AWS Annual Project Report: NSF-OPP Grant #ANT-0944018, September 1, 2012 to August 31,2013

Collaborative Research:

Antarctic Automatic Weather Station Program

An Annual Report to the Office of Polar Programs, National Science Foundation

Dr. Matthew A. Lazzara, Principal Investigator
Dr. John J. Cassano, co-Principal Investigator

Linda M. Keller, George A. Weidner, Jonathan E. Thom,
Dr. Maria Tsukernik, Lee J. Welhouse. David Mikolajczyk - Meteorologists

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Preview of Award 0944018 - Annual Project Report

Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	0944018
Project Title:	Collaborative Research: Antarctic Automatic Weather Station Program
PD/PI Name:	Matthew A Lazzara, Principal Investigator
Submitting Official (if other than PD\PI):	Matthew A Lazzara Principal Investigator
Submission Date:	08/31/2013
Recipient Organization:	University of Wisconsin-Madison
Project/Grant Period:	09/15/2010 - 08/31/2014
Reporting Period:	09/01/2012 - 08/31/2013
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	Matthew A Lazzara

Accomplishments

* What are the major goals of the project?

This Antarctic Automatic Weather Station (AWS) Project is focused around two major questions:

1. How is the climate of the Antarctic changing as seen from surface observations of the Automatic Weather Station network?

2. What dynamical mechanisms are responsible for shaping the wind field over the southern Ross Ice Shelf, and are model indicated wind speed maxima across the Ross Ice Shelf consistent with available in-situ observations?

The second question is reported by collaborator co-PI Cassano, in his research project.

Some sub-objectives of this project include:

- Reconfiguration of the network to match the goals of the project, with the removal of some AWS sites and installation of new sites.
- Reducing the number of AWS using the Argos DCS data communications system in the McMurdo area, and switching to VHF Freewave modem relay into McMurdo Station
- Work to quality control AWS observations, and bring all AWS including historical observations, through a consistent quality control process
- Expanded meteorological sensors on newly installed AWS, including measurements of incoming broadband solar radiation, snow accumulation with acoustic depth gauges, additional temperature sensors, etc.

* What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities: The major activities that are associated with the project can be broken down into two areas: Field Activities and Research Activities.

1. Field Activities

The 2012-2013 field season, while meeting roughly half of the objectives (which is a good field season by traditional standards) was the most challenging in the last three years, as the last two seasons met over 90% of the objectives. Efforts included continuing to roll out the VHF Freewave modem AWS systems in the McMurdo area. Attached to this report is the AWS field season report. The prior field season report, 2011-2013, has been published in peer-reviewed literature.

2. Research Activities

In the past year, effort included working with The Ohio State University, Byrd Polar Research Center, on the climate record of Byrd AWS. This was critical for a publication on the warming of Central West Antarctica. Efforts continue with preparing data and manuscripts on the surface climate of regions of the Antarctic.

Specific Objectives:

AWS network reconfiguration: This effort has been an on-going effort, that has met the minimum standards for the needs of this project.

Converting AWS to the Freewave network: This effort continues, and this effort, should be completed next year in the upcoming field season.

AWS QC efforts: The quality control of AWS observations is a continuous effort.

Improved sensors: All new AWS have been outfitted with new sensors not traditionally on Wisconsin AWS 2B. Specifically, the follow sensors have been added to the routine temperature, wind speed/direction, pressure and relative humidity that are now standard:

- Acoustic Depth Gauge (snow accumulations)
- Incoming broadband solar radiation
- Second level temperature sensor and/or delta-T measurement

Significant Results:

Finding of significant warming of Central West Antarctica is the significant result that the AWS network and project has contributed to in the past year.

Key outcomes or Other achievements:

*** What opportunities for training and professional development has the project provided?**

The AWS project has facilitated the training and development for AWS team members. Specifically, Lee Welhouse and Dave Mikolajczyk have been learning from seasoned staff members George Weidner (emeritus) and Jonathan Thom. The training has been extended to the students working on the project, specifically Carol Costanza, who has been working on the data and analysis for the surface climate research.

Jonathan Thom will be departing the research group in the coming year. Additionally, Linda Keller has achieved emeritus status as of early August 2013. (George Weidner, is also emeritus) Project benefits from the emeritus staff sage advice and experiences. Dave and Lee are stepping up into the roles held historically by Jonathan and George, especially with regards to field deployment activities.

*** How have the results been disseminated to communities of interest?**

This project disseminates the activities, the data and the results of this project via a variety of means, including but not limited :

- Published papers
- Use of the data via various other researchers (aka inserting into the National Climatic Data Center International Surface Temperature Initiative Global Land Surface Databank project)
- Via internet servers and services (e.g. Web, FTP, LDM, RAMADDA, etc.)
- Presentations at science conferences
- Outreach presentations to the community (including a virtual tour seen on the AMRC Youtube Channel)

What do you plan to do during the next reporting period to accomplish the goals?

In the coming year, the following activities will be worked on:

- AWS quality control work will continue
- Finishing the Freewave network (next field season activity)
- Removal of some AWS sites partially as the science is completed, and partially to meet the AWS network reconfiguration goals.
- Complete analysis and manuscript on Antarctic surface climate as observed via the AWS.
- Educational outreach activities will be conducted, as can be arranged.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
AWS-Fieldreport12-13-reduced.pdf	The Automatic Weather Station Program 2012-2013 Field Season Report.	Matthew Lazzara	08/27/2013

Products

Journals

Lazzara, M.A., LJ. Welhouse, J.E. Thom, J.J. Cassano, A.K. DeVivier, G.A. Weidner, L.M.Keller, and L. Kalnajs (2013). Automatic Weather Station (AWS) Program operated by the University of Wisconsin-Madison during the 2011-2012 field season. *Antarctic Records*. 57 (1), 125.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Bromwich,D.H., J.P. Nicolas, A.J. Monaghan, M.A. Lazzara, L.M. Keller, G.A. Weidner, and A.B. Wilson (2013). Central West Antarctica among the most rapidly warming regions on Earth. *Nature Geoscience*. 6 139.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1038/NGEO1671

Colwell,S., L.M. Keller, M.A. Lazzara, and A. Setzer (2013). [Antarctic] Surface manned and automatic weather station observations [in "State of the Climate in 2012]. *Bulletin of the American Meteorological Society*. 94 (8), S135.

Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes

Books

Book Chapters

Thesis/Dissertations

Conference Papers and Presentations

Costanza, C, L. Keller, M. Lazzara, J. Thom, and L. Welhouse (2012). *Antarctic climatology using Automatic Weather Stations*. National Weather Association 37th Annual Meeting. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Welhouse, L., M. Lazzara, J. Thom, G. Weidner, and L. Keller (2012). *Overview of the Antarctic Automatic Weather Station Network*. National Weather Association 37th Annual Meeting. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Mikolajczyk,D., L. Welhouse, M. Lazzara, L. Keller, J. Thom, M. Tsukernik, and J. Cassano (2013). *Antarctic Automatic Weather Station Program: 2012-2013 Field Season Overview*. 8th Antarctic Meteorological Observation, Modeling and Forecasting Workshop. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Nigro, M., J. Cassano, L. Keller, and M. Lazzara (2013). *Observations of Vertical Temperature Profiles over the Ross Ice Shelf from Alexander Tall Tower AWS*. 8th Antarctic Meteorological Observation, Modeling and Forecasting Workshop. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Welhouse, L., M. Lazzara and L. Keller (2013). *Antarctic Automatic Weather Station Data Usage in ECMWF Reanalysis Data Sets*. 8th Antarctic Meteorological Observation, Modeling and Forecasting Workshop. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Weidner, G., J. Thom, and M. Lazzara (2013). *Legacy Calibration of the Automatic Weather Station Model 2 of the United States Antarctic Program*. 8th Antarctic Meteorological Observation, Modeling and Forecasting Workshop. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Lazzara, M. (2013). *AWS Field Season Plans for 2013-2014 and beyond*. 8th Antarctic Meteorological Observation, Modeling and Forecasting Workshop. Madison, WI.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Other Publications

Technologies or Techniques
Nothing to report.

Patents
Nothing to report.

Inventions
Nothing to report.

Licenses
Nothing to report.

Websites

Title: AMRC-AWS Web site

URL: http://amrc.ssec.wisc.edu/

Description: The AMRC-AWS web site offers a variety of Antarctic meteorological data and information. Real-time AWS observations are available here in particular along with links to other AMRC-AWS services via FTP, and RAMADDA (via web portal).

Title: AWS AMRC YouTube Channel

URL: http://www.youtube.com/user/AMRCantmet?feature=mhee

Description: This site offers a virtual tour of the AMRC, and has a focus on our field work with the AWS project.

ther Products

Product Type: Databases

Description: AWS observations are available and hosted by various means including Web site, FTP server, Antarctic-Internet Data Distribution (Local Data Manager), and Repository for Archiving and Managing and Accessing Diverse Data (RAMADDA) server. Even e-mail distribution is available upon request.

Other:**Supporting Files**

Filename	Description	Uploaded By	Uploaded On
2013_AWS_Sites_UW_07_09_2013.pdf	This map displays all of the locations of the UW-Madison AWS network as of 2013.	Matthew Lazzara	08/30/2013
2013_AWS_Sites_ALL_07_09_2013.pdf	This map display all of the locations of all known AWS in the Antarctic in 2013.	Matthew Lazzara	08/30/2013
2013_AWS_Sites_All_Peninsula_3_20_2013.pdf	This is a close up map of the AWS in the Antarctic Peninsula region.	Matthew Lazzara	08/30/2013
2013_AWS_Sites_UW_RossIslandVicinity.pdf	This map shows all of the UW-Madison AWS network in the Ross Island area of Antarctica for 2013.	Matthew Lazzara	08/30/2013

articipants

Research Experience for Undergraduates (REU) funding

/hat individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked

Linda Keller	Other Professional	8
Matthew A Lazzara	PD/PI	2
David Mikolajczyk	Technician	4
Joey Snarski	Undergraduate Student	0
Jonathan Thom	Technician	4
Nick Weber	Undergraduate Student	3
Lee Welhouse	Technician	9
Carol Costanza	Undergraduate Student	2
Sam Batzli	Staff Scientist (doctoral level)	1

What other organizations have been involved as partners?

Name	Location
University of Colorado - Boulder	Boulder, CO, USA

Have other collaborators or contacts been involved? Y

Impacts

What is the impact on the development of the principal discipline(s) of the project?

The AWS observations are extending our knowledge of the surface meteorology and climatology of the Antarctic. While the initial purpose of the AWS network focused on understanding meteorological processes in the Antarctic, with many locations operating nearly or greater than 30 years, we can conduct definitive climatological analysis, and capture regional climatology. The Central West Antarctica project is the first demonstration of that, and more results are in progress. The observations from the network are contributing to larger data collections, such as the International Surface Temperature Initiative Global Land Surface Databank, hosted by the National Climatic Data Center. Beyond research contributions and characterization and process study efforts, the network is used for weather forecasting - one of the first goals the original network was established for over 30 years ago.

What is the impact on other disciplines?

Surface meteorological observations indeed aid in other areas of study, from glaciology to oceanography to biological studies, several other disciplines make use of the observations. Even logistical planning efforts make use of the observations. This network is approximately half of the available surface observations for the entire Antarctic continent.

What is the impact on the development of human resources?

There are three levels of impact on human resources, and specifically training. The first level is with staff members on the AWS project, especially those new to the group or with intermediate experiences. Senior and experienced team members have been passing along their advice and lessons learned to continue to have the project be able to meet its goals (from field work through to quality control efforts). The second level of training is with the undergraduate students involved in the group. They are learning to work with the data, gaining skills with real-world observational data as well as participating in studying the researching questions central to the project. The third level of impact is with those that are participants in the educational outreach activities, whether it be the hundreds of K-12 students that tour the AMRC/AWS or the general public or service organizations. As a part of this level, we have team members create a virtual tour of the AMRC which has a focus on the AWS project associated topics, including what life is like in the Antarctic.

What is the impact on physical resources that form infrastructure?

The AWS network is a significant contribution to the observing of the surface of the Antarctic continent. This is a tremendous physical resource as it is nearly half of all surface observing in the Antarctic.

What is the impact on institutional resources that form infrastructure?

As a part of the Antarctic Meteorological Research Center (AMRC), the AWS project in part forms the polar, and specifically, Antarctic expertise area of the Space Science and Engineering Center at the University of Wisconsin-Madison. Students, especially majoring in the atmospheric and oceanic sciences often rely on support and expert help from members of the project team.

What is the impact on information resources that form infrastructure?

While the AMRC group hosts the primary information resources (databases, servers, services, etc.), the Antarctic AWS observations are a significant contribution to those resources.

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

This project has impact on multiple levels. From the point of view of a broad policy level, the results of the significant warming in Central West Antarctic contribute to efforts to characterize the significant changes occurring in the climate. These results could impact larger efforts including the Intergovernmental Panel on Climate Change (IPCC). From the point of view of those who conduct work in the Antarctic (e.g. the US Antarctic Program), efforts here can in turn affect planning for future science campaigns, for example.

Changes

Changes in approach and reason for change

Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them

Nothing to report.

Changes that have a significant impact on expenditures

Nothing to report.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.

