

PALMER STATION MONTHLY SCIENCE REPORT
March 2007



Leopard seal sighted at Gamage Point. Photo courtesy of Shawn Vainio.

NEWS FROM THE LAB

Phil Spindler, Assistant Supervisor Laboratory Operations

David Minor, Winter Assistant Supervisor Laboratory Operations

The arrival of March brought with it a profound change in the climate here at Palmer Station, as several stormy days and reduced daylight hinted at the beginning of the winter season. Wildlife was still present in abundance. Station personnel watched as two leopard seals captured and played with their prey. Fur seals and Adelie penguins were frequent visitors to our shores and Giant Petrel chicks were stretching their wings on local islands in preparation for their imminent fledging. Two port calls from the *R/V Laurence M. Gould*, on 12 March and 28 March, highlighted the transition to winter, as a number of science groups completed a successful and productive season and returned to their institutions, and the majority of winter-over personnel arrived. In addition, we were visited by the last tourist vessel of the season, the *Aleksey Maryshev* on March 19th. The vessel brought to Palmer Station the film crew and cast of the Discovery Channel program "Generation Earth". Palmer Station will be featured in this program about a group of high school students called the Eco Team who travel the world exploring areas suffering the effects of global climate change.

Four science groups (B-028-P (Ross/Quetin), B-016-P (Vernet), B-032-P (Smith), B-013-P (Fraser), and B-256-P (Lee)) wrapped up their field work for the season, while B-022-P (Amsler) ramped up with the arrival of Dr. Bill Baker on 12 March. Drs. Chuck Amsler and James McClintock were featured on a CNN news report highlighting their work on the chemical defense mechanisms that marine organisms use to deter predators. Members of B-022-P will be part of the extended field science season occurring on station this year. Also, two members of B-038-E (Blanchette) arrived on 28 March for a short excursion into the field to continue their investigation into microbial diversity associated with the deterioration of historic wooden huts on the continent.

Station population peaked at 43 people due to the transition from summer to winter personnel. Station management changed hands as Eric Pohlman began tasking as the Winter Site Manager, Dave Minor assumed the tasking of Laboratory Supervisor, and Lana Cohen took over duties from Christina Hammock as the station Research Associate. Overall, March was filled with turn-over style activities, including orientation, drills, and training for the winter-over RPSC support staff. The winter staff hopes to carry on with a productive and gratifying field season at Palmer Station.

MARCH WEATHER

Lana Cohen, Research Associate

Winter is on its way with cooler temperatures and a number of significant snowfalls this month. Several large storm systems swept through the Drake producing some windy conditions during the month.

The glacier continues to calve, often bringing thick brash ice and bergy bits around the area. Sea surface temperatures cooled significantly this month peaking at 1.5 °C early in the month.

The coldest temperature was on the 4th at -5.8 °C and the warmest was on the 17th at 6.3 °C. The average temperature for the month was 0.0 °C. Palmer received 30 cm of snowfall throughout the month and measured a total 25.4 mm of melted precipitation.

The following projects conducted research at Palmer Station during March:

B-013-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH PROJECT: CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: SEABIRD COMPONENT

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

Personnel on station: Jennifer Blum, Brett Pickering, Peter Horne

March weather was somewhat wet and snowy but we were able to complete the majority of our fieldwork on schedule. The month was marked by the departure of Brett Pickering on the 15th, the arrival of most of the RPSC winter crew, and a visit to Palmer Station on March 19th by a film crew for the Discovery Channel's Generation Earth kids program.

Preparations for this event were coordinated with Christina Hammock, the Research Associate.

We finished up our Adelie penguin work this month, as we ended our radio transmitter project and removed the equipment from Humble Island. We also continued to retrieve and process sediment trap contents from Adelie colonies on local islands as well as Gentoo and Chinstrap colonies on Biscoe and Dream Islands, respectively. Part of this work was completed with the visiting Generation Earth kids program. Processing continued until the end of the month.

Monitoring of South Polar Skua chick growth on Shortcut Island continued throughout the month and completion was marked by banding of the chicks. The South Polar Skua satellite transmitter work finished at the beginning of the month. Giant Petrel chick banding was completed on all local islands, and Giant Petrel chick measurements continued on Humble Island. We commenced preparations and training for RPSC winter personnel who will be continuing some measurements for this project.

