

PALMER STATION MONTHLY SCIENCE REPORT

November 2005



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NEWS FROM THE LAB

Langdon Quetin, Station Science Leader

Last season we started the November SitRep with a visit to the station in mid month by the *Laurence M. Gould*. This season, despite general ice conditions that are less extensive than last season, we start by reporting that the *Laurence M. Gould* was turned back by heavy ice conditions 8 miles from the station in mid November. On board the ship were a Palmer LTER Site Review team (composed of external reviewers, NSF Program Managers, Palmer LTER Principal Investigators and Palmer LTER graduate students), much-needed science cargo, station and science personnel, and much-desired “freshies”. We were reminded once again of the capricious nature of the Antarctic environment and its impact on the program’s logistics. Fortunately, the *Laurence M. Gould* was able to deliver science parties to both Cape Sheriff and Petermann Island, and to deliver cargo to COPA, Admiralty Bay, King George Island or the ship schedule would have been much more severely impacted.

During the month there were 21 scientists at the station spread among 7 projects. Four scientists arrived at Palmer Station November 27 aboard the tour ship *Clipper Adventure* thanks to the efforts of Bob Farrell, Station Manager, to expedite their arrival after the *Laurence M. Gould* was thwarted earlier in the month. The Palmer Research Associate continues to oversee data collection for 13 research projects, operate and maintain on-site equipment for the Palmer tide gage, and serve as chief weather observer for the station. New to the program this season is Steve Dobbs who is taking over for the winter-over Research Associate, Glenn Grant. Steve will have the distinction of working the first full season in the new Terra Lab, constructed last winter as a replacement for the T-5 building.

Briefly, air temperatures for the month averaged 0.2°C, ranging from -5.9°C November 4 to 8.1°C November 19. Wind averaged 6 kts and peaked at 41 kts November 13. We had 13.7 mm of melted precipitation and 13 cm of snowfall, much drier than last season when the numbers were 49 and 31, respectively. Snow-stake depth at the end of the month was 35 cm. For this year-to-date we have had 440.2 mm of melted precipitation, which is one of the lowest amounts of melted precipitation through November during the past 15 years.

Thank you to all of the Palmer Station personnel for maintaining the excellent support and quality of life at the station. As the holiday season approaches, we extend our best wishes to our Antarctic family here on the continent, back in the United States or wherever else you find yourself at the end of next month.

The following projects conducted research at Palmer Station during November:

B-003-P

Response of Terrestrial Ecosystems Along the Antarctic Peninsula to a Changing Climate

Thomas A. Day, Principal Investigator, Arizona State University, Tempe, AZ.

Personnel on station: Sarah Strauss, Matt Krna and Caroline DeVan

Work continued on preparing our climate manipulation plots in the backyard behind Palmer Station. In these plots we will modify temperature and precipitation regimes to mimic future climate change along the Peninsula, and examine how these changes affect tundra microcosms (cores containing terrestrial plants and associated soils) that we have placed in the plots. After removing snow from the plots, infrared heaters were placed over some plots to allow us to warm cores in these plots. A precipitation collector placed near the site was uncovered and set up. The precipitation we collect will be applied to some cores, providing a supplemental precipitation treatment that simulates another possible climate change scenario.

The snow covering the plots and cores melted out by 24 November. However, below freezing temperatures have kept the core soil frozen which has slowed initial growth of the plants. Two cores from each plot and each treatment (water and no-water) have been selected for intensive measurements this season. In early December, we will begin treatments (heating and adding supplemental precipitation) in plots. Shortly thereafter, we will also begin measurements of CO₂ flux from the cores. Fluxes are measured in the light and the dark to give us estimates of net ecosystem CO₂ exchange and ecosystem respiration, respectively. In conjunction with flux measurements, we will begin non-destructive measurements of leaf and shoot growth on these cores as well.

We also collected and sorted leaf litter of one of the higher plant species we are studying, *Deschampsia antarctica*. The litter was placed in small mesh bags that will be used to monitor litter decomposition rates at some of the glacial recession sites near Station. Anion/cation resin bags were also made for measuring nitrate and ammonium flux in the soil at some of the glacial recession sites near Station.

Nearly 2000 sample bottles were acid washed this past month in preparation for the leechate samples that will be collected from under tundra cores and the atmospheric deposition collected from around our core plots. These samples will be collected roughly every week and will be filtered and frozen for transport back to ASU. There they will be analyzed for nutrient concentrations.