Preview of Award 0943952 - Annual Project Report

Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	0943952
Project Title:	Collaborative Research: Antarctic Automatic Weather Station Program
PD/PI Name:	John J Cassano, Principal Investigator
Submitting Official (if other than PD\PI):	N/A
Submission Date:	N/A
Recipient Organization:	University of Colorado at Boulder
Project/Grant Period:	09/15/2010 - 08/31/2014
Reporting Period:	09/01/2012 - 08/31/2013
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	N/A

Accomplishments

*** What are the major goals of the project?**

- Investigate the surface wind regime of the Ross Ice Shelf

- Assist in maintenance of Antarctic AWS network

- Demonstrate the ability of using small, inexpensive, logistically simple unmanned aerial vehicles for making atmospheric boundary layer measurements in the Antarctic (added as part of supplemental funding to this award)

Broader Impacts

- Maintenance of long-term Antarctic climate records through maintenance of the AWS network

- Public outreach via blogs and school visits

- Graduate and post-doctoral training

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities: The Cassano group at the University of Colorado focused on three main research activities as part of this project: analysis of the dynamics of the low-level winds over the Ross Ice Shelf, demonstration of the use of small, inexpensive, and logistically simple unmanned aerial vehicles in the Antarctic, and analysis of the atmospheric surface layer in the vicinity of the Tall Tower AWS on the Ross Ice Shelf.

Our analysis of the dynamics of the low-level winds over the Ross Ice Shelf has used a combination of in-situ AWS observations and Antarctic Mesoscale Prediction System (AMPS) model output to evaluate the mechanisms responsible for driving strong barrier parallel flow adjacent to the Transantarctic Mountains. A case study of a 2-day high wind event at Sabrina AWS on the southern Ross Ice Shelf was published (Nigro et al. 2012). The method of self-organizing maps (SOMs) has been used to expand upon this case study and analyze two years of AMPS forecasts over the Ross Ice Shelf. This research formed part of Melissa Nigro's Ph.D. dissertation and is currently being prepared for publication as a two part manuscript. The first manuscript will describing the low level wind climatology from a SOM perspective (Nigro and Cassano 2013a). The second manuscript will analyze the details of the dynamics with a focus on identifying the barrier wind, katabatic, and synoptic / mesoscale components of the flow (Nigro and Cassano 2013b).

Through supplemental funding obtained in 2011 two Small Unmanned Meteorological Observer (SUMO) unmanned aerial vehicles (UAVs) were purchased. Boundary layer flights were conducted during the University of Colorado Antarctic deployment as part of the AWS project in January 2012 and during a different project's field deployment in September 2012. Temperature profiles collected during 6 flights days showed a range of boundary layer profiles from deep, well-mixed conditions to strong, shallow inversions. Repeat profiles on individual flight days showed rapid boundary layer evolution over periods of tens of minutes to several hours. These rapid boundary layer changes would be difficult to observe with other boundary layer observing strategies. Results from these SUMO UAV demonstration flights were published in the last year (Cassano 2013).

Two years of data from the 30 m Tall Tower AWS located on the Ross Ice Shelf have been quality controlled and analyzed by members of the Cassano research group. The data have been analyzed using the method of self-organizing maps, which has allowed for an objective identification of the temperature profiles observed during the two year period. The frequency of occurrence and seasonality of the 30 temperature profiles identified by the SOM algorithm were determined. Mean profiles of potential temperature, wind speed, and differences in temperature and wind speed over the height of the AWS were also calculated for each pattern. This analysis revealed that the surface layer at this site varies from convective conditions in the summer to strong inversions in the winter, with light winds favoring both convective conditions and strong near surface inversions. Stronger winds lead to well mixed conditions in summer and weaker inversions in winter. The results of this analysis are continuing. We expect to submit a manuscript describing these results in early 2014.

Members of the University of Colorado also contributed to an overview article on the Antarctic AWS program, which was published in October 2012 (Lazzara et al. 2012) and an overview of the 2011-2012 Antarctic AWS field season (Lazzara et al. 2013).

Specific Objectives: The following activities helped meet the portions of the project's major goals.

A case study of a high wind event (wind speeds >20 m/s for nearly 2 days) at Sabrina AWS on the southern Ross Ice Shelf (RIS) was published in the last year (Nigro et al. 2012).

Two additional manuscripts describing the climatology of the low level wind regime over the Ross ice shelf and the dynamics of this low level flow are in preparation (Nigro et al. 2013a, 2013b).

A manuscript describing the SUMO UAV observations collected during January and September 2012 is currently in press (Cassano 2013).

Significant Results: Analysis of the low level wind dynamics over the Ross Ice Shelf has suggested that the classic description of barrier winds may not be appropriate for many "barrier wind" cases over the Ross Ice Shelf. Flow regimes which appear, from near surface wind observations, to be "classic" barrier winds in fact show strong forcing from the nearly permanent baroclinic zone between the East Antarctic boundary layer and the warmer, free atmosphere over the Ross Ice Shelf. These results are currently in preparation for publication (Nigro et al. 2013b).

Analysis of the Tall Tower AWS observations using self-organizing maps has demonstrated the utility of SOMs for analyzing high temporal resolution (10 minute) surface layer profiles over an extended (2 year) period of time. Results from this analysis are currently in preparation for publication.

Key outcomes or Other achievements: Two successful SUMO UAV boundary layer field campaigns were completed which demonstrated the robustness and utility of using small, inexpensive, and logistically simple UAVs for Antarctic boundary layer studies. The results from these flights are currently in press in *Antarctic Science* (Cassano 2013).

*** What opportunities for training and professional development has the project provided?**

This project supported Melissa Nigro as she completed her Ph.D. at the University of Colorado. She earned her degree in December 2012. She is now supported by this project as a post-doctoral research scientist. Nigro has also gained Antarctic field experience from her participation in the 2008-2009 and 2010-2011 AWS field seasons.

*** How have the results been disseminated to communities of interest?**

The Cassano research group has led the preparation of four manuscripts (one published, one in press, two in preparation) and contributed to two additional manuscripts (both published) in the last year. Cassano also contributed a chapter on Antarctic weather and climate for a book about Antarctic science that was published in 2013. The Cassano research group contributed to or gave 17 oral presentations and 1 poster presentation in the last year. Three of these presentations were invited presentations.

Cassano visited one elementary school (Plainview, NY) and gave a live Skype interview with two introductory meteorology classes at Anoka-Ramsey Community College (Coon Rapids, MN). Both of these outreach activities evolved from the blog Cassano published during his 2011-2012 Antarctic field season.

Conferences attended / presentations:

Attend Transantarctic Mountains Camp workshop, Indianapolis, IN, 25-27 June 2012.

Cassano, J., M. Nigro, and M. Lazzara, 2012: Observing the Antarctic atmosphere with SUMO UAVs. Transantarctic Mountains Camp workshop, Indianapolis, IN (poster).

Lazzara, M.A., N. Weber, L.M. Keller, C. Costanza, J.J. Cassano, and M.A. Nigro, 2012: Meteorology of the Transantarctic Mountains. Transantarctic Mountains Camp workshop, Indianapolis, IN (oral).

