ppm, 385 ppm, and 750 ppm will be bubbled into 20L carboys to simulate pre-industrial, current, and predicted 2100 CO₂ conditions.

I would like to give special thanks to Tracey Baldwin, Carolyn Lipke, the Palmer Logistics Team, and the rest of the Raytheon employees who were able to help us get the supplies from Punta Arenas which were make or break items for the mesocosm experiment. Also, B-019 would like to thank the rest of the science groups for helping with the prep work. This experiment could not be run by three people alone, and we appreciate the help that has been available.

Additionally, glider preparations were started in anticipation of an early December deployment. The deep glider, RU-25, was found to have a leak, so a large amount of time and effort went into finding and fixing this leak. Thanks to Travis Miles the leak was found in the science bay, due to one of the backscatter pucks, and repairs are in order. RU-25 will most likely start at the canyon by Palmer then make its way offshore. The technicians back home will control it from Rutgers University once it begins its sampling mission.

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

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

Personnel on station: Kim Bernard, Carolina Funkey

After a number of trials with different nets, towing set-ups and zodiac platforms, we are now happy that we have found an effective and safe way to collect zooplankton. We are currently using the "Mrs. Chippy" platform, but will possibly switch to "Wonderbread" as it has more space for our net set-up. The towing method we are now using is as follows: a rope in the form of a "V" is attached at two points to the transom of the zodiac (one on each side) and is positioned off the motor, held up by a float. Rope that is secured to the 1m net (with a mesh size of 2mm) is passed through a locking carabineer attached below the float. The rope is let out gradually while the boat slowly moves forward until 50m has been let out, the rope is then secured to a point on the transom. The net is then towed between stations (e.g. B to C). On arrival at the second station three floats tied together and attached to a line that is secured with a locking carabiner to the net rope are released over board. While the boat continues to move forward the line with the three floats moves down the net rope lifting the net. The zodiac is then spun around and the slack line is quickly pulled in and secured. The procedure is repeated until the net is retrieved on board. We have found this method to be effective at sampling macrozooplankton in the region. It does, however, have some disadvantages. We are unable to conduct oblique tows through the water column, instead we are essentially conducting mid-water trawls (to depths are approximately 20m, although deeper depths are reached). It should be pointed out though that we were not able to sample obliquely with the winch either. Bringing the net in is a slow process as it is done by hand, it is therefore possible that some of the zooplankton may be escaping. However, we are able to tow at slightly higher speeds with this system than we were with the winch set-up, which spooled out (even though it was locked) as we reached 2 knots. The slightly higher speed with the rope set-up (up to 3.5 knots) allows us to catch krill that might otherwise be able to avoid the net at the slower

speeds of the winch set-up. In terms of safety, the rope set-up currently being used does not pose the same potential threats as the winch system did. Also, since we are able to tow the net from behind, the zodiac is not pulled to one side (as was the case with the winch system when towing from port side).

All *Euphausia superba* collected are measured, counted and frozen at -70°C for carbon analysis back at the home laboratory. All other zooplankton are preserved in 6% formaldehyde and will be identified and counted. Preliminary results suggest that the macrozooplankton community in the vicinity of Palmer Station is made up largely of juvenile *E. superba*, most likely age class 0 as they are all < 20mm in length. Other species caught include the copepods, *Rhincalanus gigas* and *Calanus* sp. (most likely *C. propinquus*); the pteropods, *Limacina helicina* and *Clione limacina*; the tunicate, *Salpa thompsoni*; larval fish, most likely *Pleurogramma antarcticum*; and the chaetognaths, *Eukrohnia* sp. and *Sagitta* sp.

We have been sampling between stations B & C and D & E on a twice-weekly basis. Now that we have selected the best towing system for our needs, we will reduce the number of days we sample both stations to once per week only. On the other days we will begin sampling to collect krill for experiments. Multiple net tows will be conducted until sufficient krill in good condition are caught. These will then be placed in an aquarium tank to acclimate. If this is successful experiments will be conducted.

Unfortunately the DT-X echosounder is not working and so we have had to drop that from our sampling protocol. There is a chance, however, that we will be able to use the DT-X that is on the LMG when it is not needed by the researchers onboard the vessel.

