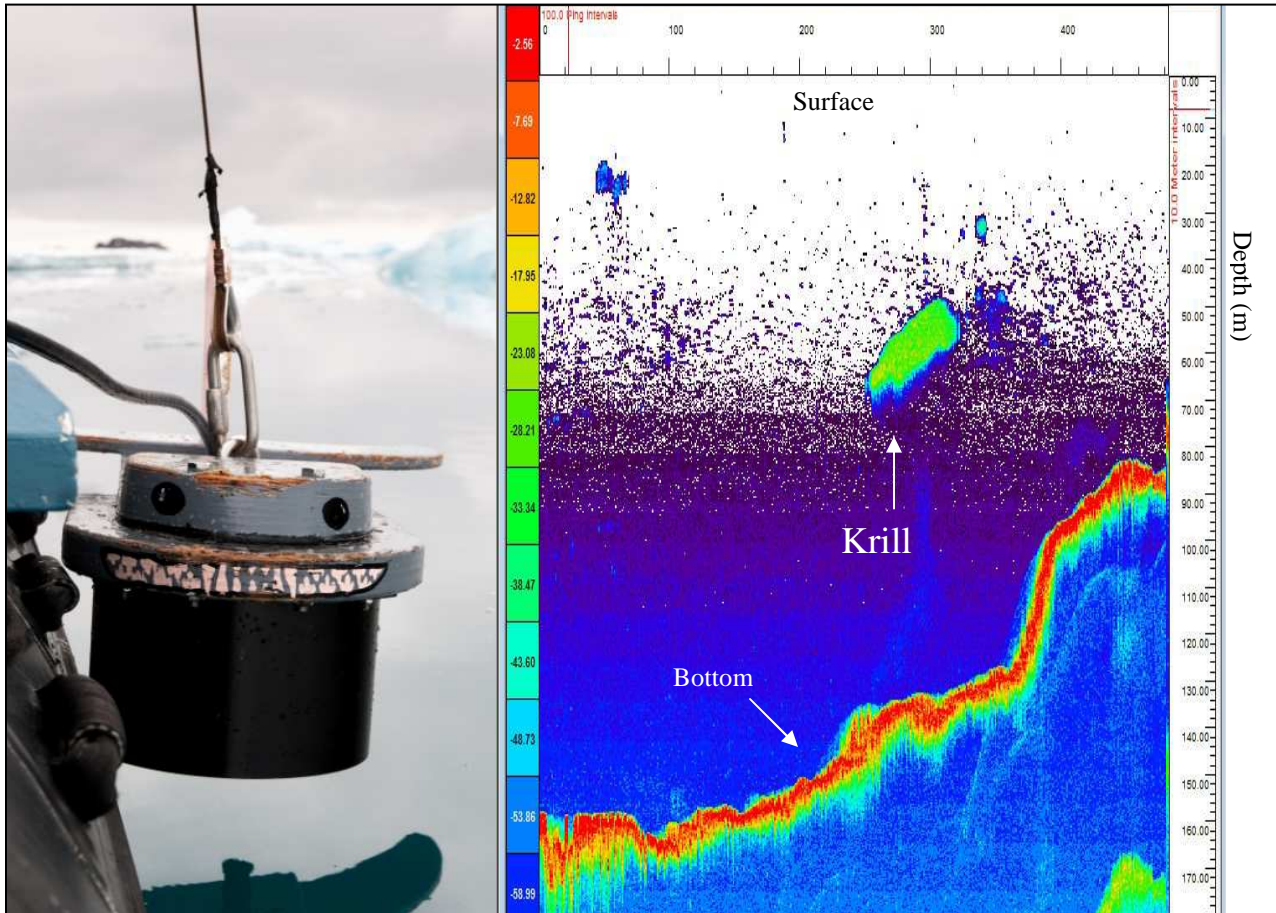


PALMER STATION MONTHLY SCIENCE REPORT

December 2011



The B-020-P (Steinberg) field team deploys their echo sounder to find large aggregations of krill. The aggregate pictured above was over 185m long and 25m wide, and contained approximately 830 individual krill per cubic meter of seawater. Image Credit: Kim Bernard