Attend Antarctic Meteorological Observation, Modeling, and Forecasting Workshop, Boulder, CO, 9-11 July 2012.

Welhouse, L.J., M.A. Lazzara, J.E. Thom, L.M. Keller, G.A. Weidner, J.J. Cassano, A. DuVivier, 2012: USAP Antarctic automatic weather station program status and field report. Antarctic Meteorological Observation, Modeling, and Forecasting Workshop, Boulder, CO (oral).

Lazzara, M.A., J.E. Thom, L.J. Welhouse, L.M. Keller, D.E. Mikolajczyk, G.A. Weidner, and J.J. Cassano, 2012: Antarctic automatic weather station 2012-2013 field season plans. Antarctic Meteorological Observation, Modeling, and Forecasting Workshop, Boulder, CO (oral).

Cassano, J.J., 2012: Observing the Antarctic atmosphere with small unmanned meteorological observers (SUMO). Antarctic Meteorological Observation, Modeling, and Forecasting Workshop, Boulder, CO (oral).

Lazzara, M.A., L.M. Keller, G.A. Weidner, J.E. Thom, and J.J. Cassano, 2012: The abridged history of the Antarctic automatic weather station. Antarctic Meteorological Observation, Modeling, and Forecasting Workshop, Boulder, CO (oral).

Nigro, M.A. and J.J. Cassano, 2012: Analysis of high winds over the Ross ice shelf, Antarctica: Barrier winds along the Transantarctic Mountains. Antarctic Meteorological Observation, Modeling, and Forecasting Workshop, Boulder, CO (oral).

Attend Scientific Committee on Antarctic Research open science conference, Portland, OR, 16-19 July 2012.

Cassano, J., S. Knuth, and M. Nigro, 2012: Using autonomous observations and numerical models to understand the Antarctic atmosphere. Scientific Committee on Antarctic Research open science conference, Portland, OR (oral).

Attend New Zealand Meteorological Society Annual Meeting, Wellington, New Zealand, 19-20 November 2012.

Cassano, J., 2012: Probing the Antarctic atmosphere with unmanned aerial vehicles (UAVs). New Zealand Meteorological Society Annual Meeting, Wellington, New Zealand (oral).

Attend First Conference of the International Society for Atmospheric Research using Remotely-piloted Aircraft, Palma de Mallorca, Spain, 18-20 February 2013.

Cassano, J.J. and S.L. Knuth, 2013: Boundary layer observations of the boundary layer over an Antarctic polynya. First Conference of the International Society for Atmospheric Research Using Remotely-Piloted Aircraft, Palma de Mallorca, Spain (oral).

Note: This presentation included a discussion of SUMO UAV flights, in addition to the Terra Nova Bay Aerosonde UAV flights.

Attend American Meteorological Society Conference on Polar Meteorology and Oceanography, Seattle, WA, 29 April – 1 May 2013.

Nigro, M.A. and J.J. Cassano, Analysis of low-level winds over the Ross Ice Shelf, Antarctica: Barrier winds along the Transantarctic Mountains. AMS Conference on Polar Meteorology and Oceanography, Seattle, WA (oral).

Attend 8th Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI, 9-12 June 2013.

Mikolajczyk, D., L. Welhouse, M. Lazzara, L. Keller, J. Thom, M. Tsukernik, and J. Cassano, 2013: Antarctic automatic weather station program: 2012-2013 field season overview. Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI (oral).

Nigro, M., J. Cassano, L. Keller, M. Lazzara, J. Thom, G. Weidner, and L. Welhouse, 2013: Observations of vertical temperature profiles over the Ross Ice Shelf from Alexander Tall Tower AWS. Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI (oral).

Nigro, M. and J. Cassano, 2013: Forcing mechanisms of the Ross Ice Shelf airstream. Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI (oral).

Attend Planning and Operational Meeting on Polar Atmospheric Measurements Related to the DOE ARM Program Using Small Unmanned Aerial Systems and Tethered Balloons, Washington D.C., 23-26 July 2013.

Cassano, J., 2013: UAV observations of the atmosphere over the Terra Nova Bay polynya: September 2012 and September 2013. Planning and Operational Meeting on Polar Atmospheric Measurements Related to the DOE ARM Program Using Small Unmanned Aerial Systems and Tethered Balloons, Washington D.C. (invited).

Note: This presentation included a discussion of SUMO UAV flights, in addition to the Terra Nova Bay Aerosonde UAV flights.

Presentations not given at scientific conferences:

Cassano, J.J., S. Knuth, N. Logan, C. Hall, P. Herrmann, and P. Kernebone, 2012: Probing the Antarctic atmosphere with unmanned aerial vehicles (UAVs), McMurdo, Antarctica Sunday science lecture (oral).

Cassano, J., S. Knuth, and M. Nigro, 2012: Using autonomous observations and numerical models to understand the Antarctic atmosphere. Dept. of Physics and Astronomy, University of Canterbury (invited).

Cassano, J., 2012: Probing the Antarctic atmosphere with unmanned aerial vehicles (UAVs), Gateway Antarctica, University of Canterbury (invited).

*** What do you plan to do during the next reporting period to accomplish the goals?**

The main activities during the next reporting period will be completion of the two manuscripts describing the climatology and dynamics of the low-level wind field over the Ross Ice Shelf and completion of a manuscript describing the two-year climatology of the surface layer at the Tall Tower AWS.

Products

Journals

Cassano, J.J. (2013). Observations of atmospheric boundary layer temperature profiles with a small unmanned aerial vehicle. *Antarctic Science*. .

Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Lazzara, M.A., G.A. Weidner, L.M. Keller, J.E. Thom, and J.J. Cassano (2012). Antarctic automatic weather station program: 30 years of polar observations. *Bulletin of the American Meteorological Society*. 93 1519.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1175/BAMS-D-11-00015.1

Lazzara, M.A., L.J. Welhouse, J.E. Thom, J.J. Cassano, A.K. DuVivier, G.A. Weidner, L.M. Keller, and L. Kalnajs (2013). Automatic weather station (AWS) program operated by the University of Wisconsin-Madison during the 2011-2012 field season. *Antarctic Record.* 57 125.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Nigro, M.A., J.J. Cassano, M.A. Lazzara, and L.M. Keller (2012). Case study of a barrier wind corner jet off the coast of the Prince Olav Mountains, Antarctica. *Monthly Weather Review.* 140 2044.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1175/MWR-D-11-00261.1.

Nigro, M.A. and J.J. Cassano (2013). Analysis of high winds over the Ross Ice Shelf, Antarctica Part 1: Wind Pattern Identification using Self Organizing Maps. *TBD.* .

Status = OTHER; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Nigro, M.A. and J.J. Cassano (2013). Analysis of high winds over the Ross Ice Shelf, Antarctica Part 2: Forcing Mechanisms of the Ross Ice Shelf Airstream. *TBD.* .