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, Kelsey Ducklow

Summer has come to the Palmer area, bringing long days and calmer winds and allowing us along with the B-019 phytoplankton group to occupy our two routine stations B and E consistently. We have observed shifts in the temperature profile of the water column: an overall warming accompanied by increased stratification. Bacterial populations have responded to the stratification, in both their abundance and production rate. The production rates that we measure using radioisotope incorporation have increased through November, peaking after a phytoplankton bloom in mid-November. We have continued our week-long, net growth experiments with analysis of live populations by flow cytometry. Net bacterial growth in these experiments is variable, indicating a delicate balance between growth and removal by grazers and/or viruses. In previous weeks, the dinoflagellate zooplankton grazers decreased in numbers in the incubation experiments, but recently they have exhibited net growth. Photosynthetic nanoplankton are also growing actively.

In addition, we are participating in an exciting ocean acidification laboratory mesocosm experiment, organized by the B-019 phytoplankton group. Over a two-week time period, we are measuring bacterial abundance and growth rates in waters subjected to three different treatments: ambient CO₂, preindustrial CO₂, and a projection of CO₂ levels in 2100. This interdisciplinary project demonstrates the capability of the LTER project to carry out such interdisciplinary experiment and to collect data describing many different physical and biological variables.

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: Grieg Steward, Alexander Culley, Christopher Schvarcz

Grieg and Chris arrived at Palmer Station in late October to begin our laboratory's inaugural field season in Antarctica. The weather precluded sampling immediately; nevertheless, we used this time to orient ourselves to our new surroundings and fine-tune our procedures. Beginning November 13, 2010, we have collected samples from Station B for viral abundance; viral metagenomic analysis, to characterize the genetic diversity of the Arthur Harbor DNA and RNA virus community; viral nucleic acids, to explore the dynamics of specific viral phylotypes over the summer season; pulse field gel electrophoresis, to generate fingerprints of the virus community and track how these patterns vary over time; and for electron microscopy to assess the frequency of infected cells, and therefore estimate the percentage of host mortality that is due to viral lysis. This week we will begin experiments to determine the rate of viral production. We have made a particular effort to synchronize our sampling efforts with the LTER participants so that our data is concurrent.

In addition to the core measurements discussed above, we are participating in the ocean acidification experiment conducted by the Schofield group (B-019-P). In this experiment, we are collecting samples to assess how different CO₂ levels affect virus abundance, diversity and host infection. Finally, in order to isolate viruses from Antarctic waters, Chris has isolated several species of diatoms from Station B.



Diatom community from Station B collected 12/2/2010. Image taken with Nikon Eclipse E800 microscope and Spot camera

We feel that our sampling effort thus far has gone exceedingly well in large part due to the generosity, efficiency and competency of the Palmer Station science support staff.

Thank you for your hard work. We would also like to thank Kaycee Coleman, Michael Garzio and Travis Miles from the Schofield group (B-019-P) for their leadership and management of the ocean acidification experiment.

**B-319-P National Science Foundation Postdoctoral Fellow in Polar Regions
Research: Marine Prophages in the Western Antarctic Peninsular Region.**

Jennifer Brum, Principal Investigator, Tucson Marine Phage Lab, University of Arizona

Personnel on station: Jennifer Brum

Jennifer arrived at Palmer Station in early November. High winds during the first few weeks prevented planned sampling at regular intervals. Starting in mid-November, regular sampling commenced with surface samples collected from Station B on Mondays and Thursdays in association with the LTER groups. Water was collected for virus enumeration, frequency of visibly infected cells, and incubations for determining the percent of cells containing prophages. A large sample of 240 L was also collected in mid-November and used to concentrate free viruses and inducible prophages for genetic analysis. Jennifer will be leaving on LMG 10-10, however her sampling will be continued through the end of January with the generous help of B-239 and support from B-045 and B-019. I sincerely thank the members of B-239, B-019, B-045, and the Palmer science support staff for helping to make the first month of sampling successful.

**PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
November 2010**

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.

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 was installed early in the month by Qian Wu and Andrew Watt. The installation went smoothly and the instrument has been running well since.

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 DECADAL 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 continued normally throughout the month.

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.

Data collection continued normally through the month. A new computer was installed and greatly improved the reliability of the system.

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 though 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/tsq/>.

The thermosalinograph operated normally during the month. The bubbler was cleaned and the tubing was replaced. Both bubbler and tubing were wrapped in black tape to help minimize growth of phytoplankton and other green goo.

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. New filter media rolls, mylar tape and barcode tape were installed. These typically last about ten months.

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.

The monthly meteorology report for November resumed the use of temperature and humidity data from the primary weather station, PalMOS, since these new sensors were in place all month.

The ceilometer is still not communicating properly with the weather station. Troubleshooting will continue when the snow on Gamage Point melts completely, exposing the serial communications cable.