NEWS FROM THE LAB

By Carolyn Lipke, Assistant Supervisor of Lab Operations

December at Palmer Station marked the official beginning of the Austral summer, but the summer science season was in full swing long before the solstice arrived. The *ARSV Laurence M. Gould* returned to station for a brief, but very productive visit by the Long Term Ecological Research (LTER) site review team. This ship also brought a team of researchers from Oceanites and the Antarctic Geospatial Information Center (T-434), as well as a NOAA site visitor for the O-264-P project. Our Thursday night Science Lecture series continued with excellent talks by Dr. Bill Fraser (B-013-P) and Paul Morin (T-434).

For the Holidays we had festivities of all varieties, including a great amount of wonderful food, a Yankee Swap gift exchange, and a showing of several short films made on station this year and in years past. December also marked the beginning of the heart of the cruise ship season. We were visited by several small cruise ships and yachts this month, and conducted one offshore lecture on the *M/S VEENDAM*.

DECEMBER 2011 WEATHER

By Brian Nelson, Research Associate

This year's persistent sea ice moved out again in early December, leaving an open boating area for the two weeks leading up to Christmas. But on Christmas day it flowed back in again, filling to the horizon. It didn't last long, but strips and bands of brash remained in the immediate area into the New Year.

Temperatures were typical for December. The mean temperature was 1.6 °C, maximum temperature was 6.8 °C, and minimum temperature was -1.8 °C. Sea surface temperatures remained between zero and 1 °C, for the most part.

Average wind speed for December was 9 knots, with a peak gust of 59 knots. Aside from a few days, the month was calm, especially during the final two weeks.

We received 75.7mm of melted precipitation in December, with a total snowfall of 12cm spread out over a few random days and always melting rapidly. Snowfall for the year totaled 262cm, about 80cm shy of the average.

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, Shawn Farry, Bill Fraser, Jen Mannas

Field operations in December were impacted by a few periods of high winds early in the month, as well as periods of heavy pack ice that prevented access to certain islands and/or prevented departure from Palmer Station. Despite quite a few missed field days in early December and other days throughout the month, we were able to continue monitoring breeding chronology of our selected Adélie penguin nests and maintain regular censuses of the local Adélie colonies; however, some of our gentoo penguin work on Biscoe Island was delayed, and our annual penguin peak egg census in the Joubin Islands was missed. Weather and sea ice conditions were not appropriate for this trip at the time we needed to conduct this census.

A peak egg census was completed at the beginning of the month for the chinstrap penguins on Dream Island. We continue to monitor the number of depredated eggs from all 3 penguin species on all islands and continue to make collections for further analysis and collaborations. Preparations for the Humble Island Adélie penguin radio transmitter project continued; equipment was installed on Humble Island and data collection/transfer was tested. Foraging ecology studies of gentoo and Adélie penguins began this month with the deployment of satellite transmitters and dive depth recorders.

Skua work continued this month, as we began checking nests for newly hatched brown skua chicks on local islands as well as on Dream and Biscoe Islands. Newly breeding brown skuas on Biscoe were banded mid-month. Our south polar skua mark-recapture and breeding monitoring study on Shortcut Island continued with nest initiation checks, band resighting, and scat

collection. Blue-eyed shags hatched in early December and our timed censuses continued on Cormorant Island. A kelp gull survey was completed mid-month on all local kelp gull colonies as well as on Dream Island. Foraging ecology studies of giant petrels continued with satellite transmitter deployments on Shortcut and Humble Island breeders. Our all-island census of giant petrels began in early December; new nests were identified, new breeders were banded, and the census will continue into January. The long-term giant petrel nest monitoring study on Humble Island began near the end of December as we started checking select nests for newly hatched chicks.

Our monitoring of marine mammals continued this month and was highlighted by sightings of humpback whales in the Palmer area mid-month, as well as observations of crabeater seals in association with pack ice circulating the area. Lab work has continued with the processing of scat and regurgitate collections. LTER cruise preparations continued throughout the month. The LTER site review occurred the second week of December; associated lectures, discussions, and field demonstrations were completed as scheduled and were successful. We also participated in the Le Boreal and Corinthian II tour ship visits that occurred this month.