The persistent snow and ice on and around station have prevented us from beginning our sampling and surveying on the surrounding islands.

Thanks to all station personnel who helped us set up. Special thanks to Ken Navarro and Heidi Schernthanner for their logistics support, Ted McKinley for building a new filtration manifold, Ryan Wallace and Zee Evans for installing the heaters, Don Peterson for electrical support and Barb Watson and Cara Sucher for helping insure that our equipment arrived safely on station.

B-013-P

Palmer, Antarctica Long-Term Ecological Research Project: Long-Term Ecological Research on the Antarctic Marine Ecosystem: Climate Migration, Ecosystem Response and Teleconnections in an Ice-Dominated Environment: Seabird Component

and

B-198-P

Monitoring the Effects of Tourism and Environmental Variability on Adelie Penguins at Palmer Station

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

Personnel on station: Kristen Gorman, Brett Pickering, Jennifer Blum, Fen Montaigne, Peter Horne

Sea ice was thick in the Palmer area for the first half of November, preventing field visits for 16 days this month. The time on station gave us an opportunity to sort skua and cormorant diet samples collected in 04/05. We also used the time to organize our databases and test radio and satellite transmitters. Engine troubles on the *L.M. Gould* combined with thick ice in mid-November delayed the arrival of our additional team members. The *Clipper Adventurer* arrived on November 27 bringing Brett Pickering and Kristen Gorman to our field team.

The latter half of the month brought more favorable ice conditions, which allowed for regular field visits to all Adelie colonies in the local area. We monitored the total number of adults and nests on Torgersen, Humble, Litchfield, Cormorant and Christine islands, as well as egg production for a subset of nests. From these data we determined the timing for the peak egg census. We also collected Adelie egg weights and measurements, monitored the number of depredated eggs, and measured the depth of snow along transects across all islands with penguin colonies. The tourist impact study began on November 27 as the cruise ship *Endeavor* brought the first tourists to Torgersen Island. In addition to our work on the local islands, weather and ice allowed for a brief trip to Dream Island toward the end of the month. We began our census of both Adelie and chinstrap penguins on Dream, and monitored the status of the snow fence experiment. Ice and wind prevented visits to Biscoe.

Our work with brown skuas began with their arrival early in the month. We noted leg bands and monitored nests for all brown skuas in the Palmer area. South polar skuas began arriving in the latter part of the month, and we began our monitoring of them on Shortcut Island. We also counted the blue-eyed shag rookeries on Cormorant Island and Elephant Rocks, and all kelp gull nests in the Palmer area. Our monitoring of marine mammals continued this month with sightings of Orcas and Minke whales in addition to leopard, Weddell, crabeater, and elephant seals.

Our work this month was greatly facilitated by great support from RPSC. Particular thanks to Paul Smotherman who helped us in the field as we were catching up after the long period of thick ice.

B-016/032-P

Palmer, Antarctica Long-Term Ecological Research Project: Long-Term Ecological Research on the Antarctic Marine Ecosystem: Climate Migration, Ecosystem Response and Teleconnections in an Ice-Dominated Environment: Phytoplankton Ecology and Bio-Optics, Remote Sensing, Sea-Ice Components

Maria Vernet, Scripps Institution of Oceanography (Principal Investigator, B-016-P)

Raymond Smith, University of California, Santa Barbara (Principal Investigator, B-032-P)

Personnel on station: Karie Sines (016), Maria Vernet (016), Julie Shcramm (016), Austen Thomas (032) and Boreth Eam (032)

Lab setup and zodiac preparation continued through the first week of November. The amount of ice in the immediate vicinity prevented sampling of core inshore stations B & E, but left endless possibilities for ice sampling. Ice was collected from the zodiac twice during the month on 01 and 10 Nov. Several experiments were conducted with this ice, marking the beginning of sampling and experimental work that will be done throughout the season. The brown ice collected 01 Nov was used for chlorophyll, hplc, chn, primary production and DOC (Dissolved Organic Carbon) experiments. Sampling from and around the seawater intake system began 03 Nov and continued on 10 and 14 Nov due to the persistence of the ice. During this time, there was an occasion when the zodiacs could be launched and we succeeded in reaching station A where testing of equipment and water collection occurred. Seventeen Nov the ice moved out and core sampling of station B began followed the next day by station E. Due to a shortage of equipment on station, Palmer inshore stations B & E were sampled on separate days, but weather and ice allowed full sampling of both stations a total of 4 times each: B sampled on 17, 22, 25 and 28 Nov, E sampled 18, 21, 24 and 29 Nov. The full complement of core samplings were conducted with this water.