Status = OTHER; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Books

Book Chapters

Cassano, J.J. (2013). Climate of Extremes. *Antarctica: Global Science From a Frozen Continent* D.W.H. Walton. Cambridge University Press. Cambridge. 102.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes ; Peer Reviewed = No

Thesis/Dissertations

Nigro, M.A.. *What drives the low level winds over the Ross Ice Shelf, Antarctica?.* (2012). University of Colorado.

Acknowledgment of Federal Support = Yes

Conference Papers and Presentations

Other Publications

Technologies or Techniques

During the 2011-2012 AWS field season we successfully demonstrated the use of small unmanned meteorological observer (SUMO) UAVs for use in studying the Antarctic boundary layer. Results from this field campaign are currently in press in *Antarctic Science* (Cassano 2013).

Patents

Nothing to report.

Inventions

Nothing to report.

Licenses

Nothing to report.

Websites

Title: http://dl.dropbox.com/u/53700947/Antarctic_blog/index.html

URL: This site is a blog maintained by co-PI Cassano during the 2011-12 Antarctic field season.

Description:

Other Products

Nothing to report.

Participants

Research Experience for Undergraduates (REU) funding

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
John J Cassano	PD/PI	1
Melissa Nigro	Postdoctoral (scholar, fellow or other postdoctoral position)	12

What other organizations have been involved as partners?

Name	Location
Lindenberg und Müller	Hildesheim, Germany

Have other collaborators or contacts been involved? N

Impacts

What is the impact on the development of the principal discipline(s) of the project?

The research activities of this project have contributed to an improved understanding of synoptic, mesoscale, and boundary layer processes in the Antarctic. We have published one paper and have two papers in preparation over the past year that describe the climatology and dynamics of the low level wind field over the Ross Ice Shelf. We are currently continuing our analysis of surface layer observations from the Tall Tower AWS.

We have demonstrated the utility of a small, inexpensive, and logistically simple UAV for Antarctic atmospheric boundary layer studies. Results from this work are currently in press (Cassano 2013).

What is the impact on other disciplines?

It is hoped that our demonstration of the use of the SUMO UAV will encourage scientists in other fields to explore the potential of using small, inexpensive, and logistically simple UAVs as part of their Antarctic field work. One obvious potential use would be for wildlife surveys using UAVs equipped with small cameras.

What is the impact on the development of human resources?

Funds from this project have supported Melissa Nigro (currently as a post-doctoral research scientist and formerly as a Ph.D. student). Nigro has gained experience in analyzing observational and model based data, performing Antarctic fieldwork, presenting results of her research at national and international conferences, and publishing her research results in the peer reviewed literature.

Cassano has been an active mentor for the Association of Polar Early Career Scientists (APECS). In February 2012 he led an APECS webinar titled "Tackling the Thesis or Dissertation and Making it Work for You When it is Complete". Questions during this webinar addressed issues of polar fieldwork relevant to this award.

What is the impact on physical resources that form infrastructure?

Funds from this project have allowed us to purchase two SUMO UAVs and the laptop required for controlling these UAVs. These resources will be available for future fieldwork activities by the Cassano research group.

What is the impact on institutional resources that form infrastructure?
Nothing to report.

What is the impact on information resources that form infrastructure?
Nothing to report.

What is the impact on technology transfer?
Nothing to report.

What is the impact on society beyond science and technology?

Cassano has been engaged in outreach to students at Anoka-Ramsey Community College and to elementary grade students at Plainview elementary school.

Changes

Changes in approach and reason for change
Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them
Nothing to report.

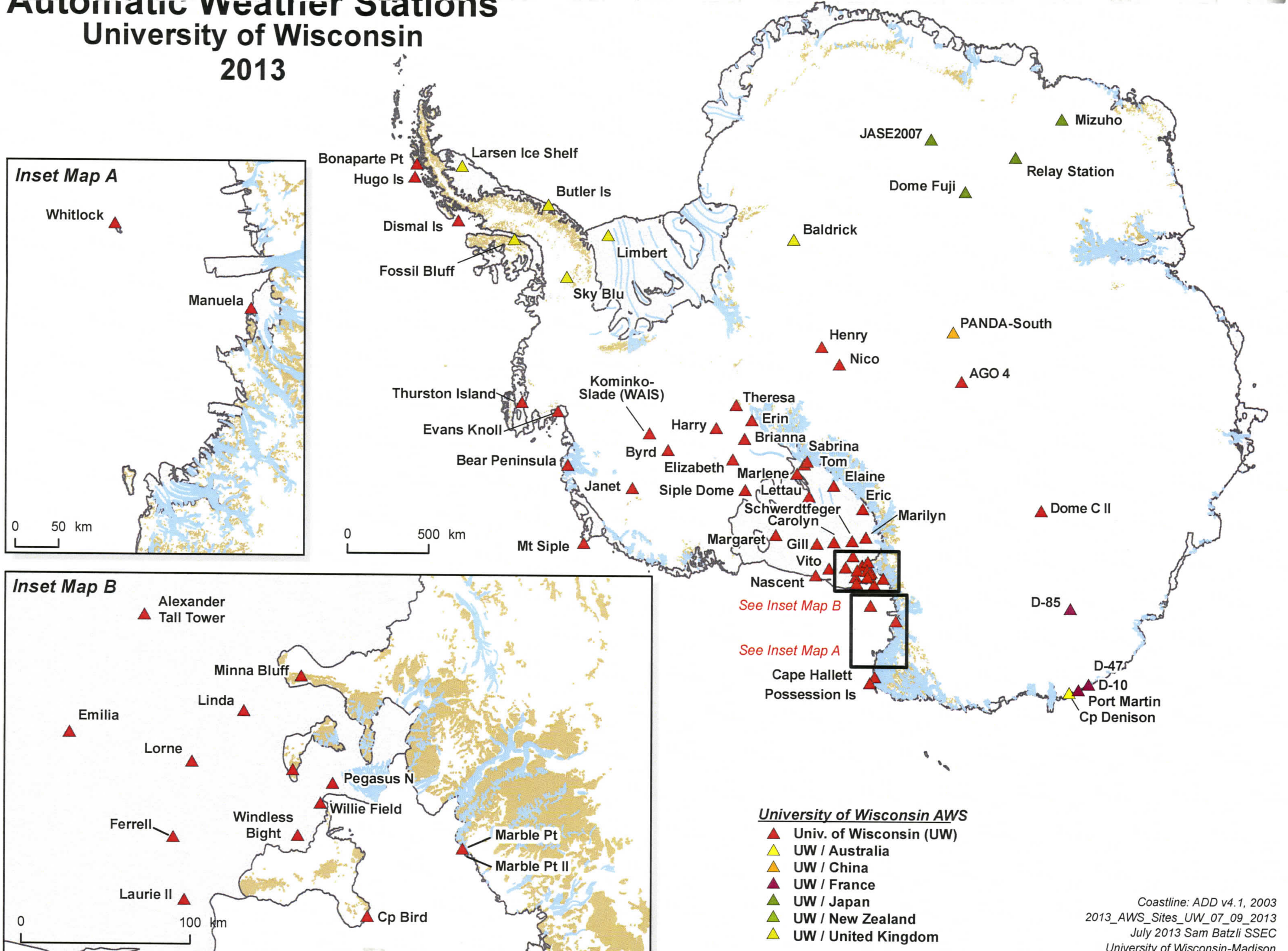
Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