Thanks to RPSC for their continued support this month. Special thanks to Ted McKinley and Graham Colegrove for their assistance setting up our Biscoe Island camp, and to Paul Queior for assisting with some IT issues. Also thanks to Jeff Otten for his assistance with setting up the cruise palms. Finally, a warm-hearted thank you to our chefs, Marci Levine and Fran Sheil, for putting together the special holiday meals and for keeping us fueled in the field.

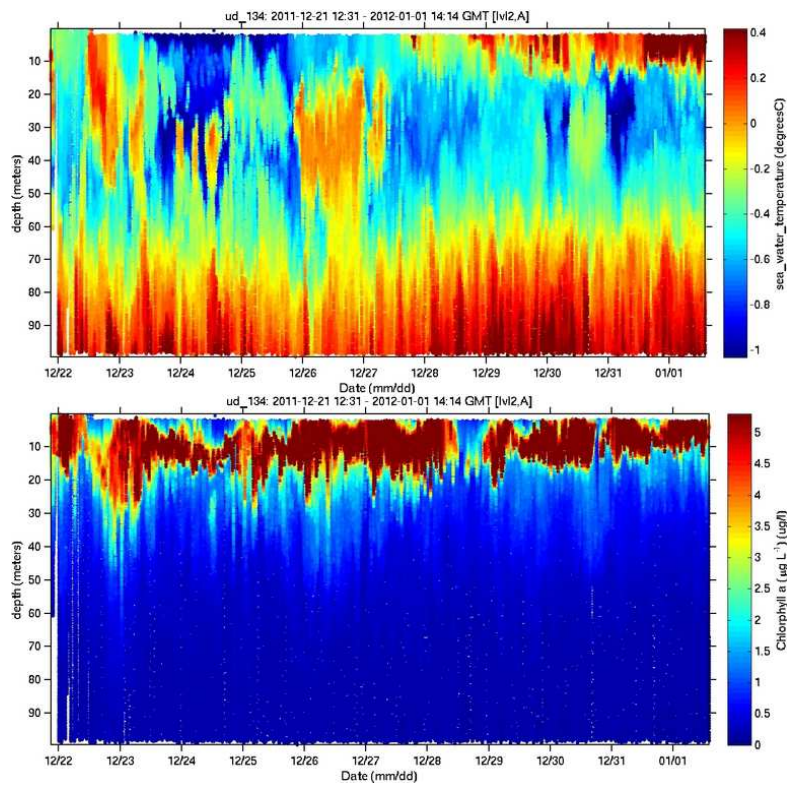
B-019-P PALMER LONG TERM ECOLOGICAL RESEARCH (LTER): LOOKING BACK IN TIME THROUGH MARINE ECOSYSTEM SPACE, PHYTOPLANKTON COMPONENT

Principle Investigator: Oscar Schofield, Rutgers University

Personnel on Station: Kaycee Coleman and Travis Miles

December marked a busy month for B-019-P. We deployed multiple gliders into the local Palmer region to mark the beginning of an extended experiment, which coincided with penguin tags deployed by birders. We were also host to the LTER site-review, and continued time-series sampling.

One glider, RU05 flew a pattern over the flanks of the Palmer Deep region and station kept just westward of the canyon head, while another glider the Blue Hen, on loan from Matt Oliver at University of Delaware held a station in the Bismark Strait south of Biscoe Bay. Each glider was placed in historic Adelie and Gentoo feeding regions. We used the gliders as virtual moorings in order to identify the temporal variability associated with Diurnal and Semi-diurnal tides. Both gliders were recovered, re-battered and will be re-deployed to continue this experiment throughout January.



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

December has been a very busy month for the zooplankton team. During the month there were two series of diurnal/semi-diurnal tidal phases. The first began on December, 6th and we were able to sample during 4 days of the diurnal tide and 4 days of the following semi-diurnal tide. On most sampling days we were able to conduct the full survey (i.e. both grids), but there were a few occasions when we were unable to do so, mostly due to wind and swell. This tidal series followed a period of gale force winds from the north and we found very little krill throughout the period, with no statistically significant difference between the diurnal and semi-diurnal tidal phases.