In addition to core collections, the DOC experiment was run a total of five times (12, 17, 21, 24 and 28 Nov). Chlorophyll size fractionation was conducted in order to determine size distribution of phytoplankton communities inhabiting early season in-shore ice and water column. Preliminary results from chlorophyll and primary production experiments show limited amounts of activity within the water columns at stations B & E, with station B showing slightly

more production than E. CTD (Conductivity, Temperature and Depth sensors) data show small increases in fluorescence and decreases in light transmission. Microscopy samples show beginning communities of Corethron, Coscinodiscus, Chaetoceros, Thalassiosira and Fragilariopsis.

B-028-P

Palmer, Antarctica Long-Term Ecological Research Project: Long-Term Ecological Research on the Antarctic Marine Ecosystem: Climate Migration, Ecosystem Response and Teleconnections in an Ice-Dominated Environment: Prey Component

Robin Ross and Langdon Quetin, Principal Investigators, Marine Science Institute, University of California at Santa Barbara

Personnel on station: Langdon Quetin and David Huang

November is typically the month where we change our mode of operation from diving under pack ice to collect and assess the stage structure and condition of larval krill at the end of winter, to sampling adult and juvenile krill from zodiacs. Ice conditions were not as consistent or extensive compared to last season at this time, and late this month we were able to tow and collect krill and complete our two acoustic transects, which we do twice a week when the area is ice-free. We did catch some < 1 year old krill in the net, but krill were mostly > 40 mm total length, an indication of a maturing population as shown from past work. This year or next we expect another positive pulse in krill recruitment in the area.

Early in the month we assembled our sampling zodiac (RDIII), complete with a newly painted platform, a rebuilt hydraulic winch and a new 75 hp Yamaha 4-stroke outboard. After we blew a DC to AC inverter on our first outing, we converted the entire electronic set up on RDIII to solely DC power, a great improvement. The new outboard works perfectly, and 75 hp has proven to be an ideal engine size given the heft of RDIII. For those interested, on calm water RDIII planes at half throttle, cruises effortlessly at 17 kts and maxes at 22.5 kts with two people and all sampling gear on board. Besides the additional safety and environmental cleanliness of the new engine, the faster transit times mean that we can now survey the Palmer Area for surface-feeding activity by birds as indicators of krill in the area, which we could not do previously. The rebuilt hydraulic winch, on the other hand, is operating slower than previously. We continue to assess the issue since it limits our time-sensitive sampling efforts and attempts at sampling in more challenging areas.

Also, early in the month, we spent time preparing for the mid-term Palmer LTER site visit. Unfortunately, the *Laurence M. Gould* was thwarted from reaching Palmer Station by pack ice in the area. The lack of the mid-month station visit by the *Laurence M. Gould* meant not only the loss of the site visit and personnel transfer, but also a further delay in receiving our dive gear, a severe impact to the early part of our seasonal sampling program.

We look forward to increased boating operations next month and thank all station personnel for their continued and excellent support. Palmer Station continues to be a fun and exciting place to work largely due to the efforts of our compatriots at the station.

B-045-P

Palmer, Antarctica Long-Term Ecological Research Project: Long-Term Ecological Research on the Antarctic Marine Ecosystem: Climate Migration, Ecosystem Response and Teleconnections in an Ice-Dominated Environment: Microbial/Biogeochemistry Component

Hugh Ducklow, Principal Investigator, School of Marine Science, The College of William and Mary

Personnel on station: Hugh Ducklow, Nicole Middaugh and Bess Koffman

November was a tumultuous month with the departure of the ice clogging Arthur Harbor, the failure of the LMG to bring the LTER Site Review to Palmer Station, and the delayed exchange of our lead investigator, Hugh Ducklow, mid-month with Bess Koffman, our new science technician. The sea ice finally departed on November 17, allowing us to reach and sample Station B for the first time this month. Since that time we have occupied stations E and B four times – well ahead of last year's pace. This season, we have increased our sampling load from four depths to six, in order to coordinate sampling with the B-048-P biocomplexity project. Thus far in the season, both bacterial production and abundance assays show a picture generally consistent with previous years, with the bacterial activity being variable, but greater in the upper 20 meters and lower in the deep water. Activity and abundance are currently greatest at about 10-20 meters. This season we are also examining protozoan bacterivore abundance.