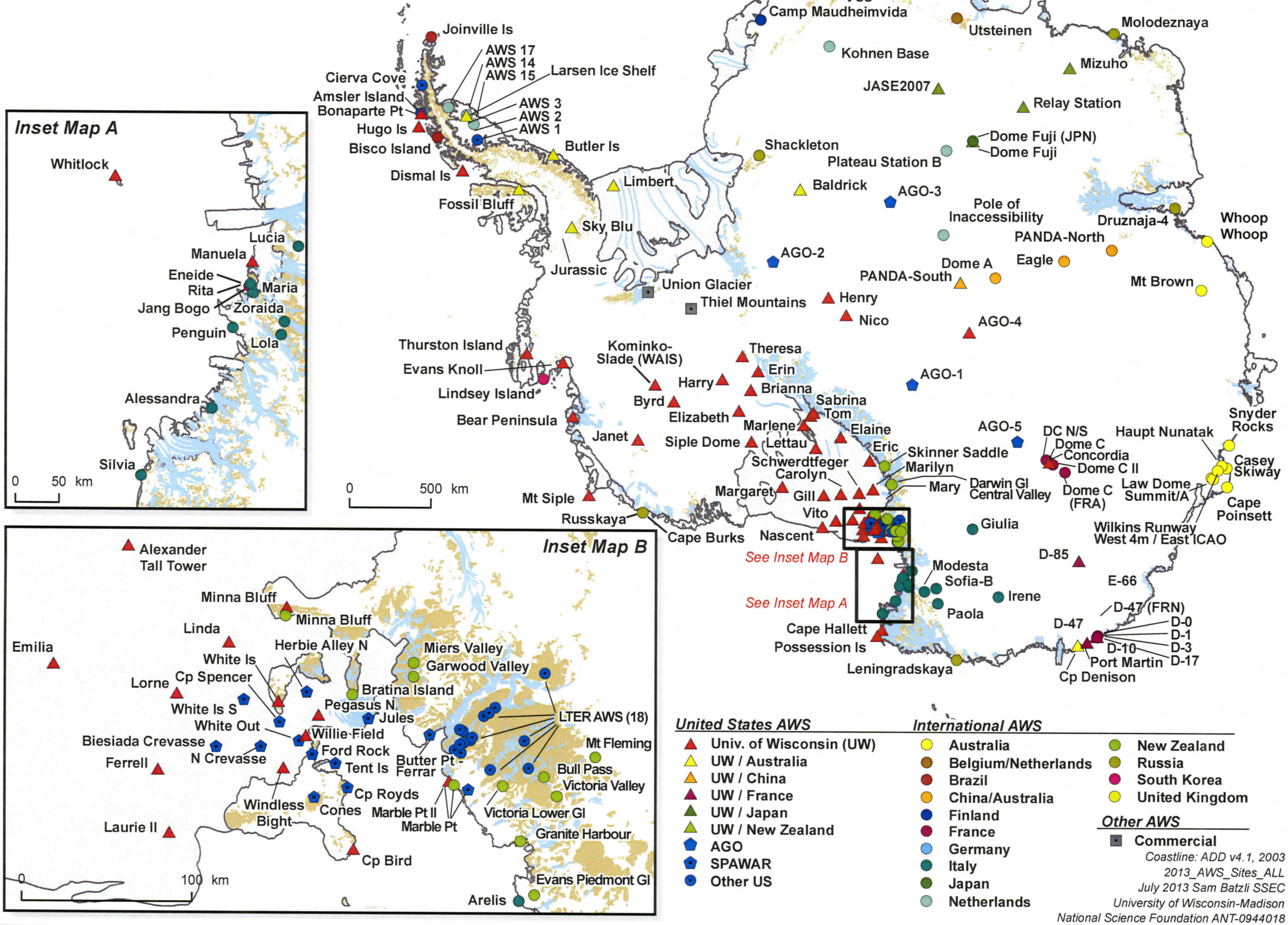
Significant changes in use or care of biohazards
Nothing to report.

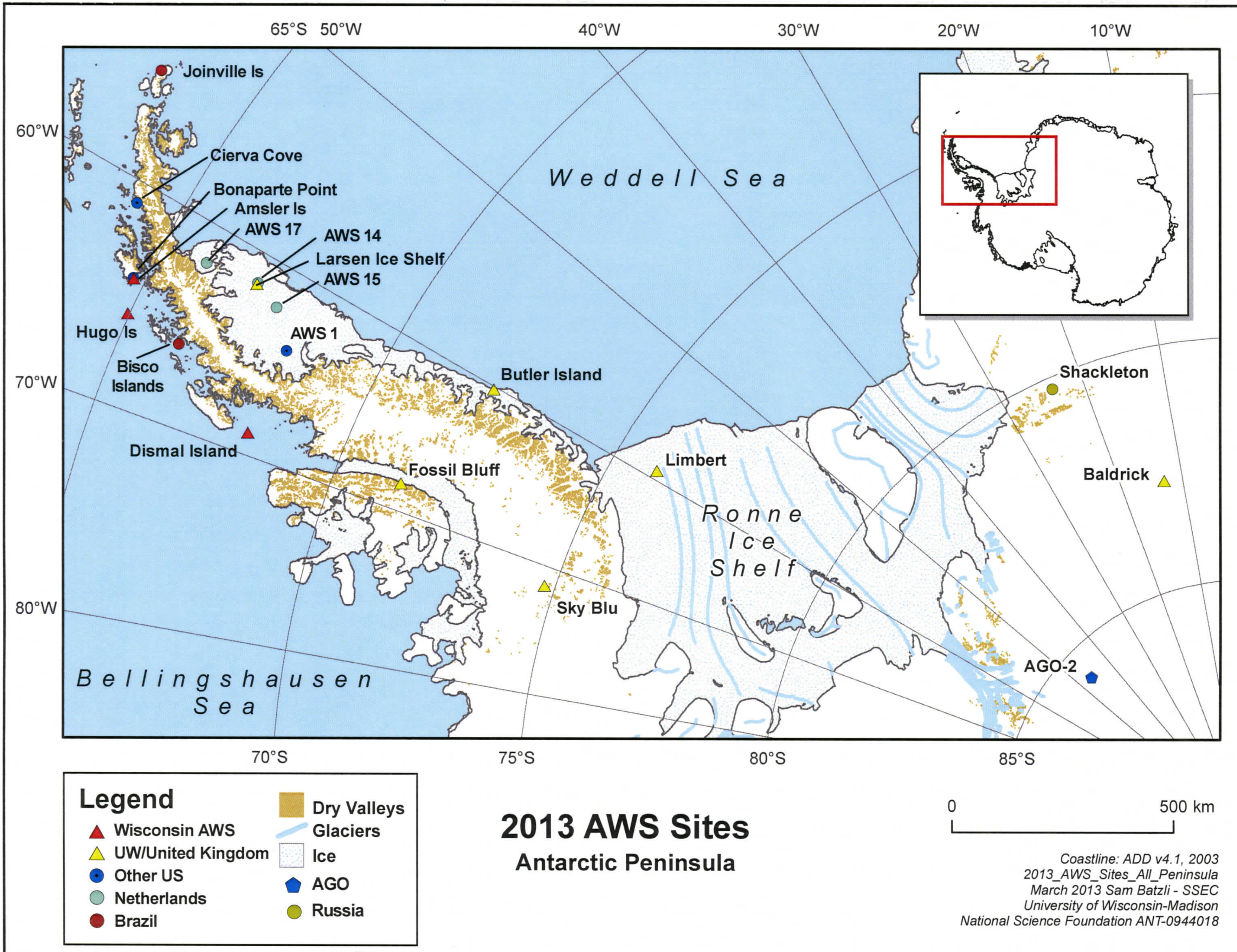
Automatic Weather Stations
University of Wisconsin
2013