The second diurnal/semi-diurnal tidal series began on December, 21st. We were able to sample during 4 days of the diurnal tides and 3 days of the semi-diurnal tides. Again, we were able to do the whole survey on most days, but were restricted on a few days due to either winds or ice. This tidal series was particularly interesting (and exciting) as there was a significant increase in krill biomass at the onset of the diurnal tide, which increased over the next four days. On December, 23rd, we sampled for krill using the 1m ring net and caught enough krill to measure for length frequency analysis. The echo sounder showed that we were in the middle of a very large krill aggregation, with krill from just below the surface of the water to just above the bottom of the sea floor. There were two humpback whales feeding on the same aggregation. Following the

diurnal tidal phase, the krill biomass dropped off somewhat, but was still higher than it has been in the region for the last month or so.

During December we had the mid-term site review for the Palmer Antarctica Long-Term Ecological Research (Pal LTER) project. This was extremely successful and we would like to thank everyone on station for helping us in various different ways and for being so generous with their time and energy. Sadly, Domi left with the site review. Luke McKay (B-045-P) and Marie Séguret (B-019-L/P) were both able to step in and help out with the sampling though.

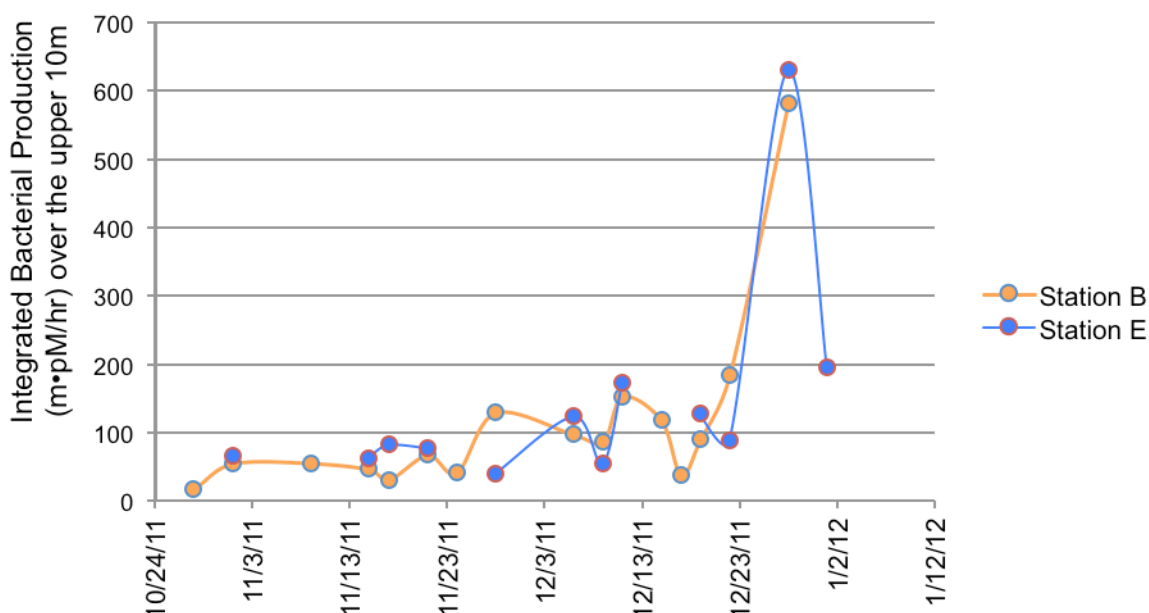
B-045-P: PALMER, ANTARCTICA LONG-TERM ECOLOGICAL RESEARCH (LTER): CLIMATE MIGRATION, ECOSYSTEM RESPONSE AND TELECONNECTIONS IN AN ICE-DOMINATED ENVIRONMENT: MICROBIAL / BIOGEOCHEMICAL COMPONENT

Principal Investigator: Dr. Hugh Ducklow (Ecosystems Center, MBL)

Personnel on station: Zena Cardman, Luke McKay, Pamela Moriarty

B-045-P continues to work closely with B-019-P, collecting water by Zodiac from the historically-sampled Stations B and E. We've been grateful for calmer winds, and are very pleased to have made it onto the water on eight separate sampling days – our goal every month.