B-045 would like to thank Bob Farrell, Cara Sucher and Ken Navarro for their hard work getting our Go-Flo bottles to us from Santiago. Also, thanks to Ted McKinley for making us a beautiful carrying case for our newly acquired bottles.

B-048-P

Complex Molecular to Global Interactions and Feedbacks in the Marine DMS cycle

Patricia A. Matrai, Principal Investigator, Bigelow Laboratory for Ocean Sciences
Co-PIs: J Dacey (Woods Hole Oceanogr, MA), G DiTullio (U. Charleston, SC), D Erickson (Oak Ridge Nat. Lab., TN), A Gabric (U. Griffith, Brisbane, Australia), W Gregg (NASA Goddard, MD), R Kiene (U South Alabama, AL), D Kieber (SUNY Syracuse, NY), R Najjar (Penn State), R Simó (Institut de Ciències del Mar, Barcelona, Spain),

Personnel on station: Patricia Matrai, Kerry McElroy, George Westby, John Dacey

This is the Biocomplexity group's first time at Palmer station. Much time has been devoted to moving into the station. The month of November was spent setting up our lab, confirming availability of materials and equipment, organizing our sampling and analytical techniques, and evaluating workload. We have had much success with our Zodiac which includes a platform with winch and davit. Some adjustments were required, but Toby Koffman and Ted McKinley have been extremely helpful and quick to respond to our requirements, helping to make sampling very easy.

Pack ice conditions have made sampling problematical. Initially we could not use a Zodiac for sampling, so samples were taken several times at the seawater intake for Palmer Station. We have sampled at either Palmer LTER Station B or E for a total of eleven profiles in collaboration with the Palmer LTER group. This has helped build a good perspective on early season levels of DMS, DMSP, DMSO, chlorophyll, and CDOM. Experiments were also conducted to measure the turnover rates for some of these compounds.

RESEARCH ASSOCIATE MONTHLY REPORT

A turnover of duties for the station Research Associate started in late October was completed.

G-052-P

GPS Continuously Operating Reference Station

Jerry Mullins, Principal Investigator, U.S. Geological Survey

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/CDDIS in Greenbelt, MD.

The GPS/CORS system was moved into Terra Lab, the corrector transmission antenna was mounted externally, and a new 30-meter cable connecting the system to the antenna was installed. This change to the system has raised some questions, which are currently under review. Since corrector transmissions are used on an irregular basis, the change has not affected operations at this point.

The system is currently operating normally. If corrector transmissions are used in the current configuration, the corrector signal strength will be slightly attenuated due to the new, longer transmission cable.

G-090-P

Global Seismograph Network (GSN) Site at Palmer Station

Rhett Butler, 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 130 sites in the GSN monitoring seismic waves produced by events worldwide. Data files are recorded to tape and also sent real-time to the U.S. Geological Survey (USGS).

At the request of the USGS, the dot matrix logging printer was turned off and the instructions for replacing the DP filter will be changed. The printer has been left connected for use when needed. The logs that were being printed are available in the electronic log. A note was placed in the SOP to rewrite the section on changing the system filter from "once a month" to "inspect

once a month and change as needed". This change will be made when the SOP is updated at the end of the summer 2005-2006.

O-202-P

Antarctic Meteorological Research Center (AMRC) Satellite Data Ingestor

Charles Stearns, 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.

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 station physician collects air samples on a semiweekly basis.

The goal of this project is to resolve seasonal and inter-annual 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. Samples taken from the station are sent to Scripps where the analysis of O₂ and CO₂ content takes place.

O-264-P

Collection of Atmospheric Air for the NOAA/CMDL Worldwide Flask Sampling Network

David Hofmann, Principal Investigator, Climate Monitoring and Diagnostics Laboratory, National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) Climate Monitoring and Diagnostics Laboratory continues its long-term measurements of carbon dioxide and other climate relevant atmospheric gases. The Palmer Station air samples are returned to the NOAA laboratory for analysis as part of NOAA's effort to determine and assess the long-term buildup of global pollutants in the atmosphere. Data from this experiment will be used in modeling studies to determine how the rate of change of these parameters affects climate. The station physician collected air samples on a weekly basis.

O-275-P

DHS-EML Remote Atmospheric Measurements Program (RAMP)

Colin Sanderson, Principal Investigator, Department of Homeland Security, Environmental Measurements Laboratory

The RAMP system is part of a global network seeking to characterize the quantity and distribution of radionuclide particles occurring both naturally and artificially in the atmosphere. One sample filter was exposed for the duration of each week, and a weekly schedule of calibration, background, and sample counts was maintained. The Research Associate operates and maintains on-site equipment for the project.