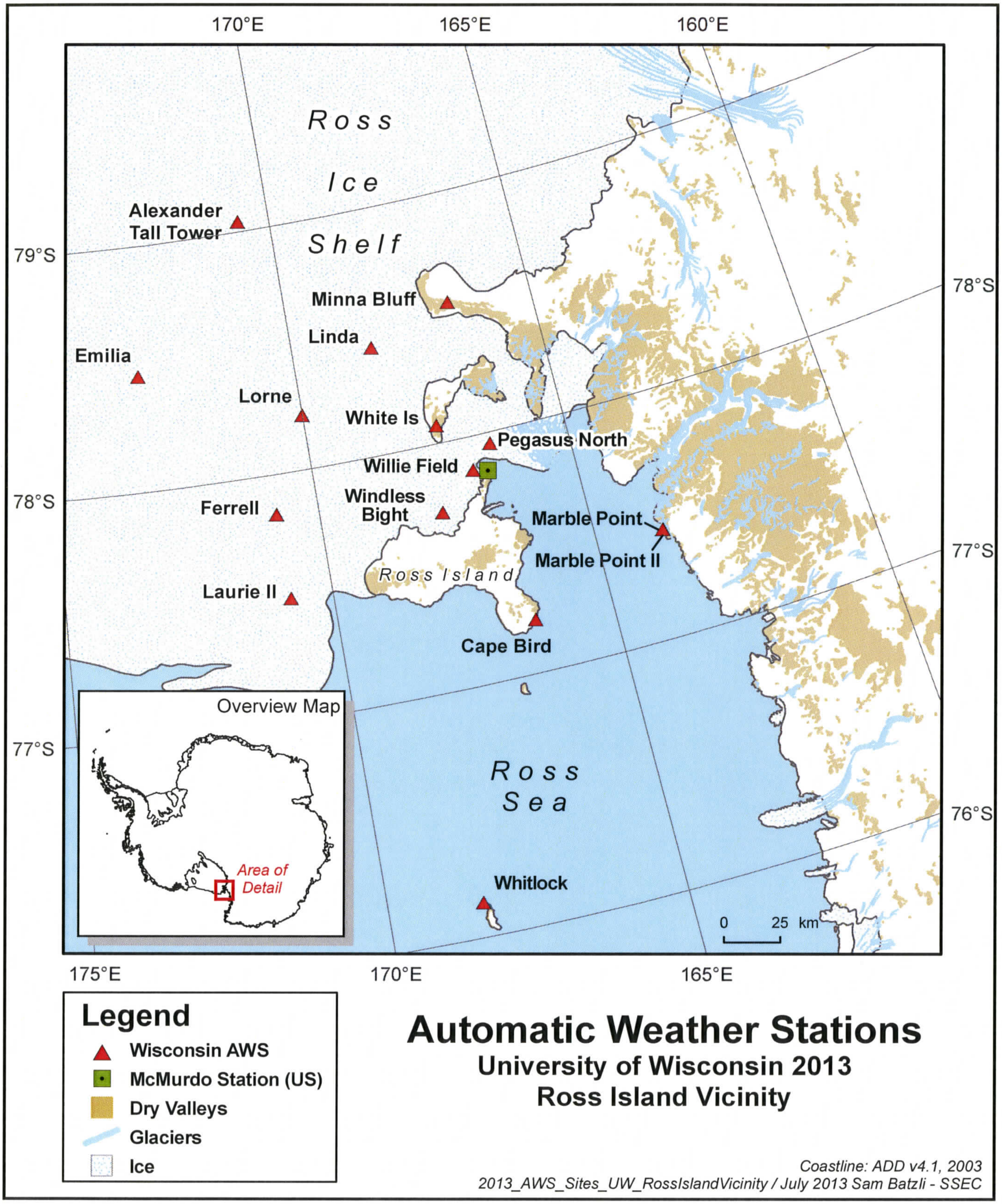


Coastline: ADD v4.1, 2003
2013_AWS_Sites_UW_07_09_2013
July 2013 Sam Batzli SSEC
University of Wisconsin-Madison
National Science Foundation ANT-0944018

Automatic Weather Stations
Antarctica - 2013




2013 AWS Sites
Antarctic Peninsula
Weddell Sea
Bellingshausen Sea
Ronne Ice Shelf
Joinville Is
Cierva Cove
Bonaparte Point
Amsler Is
AWS 17
AWS 14
Larsen Ice Shelf
AWS 15
AWS 1
Hugo Is
Bisco Islands
Dismal Island
Butler Island
Fossil Bluff
Limbert
Sky Blu
Shackleton
Baldrick
AGO-2
65°S 50°W
40°W
30°W
20°W
10°W
60°W
70°W
80°W
70°S
75°S
80°S
85°S
Legend
Wisconsin AWS
UW/United Kingdom
Other US
Netherlands
Brazil
Dry Valleys
Glaciers
Ice
AGO
Russia
0
500 km
Coastline: ADD v4.1, 2003
2013_AWS_Sites_All_Peninsula
March 2013 Sam Batzli - SSEC
University of Wisconsin-Madison
National Science Foundation ANT-0944018