For the Palmer LTER, December is always an exciting month. Most notably, this is the time of year when we see phytoplankton blooms and correlating peaks in bacterial activity. On December 28th, a week after the Austral Summer Solstice, our group witnessed a tremendous spike in microbial production – nearly three times higher than any we've seen yet this season! This season has been a good year for sea ice, and the microbial ecosystem reflects that. Our data are fitting nicely with long-term averages as far back as 2002, especially compared to last season's exceptionally early and high spikes in production.



This month we also began a growth experiment in which whole, untreated seawater samples are incubated at in-situ temperatures alongside diluted samples. Normally we are only able to calculate net growth. However, this experiment aims to calculate actual growth and grazing rates by lowering prey concentration below a threshold “prey saturation” level, thereby uncoupling bacterial growth from predatory grazing. If growth and grazing were balanced in the untreated sample, for example, bacterial numbers should grow faster in the diluted samples.

For our group, December was also our chance to prepare chemicals, repair and calibrate instruments, and gather supplies for the annual LTER cruise on board the Laurence M. Gould. We anticipate a very successful month ahead for our B-045-L counterparts.

PALMER STATION
RESEARCH ASSOCIATE MONTHLY REPORT
December 2011
Brian Nelson

G-090-P: GLOBAL SEISMOGRAPH NETWORK (GSN) SITE AT PALMER STATION.
Kent Anderson, Principal Investigator, Incorporated Research Institutions for Seismology (IRIS)

Station PMSA is one of more than 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). The Research Associate operates and maintains on-site equipment for the project.

Data collection occurred normally during the month.

A-109-P: ANTARCTIC EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY (ELF/VLF) OBSERVATIONS OF LIGHTNING AND LIGHTNING-INDUCED ELECTRON PRECIPITATION (LEP).

Robert Moore, Principal Investigator, University of Florida

ELF/VLF radio wave observations at Palmer Station are used to provide a deeper understanding of lightning and its effects on the Earth’s inner radiation belt. The Research Associate operates and maintains on-site equipment for the project.

Data collection went as planned for the month.

A-132-P: FABRY-PEROT INTERFEROMETER (FPI)

Qian Wu, Principal Investigator, National Center for Atmospheric Research

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

The instrument remained off through December; it will be turned back on in January when summer light levels decrease.

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

Mathew Lazzara, Principal Investigator, University of Wisconsin

The AMRC computer processes satellite telemetry received by the Palmer Station TeraScan system, extracting Automated Weather Station information and low-resolution infrared imagery and sending the results to AMRC headquarters in Madison, WI. The Research Associate operates and maintains on-site equipment for the project.

The data ingestor operated normally through 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 help to determine rates of marine biological productivity and ocean mixing as well as terrestrial and oceanic distribution of the global anthropogenic CO₂ sink. The program involves air sampling at a network of sites in both the Northern and Southern Hemispheres. The Research Associate collects samples fortnightly from both TerraLab and the VLF Building.

Sampling occurred regularly throughout the month. The air sampling mast was removed from the west side of TerraLab, with the intention of relocating it to the east side. However, the new mounting arms are the wrong length, so the project is currently on hold while FEMC works something out. So far, air sampling has not been interrupted.

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. The Research Associate collects weekly air samples for the CCGG group and fortnightly samples for the HATS group.

Carbon Cycle and Halocarbon sampling occurred normally during the month.

O-264-P: ULTRAVIOLET (UV) SPECTRAL IRRADIANCE MONITORING NETWORK

James Butler, Principle Investigator, National Oceanic and Atmospheric Administration / Global Monitoring Division; Boulder, CO

A Biospherical Instruments (BSI) SUV-100 UV spectroradiometer produces full sky irradiance spectra ranging from the atmospheric UV cutoff near 290nm up to 605nm, four times per hour. Also collecting light spectra is a BSI GUV-511 filter radiometer, an Eppley PSP pyranometer, and an Eppley TUVR radiometer. The Research Associate operates and maintains on-site equipment for the project.