Marine mammal monitoring continued, again highlighted by sightings of Humpback whales throughout March. Labwork continued and intensified throughout the month as all samples were processed. Cargo and samples were prepped and sent north for evaluation and analysis. Data analysis projects, inventories, and project area organization/clean-up were also main activities. We attended an end-of-season outbrief with science and station management.

Our project was again provided with great support throughout March. Special thanks to Christina Hammock for her enthusiastic willingness to get involved with the Generation Earth project. Thanks to Ben Buchwald for his swift efforts in fixing an essential piece of equipment for us. We appreciate Steve's continued great boating assistance and cheerful demeanor. Thanks also to Tim Kramer for always lending a hand with the boats.

B-016-P AND B-032-P PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH PROJECT: CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: PHYTOPLANKTON ECOLOGY AND BIO-OPTICAL COMPONENTS

Dr. Maria Vernet, Principle Investigator, Scripps Institution of Oceanography (B-016-P)

Dr. Raymond Smith, Principle Investigator, University of California Santa Barbara (B-032-P)

Personnel on station: Tristan Wohlford (016), Ryan Burner (016), Julie Schram (032), Katherine Haman (032)

We sampled our offshore station, E, and our inshore station, B, a total of six times each on 1, 5, 9, 12, 15 and 19 March. As usual, sampling included filtration for particulate carbon and nitrogen, determination of discrete chlorophyll a levels by fluorometry, pigment analysis using high performance liquid chromatography, measurement of dissolved inorganic nutrients, and estimation of primary production. CTD (Conductivity and Temperature outfitted with a transmissometer and fluorometer) and PRR (Profiling Reflectance Radiometer) data were also collected in the water column.

Chlorophyll levels were at their highest on 1 March with $117 \mu\text{g chlorophyll m}^{-2}$ at Station E and $91 \mu\text{g chlorophyll m}^{-2}$ at Station B followed by a drop at both stations to an average of $24 \mu\text{g chlorophyll m}^{-2}$ on 5 March. Chlorophyll levels then remained relatively steady at both stations for the remainder of our sampling season, averaging $61 \mu\text{g chlorophyll m}^{-2}$. Primary production levels mirrored the changes in chlorophyll peaking at 1139 mg C m^{-2} on 1 March, dropping to 231 mg C m^{-2} on 5 March and then remaining steady at 412 mg C m^{-2} for the remainder of our season. Four experiments were also conducted during March to determine the grazing impact of the microzooplankton community on phytoplankton. As with chlorophyll and primary production levels, the lowest grazing rate, 0.070 d^{-1} , occurred on 5

March. However, the highest grazing occurred at the end of our season with a grazing rate of 0.199 d^{-1} on 21 March.

B-016 and B-032 would like to thank all of Palmer for helping to make the 06-07 season a success. The trio of science support offered by Phil Spindler, Ken Keenan and Steve Barten was vital in making this happen. Curt Smith, Ben Buchwald and Alden Strong have also been key to making our research plan run smoothly. As always, team logistics, Ken Navarro and Bob Devalentino, have been invaluable in their help with coordinating the movement of all of our science cargo. And even though we have often forgotten to officially thank him, Tim Kramer deserves a special thanks for dealing with the large amounts of waste that our groups are constantly creating.

B-028- PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH PROJECT: CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: PREY COMPONENT.

Robin Ross and Langdon Quetin, Principle Investigators, Marine Science Institute, University of California at Santa Barbara (UCSB)

Personnel on station: Alex Lowe and Sam Hammon

The LTER hydroacoustic surveys were done twice a week until 26 March. Strong winds kept us off the water a few days, but sampling resumed as normal once the storms passed. Krill were sparse in the area for most of the month, but our last three scheduled sampling days brought successful tows. Whole body fluorescence measurements were continued to calculate *in situ* feeding rates. Chlorophyll sampling and CTD casts were conducted inside and out of schools when krill were caught.

The last week of the season was spent packing up the labs and samples. Thanks to the help of the Logistics Team and the Lab and boating support teams, this process went well, and we got it finished on schedule. The 06-07 Sampling season has been a great success, and we are looking forward to starting back up next spring.