This event concluded operations in October and remains inactive. The system remains in its operational configuration but is turned off awaiting instructions for its final disposition.

O-283-P

Antarctic Automatic Weather Stations (AWS)

Charles Stearns, Principal Investigator, University of Wisconsin

The Research Associate monitors data transmissions for the project. AWS transmissions from Bonaparte Point, Hugo Island, and Racer Rock were monitored using the TeraScan system, with only Bonaparte Point currently operational. AWS data received was also forwarded to UCSB for B-032-P (Smith).

A-306-P

Global Thunderstorm Activity and Its Effects on the Radiation Belts and the Lower Ionosphere

Umran Inan, Principal Investigator, Stanford University

The Research Associate operates and maintains on-site equipment for the project. The Stanford equipment receives and records Very Low Frequency (VLF) radio waves in order to study natural ionospheric and magnetospheric phenomena, as well as to study the distribution of the lightning strikes that are a principle source of natural VLF signals. Broadband synoptic data was recorded on a schedule of three out of every 15 minutes each day, and broadband continuous data was recorded for at least nine hours per day. Narrowband continuous data was collected for 12 hours each day.

Additional data recordings were collected this month in support Terrestrial Gamma-ray Flash (TGF) events.

During the month, a problem arose with the transmission of VLF_NB data to Stanford. The problem was finally traced to the FTP server at Stanford. The data that had not been transmitted due to the problem was buffered in the computer and sent during extended sessions after the problem was resolved. No data was lost.

Questions arose about the integrity of the VLF data DVDs being provided by Palmer Station. Troubleshooting was conducted both here and at Stanford. The Research Associate conducted a fairly exhaustive series of tests to verify that the data was being accurately recorded and was secure on the DVDs under most environmental conditions. The problem was finally traced to a DVD burner at Stanford.

At the end of the month, the VLF_BBC was found to have quit populating data files. The problem was traced to the fact that the data disk had filled to capacity. This occurred because the maintenance task had failed to remove old files. Old files were deleted manually, the computer was rebooted, and the application was restarted to solve the problem. About two days worth of data was lost.

T-312-P

TeraScan Satellite Imaging System

Dan Lubin, Principal Investigator, Scripps Institution of Oceanography

The Research Associate operates and maintains on-site equipment for the project. Throughout the month, the TeraScan system collected, archived, and processed DMSP, NOAA, and ORBVIEW-2 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).

Multiple ice concentration images were provided to the R/V LAURENCE M. GOULD (LMG) in support of ship operations and grantee group B-050-L for cruise planning.

MODIS images were requested from NASA to support LMG05-14A and the LTER cruise in January-February 2006. A great deal of time was spent getting the images adjusted so as to suit the needs of the scientists. Daily transmissions supporting LMG05-14A began November 29 and will continue through December 23.

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.

B-390-P**Thermo-Salinograph**

Vernon Asper, Principal Investigator, University of Southern Mississippi

Sea water is pumped continuously through a 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/>.

This system has been transitioned to Terra Lab.

T-513-P**Ultraviolet Spectroradiometer Network**

Charles Booth, Principal Investigator, Biospherical Instruments, Inc

The Research Associate operates and maintains on-site equipment for the project. 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. Data from the GUV-511 instrument is made available on a daily basis on the project's website at <http://www.biospherical.com/nsf>.

Two absolute calibration scans were completed and a problem with system dates was resolved.

T-988-P:**IMS Radionuclide Monitoring**

Erik Swanberg, Principal Investigator, 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.

RASA installation was completed and the Research Associate was provided training on the system. The two grantees who installed the system initiated a seven day background count before leaving. The system is currently operating in that mode and will continue to do so until instructions are received.

Tide Gage

The Research Associate operates and maintains on-site equipment for the project. Tide height, seawater temperature, and salinity are monitored on a continual basis by a gage mounted at the Palmer Station pier.

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 six hours by the Palmer Meteorological Observing System (PalMOS) and emailed to the NOAA for entry into the Global Telecommunications System (GTS). Current weather observations for all Antarctic stations, including Palmer, are available on the web at: <http://www.wunderground.com/global/AA.html>.

The PalMOS system was inspected and cleaned twice during November. All items are in working order. The ceilometer is still awaiting a new connector to replace a broken one.