The UV monitor collected data normally for the month. A new PSP sensor and housing was installed. Problems with a refurbished power supply were eventually worked out, so we now have a spare again.

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

Mathew Lazzara, Principal Investigator, University of Wisconsin

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

The weather station ran normally during the month.

G-295-P: GPS CONTINUOUSLY OPERATING REFERENCE STATION.

Bjorn Johns, Principal Investigator, UNAVCO

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

The GPS operated normally for the duration of 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 and magnetosphere. The Research Associate operates and maintains on-site equipment for the project.

Data collection was normal throughout the month.

T-312-P: TERASCAN SATELLITE IMAGING SYSTEM

The TeraScan system collects, processes, and archives DMSP and NOAA satellite telemetry, capturing approximately 25-30 passes per day. The Research Associate operates and maintains on-site equipment for the project.

The TeraScan system operated normally for the month.

A-357-P: EXTENDING THE SOUTH AMERICAN MERIDIONAL B-FIELD ARRAY (SAMBA) TO AURORAL LATITUDES IN ANTARCTICA

Eftyhia Zesta, Principal Investigator, University of California Los Angeles

The three-axis fluxgate magnetometer is one in a chain of longitudinal, ground-based magnetometers extending down through South America and into Antarctica. The primary scientific goals are the study of ULF (Ultra Low Frequency) waves and the remote sensing of mass density in the inner magnetosphere during geomagnetically active periods. The Research Associate maintains the on-site system.

The 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 data and webcam images are sent to a mirror site (<http://4dgeo.who.edu/tsg/>) at Woods Hole Oceanographic Institute, which is a collaborator on the project.

The thermo-salinograph operated normally during the month.

T-434-M/P: POLAR GEOSPACIAL CENTER

Paul Morin, Principal Investigator, University of Minnesota

The Polar Geospatial Center provides geospatial support (in the form of mapping, data delivery, and GIS analysis) to science and logistics communities of the U.S. Arctic and Antarctic programs. The Research Associate has been requested to collect ground control points in the Palmer area throughout the 2011-2012 season.

Ground control points were collected on Eichorst, Torgersen, Breaker, and Humble Islands, as well as in Loudwater Cove.

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

Deneb Karentz, Joe Grzyski, Co-Principal Investigators, University of San Francisco

The focus of this project is to identify and evaluate changes that occur in genomic expression and physiology of phytoplankton during the transition from winter to spring, i.e., cellular responses to increasing light and temperature. A Fast Repetition Rate Fluorometer (FRRF) with a FIRe (Fluorescence Induction and Relaxation) sensor was installed in the Palmer Aquarium. The Research Associate downloads data and cleans the instrument on a weekly basis.

The FRRF was cleaned weekly and operated normally through the month, but for two unexpected stoppages that were noticed timely. No significant amount of data was lost.

T-998-P: INTERNATIONAL MONITORING STATION (IMS) FOR THE COMPREHENSIVE NUCLEAR TEST BAN TREATY ORG. (CTBTO)

Managed by General Dynamics

The IMS Radionuclide Aerosol Sampler and Analyzer (RASA) is part of the CTBTO verification regime. The automated RASA continually filters ambient air and tests for particulates with radioisotope signatures indicative of a nuclear weapons test. The Research Associate operates and maintains the instrument.

The RASA operated normally for the duration of the month.

TIDE GAGE

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

The tide gauge operated normally during the month.

METEOROLOGY

The Research Associate acts as chief weather observer, and compiles and distributes meteorological data. Weather data collected using the automated electronic system is archived locally and forwarded twice each month to the University of Wisconsin for archiving and further distribution. Synoptic reports are automatically generated every three hours by the Palmer Meteorological Observing System (PalMOS) and emailed to the NOAA for entry into the Global Telecommunications System (GTS).

The weather station operated normally throughout the month. Scheduled inspections were carried out at the Gamage Point tower. Weather updates and satellite imagery were forwarded to the R/V LAURENCE M. GOULD.