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

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

Bill Baker, Principal Investigator, University of South Florida

Personnel on station: Chuck Amsler, Jim McClintock, Maggie Amsler, Bill Baker, Craig Aumack, Alan Maschek, Philip Bucolo

March brought the arrival of Bill Baker and Alan Maschek on LMG07-03 (12 March) and Philip Bucolo on LMG07-04 (28 March).

In March our group completed 36 dives including checkout dives off the Pier for Baker and Bucolo and dives to collect amphipods, macroalgae, and sponges for laboratory studies. We expended considerable effort on gut content analyses of freshly caught amphipods both from macroalgae and sponges and on quantitative measurements of the densities of amphipods associated with sponges. We also initiated surveys of the percent incidence and abundance of filamentous macroalgae growing as endophytes within larger, chemically defended macroalgae. Endophyte-containing macroalgal thallus is being used to initiate cultures and also preserved in silica gel for DNA-based taxonomic analyses. Palatability bioassays of the few filamentous or filament-like non-endophyte macroalgal species present have been initiated using two species of herbivorous/omnivorous amphipods.

The arrival of Baker and Maschek combined with an increase in our project's lab space on 15 March allowed the natural products chemistry components of our project to begin. Two sponge species targeted for study this field season were collected for both chemical analysis as well as in vivo biosynthetic experimentation. Additional targeted collections of marine invertebrates were made to support ongoing chemical analyses.

We have also been active in educational outreach activities via our UAB in Antarctica web program (<http://antarctica.uab.edu/>). New journal entries about our group's science and also about life and operations in general at Palmer are posted every two days with new photos added every day or two. The site has been receiving low-hundreds to several thousands of visits per day including from a number of school groups. During March it was featured on the CNN web site and in several other news outlets.

We are grateful for the generous and professional assistance of numerous RPSC staff. Phil Spindler, Dave Minor, Ken Keenan, Steve Barten, and Christina Hammock deserve special thanks for facilitating our laboratory and diving operations.

PALMER STATION RESEARCH ASSOCIATE MONTHLY REPORT March 2007

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/CDDIS in Reston, VA.

The GPS base station continues to operate using the spare base station receiver with apparently normal data, but unconfirmed configuration settings. Plans to change the base station receiver from the obsolete Ashtech Z-12 backup to the new Trimble NetRS are still on hold pending receipt of directions from the new project PI. All of the GPS transmitters

were tested to confirm operation. Data were sent manually due to missing epochs following Windows Update installations and restart. Project responsibilities were turned over to the new RA.

The roving GPS system and its associated base station operated well throughout the month and a survey of the glacier terminus behind the station was performed. The reception of real time kinetic survey correctors from the base station radio was tested successfully on Dream Island without the use of a repeater antenna.

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 143 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).

The system operated well throughout the month. Bi-yearly maintenance in the seismic vault was performed in conjunction with the turnover of duties to the new RA. Maintenance tasks included pumping down the vacuum and centering the mass positions on all 3 seismometers and checking the batteries in the seismic vault.

A new configuration file was uploaded to the data acquisition hardware as per PI request. During this procedure, a problem was encountered while trying to exit the firmware startup menu. Fortunately, no data was lost during this period and documentation for the procedure was subsequently updated to prevent the problem from happening again.

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.

The system operated normally throughout the month except for a couple of minor issues. The project data acquisition computer was restarted after finding it was crashed. Disk check errors had to be resolved with the help of the PI following a hard reboot of the system due to peripheral hardware problems.

Project duties were turned over to the new RA and a logbook to record project activity was created.

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

Air samples are collected on a semiweekly basis by the Station Physician.

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. 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. Air samples are collected on a weekly basis by the Station Physician.

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 were monitored using the TeraScan system. AWS data received were also forwarded to UCSB for B-032-P (Smith).

The Bonaparte Point AWS was successfully restarted after it failed to transmit data for one day. A problem with the AWS website data graph not updating was solved.

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.

VLF data acquisition computers were restarted a few times during the month after routine Windows Update installations. A few short periods of anomalous data were reported to the project and extra periods of interesting data were archived. Regular periods of increased data archiving were continued partially through the month for an extensive world-wide experiment. The main data acquisition PC crashed a few this month, resulting in a few periods of several hours of lost data. After working with the PC technician to uninstall unnecessary software on project computer, it was found that uninstalling IE7.0 appears to have solved the problem. Project data DVDs were sent out for shipment to PIs.

The VLF antenna cable was serviced several times. New holes were drilled and posts erected on the upper third of glacier. The rest of the posts haven't been drilled yet, as the lower glacier has still been melting out. The antenna was re-aligned vertically.

Project duties were turned over to the new RA.

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).

The system operated well throughout the month. The new RA was trained on all aspects of the TeraScan system. Data tapes were packaged and sent out for shipment to various PIs. Detailed documentation of the extensive automation processes on the TeraScan system was written in order to help facilitate the future migration to a new system. Changes were made to the existing images that are produced for SPAWAR forecasters after they requested a modification of the view area.

Information regarding sea ice image support for cruises LMG07-05 and LMG07-06 was provided to PIs for projects B-232-P and B-036-P.

The recent change in the way we receive updates for satellite orbital elements from SeaSpace was successfully automated, integrated into TeraScan, and documented. One instance of subsequent failure of orbital elements updating was troubleshot and found to be due to failure

of SeaSpace to update the file available on their server. Upon notification, the file was updated and no further problems with orbital elements updating have been encountered.

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 performed well throughout the month. Duties were turned over to the new RA. The project computer was restarted once after routine Windows updates. There was continued troubleshooting of the ftp listing problem, and an upgraded version of the ftp software was installed, but this did not seem to fix the glitch. Data retrieval is not significantly affected by this problem.

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.whoi.edu/tsg/>.

The system has operated well throughout most of the month. A replacement fluorometer was ordered by the project and will be sent down via the silver trunk to arrive on LMG07-05. The new RA was trained on all aspects of the project.

T-513-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK (UVSIMN)

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 are made available on a daily basis on the project's website at <http://www.biospherical.com/nsf>.

The UV monitor operated normally throughout the month. The new RA was trained on all aspects of the project. Maintenance activity on the roof near the sensors was noted in the log. The desiccant was changed in the TUV sensor.

T-998-P: IMS RADIONUCLIDE MONITORING

Michael Pickering, 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.

The equipment operated well throughout the month. Many project tasks were carried out and project duties were turned over with the new RA. The blower motor on the RASA air intake was lubricated, as per the semi-annual maintenance and the procedure was documented and added to the official tasking. The procedure for receiving, inspecting, labeling, storing, and notifying the project of consumables was carried out for a complete new batch of consumables. Specific directions for this were written and included in the documentation. Six blank filter samples were prepared and labeled for new filter rolls. A specially requested sample was prepared and shipped for analysis at a radionuclide laboratory. Mylar and sealing tape rolls in the RASA were noted to be low and a procedure for changing the rolls was requested from the project. The procedure was carried out and added to the local documentation.

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 gauge mounted at the Palmer Station pier.

The tide gauge operated normally throughout the month. Project duties were turned over to the new RA.

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 are 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). Isobar images are sent to the LMG each day for cruise support.

All meteorology duties were turned over to the new RA. The meteorological system was reviewed and improvements were discussed with the new Meteorology Coordinator during a site visit.

MAWS and PalMOS data acquisition computers were restarted a few times after routine Windows Update installations. A problem with the ftp of synoptic data to the NOAA server was determined to be due to a full server on their end. The PalMOS automatic report generator software was manually restarted after failing to start itself after a reboot of the computer. The PalMOS data acquisition software had to be restarted in order to update itself after Daylight Saving Time.

Information concerning the PalMOS system and past data sources for the monthly summary reports was provided on request by PIs for project B-016-P. Information concerning long-term temperature records at Palmer was provided on request by PIs for project B-022-P. SPAWAR forecasters were provided with support on the PalMOS data that they use to generate our weather forecasts.

Continued problems with the intermittent failure of the recently installed present weather sensor and visibility sensor were noted throughout the month. In an attempt to improve the weather-proofing of the new present weather sensor, tape was added to the connectors. The failed present weather sensor was sent out for repair with the Meteorology Coordinator. A pyranometer problem with the shield wire was diagnosed and fixed.