Automatic Weather Stations
University of Wisconsin 2013
Ross Island Vicinity

Automatic Weather Station Program
2012-2013 Field Season Report

Field Season Report Author: Lee J. Welhouse[1]
Field Team Members: David E. Mikolajczyk[1], Joseph Snarski[1], Maria Tsukernik[2], Lee J. Welhouse[1]
Principal Investigator: Matthew A. Lazzara[1]

[1] Space Science and Engineering Center
University of Wisconsin - Madison
[2] Earth Systems History Group/Environmental Change Initiative
Brown University

The National Science Foundation's Office of Polar Programs funds the University of Wisconsin's Automatic Weather Station Program to design, fabricate, deploy, and maintain an array of automatic weather stations (AWS) in remote areas in Antarctica in support of meteorological research, applications and operations. The basic AWS units measure air temperature, wind speed and direction at a nominal height of 3 meters above the surface. Air pressure is measured at the height of the AWS electronic enclosure. Some units measure relative humidity at 3 meters above the surface and the air temperature difference between 0.5 and 3 meters above the surface at the time of installation. A small, but increasing number of AWS sites measure snow accumulation and/or solar radiation. The data are collected by the ARGOS Data Collection System (DCS) on board the National Oceanic and Atmospheric Administration (NOAA) and MetOp (EUMETSAT) series of polar-orbiting satellites. This year saw an increase in the stations using Freewave modems to transmit to a receiving station in McMurdo. The AWS units are located in arrays for specific research activities and are also used for operational purposes. Any one AWS may support several experiments and all support operational meteorological services - especially support for weather forecasts for aircraft flights around the Antarctic continent. This was the 33rd field season for project O-283 (formerly S-283) under the direction of Principal Investigators (PI) from the University of Wisconsin – Madison.

<u>Research areas supported over the years include:</u>

- Barrier wind flow along the Antarctic Peninsula and the Transantarctic Mountains
- Katabatic wind flow down the Byrd and Beardmore Glaciers, the Siple and Adelie Coast
- Mesoscale circulation and sensible and latent heat fluxes on the Ross Ice Shelf
- The Ross Ice Shelf Air Stream.
- Climatology of long operating AWS sites, in particular Byrd and Dome C sites
- Meteorological support for the West Antarctic Ice Sheet Initiative
- Long Term Ecological Research (LTER) along the Antarctic Peninsula
- Meteorological support for United States Antarctic Program flight operations

The following are a sampling of historically supported principal investigators funded by NSF-OPP:

- Dr. Douglas R. MacAyeal: Iceberg Drift in the Near-Shelf Environment, Ross Ice Shelf, Antarctica.
- Dr. Ray Smith, Long Term Ecological Research: Racer Rock, Bonaparte Point, and Santa Claus Island.
- West Antarctic Ice Sheet Initiative: Siple Dome and West Antarctic Divide drilling sites.
- Dr. John Cassano: The Ross Ice Shelf Air Stream
- Aircraft Operation: All AWS sites in Antarctic.
- The Antarctic AWS units support many investigators outside of NSF-OPP.

AMRC collaboration:

- Climatological analysis from the AWS, and other stations (complementing the activities in the SCAR READER project).
- Continued data collection, archival and distribution of AWS data.
- Continued educational outreach activities (as outlined in the above section and in the following outreach section).
- Utilities developed to generate climatological analyses from AWS observations.

Field work:

One of the unique aspects of maintaining the AWS observational network is the necessary fieldwork. A full time job in and of itself, keeping a network of 50 to 70 AWS systems operating, even with international partners, requires a devoted effort of AWS fabrication and repair team members doubling as field personnel. Flying to remote places around the Antarctic and dealing with polar weather conditions makes maintenance a challenge. The success of the AWS network would not be possible without the support of all those who help, directly or indirectly. Thanks go to Ken Borek Air, the 109th New York Air National Guard, PHI Helicopters, Raytheon Polar Services, our international partners in France, Australia, United Kingdom, Japan, New Zealand and China, and especially the Office of Polar Programs at the National Science Foundation in the USA.

For the 2012-2013 field season, the field team consisted of Lee Welhouse (O-283), David Mikolajczyk (O-283), and Joseph Snarski (O-202) from the University of Wisconsin-Madison Space Science Engineering Center, and Maria Tsukernik (O-283) from Brown University. Lee Welhouse and David Mikolajczyk deployed to McMurdo on November 28th, 2012 for the early portion of the season which consisted of updating stations in the Ross Island region to Freewave transmitters, and attempts to perform AWS service work in the Ross Ice Shelf and Ross Island region. David Mikolajczyk departed McMurdo on December 20th, 2012 for return to Madison. Lee Welhouse completed a short portion of the season which included service work on stations in the Ross Island region. Maria Tsukernik arrived in McMurdo on December 30th, 2012 to complete the final portion of the season. The final portion of the season consisted of work within the Ross Ice Shelf, West Antarctica, and final station visits in the McMurdo Island region and was performed by Lee Welhouse and Maria Tsukernik. Joseph Snarski arrived in McMurdo on January 3rd, 2013 and performed updates to various servers and computer equipment on station.

Summary of 2012/2013 field season for O-283:

White Island station installed 12/09/2012

Ferrell station removed 12/12/12

Windless Bight station updated to Freewave system 12/17/2012

White Island station repair 12/20/2012

Minna Bluff station inspection 12/26/2012

Lorne remove Argos electronics 12/26/2012

White Island further repairs 12/26/2012

Lorne install Freewave electronics 12/27/2012

Lorne repair Freewave modem 12/29/2012

Marble Point tower inspection, data recovery, and operating system update 12/29/2012

Lorne further repairs to Freewave modem required 01/03/2013

Janet AWS raise and batteries replaced on second day. 01/15/2013 and 01/16/2013

Erin station replaced with CR1000 01/20/2013

Kominko-Slade data recovered and operating system updated 01/24/2013

Tall Tower lower instruments raised and tower inspected 01/30/2013

Marilyn Aerovane replaced 02/02/2013

Schwerdtfeger replaced with CR1000 system 02/02/2013

Tall Tower unsuccessful conversion to iridium 02/02/2013

Willie Field electronics replaced 02/03/2013

Minna Bluff replaced wind direction sensor 02/05/2013

White Island

Visited on 12/09/2012, 12/20/2012, and 12/26/2012
Field Team: Lee Welhouse and David Mikolajczyk

Instrumentation:
Upper and lower temperature: Thermometrics probe
Humidity: Vaisala HMP 155
Wind speed and Direction: RM Young Wind Monitor
Acoustic Depth Gauge (ADG): CSI Canada SR50A
Pressure: Vaisala Pressure Sensor
Radiation Sensor: LI200X

The station was installed, and had minor issues with the power system that required a second visit. Later the ADG failed, and wasn't repairable during the third visit.

Heights:
ADG: 99"
Humidity: 99"
Enclosure: 45"
Lower temperature: 90"
Upper temperature: 231"
Wind: 253"

White Island

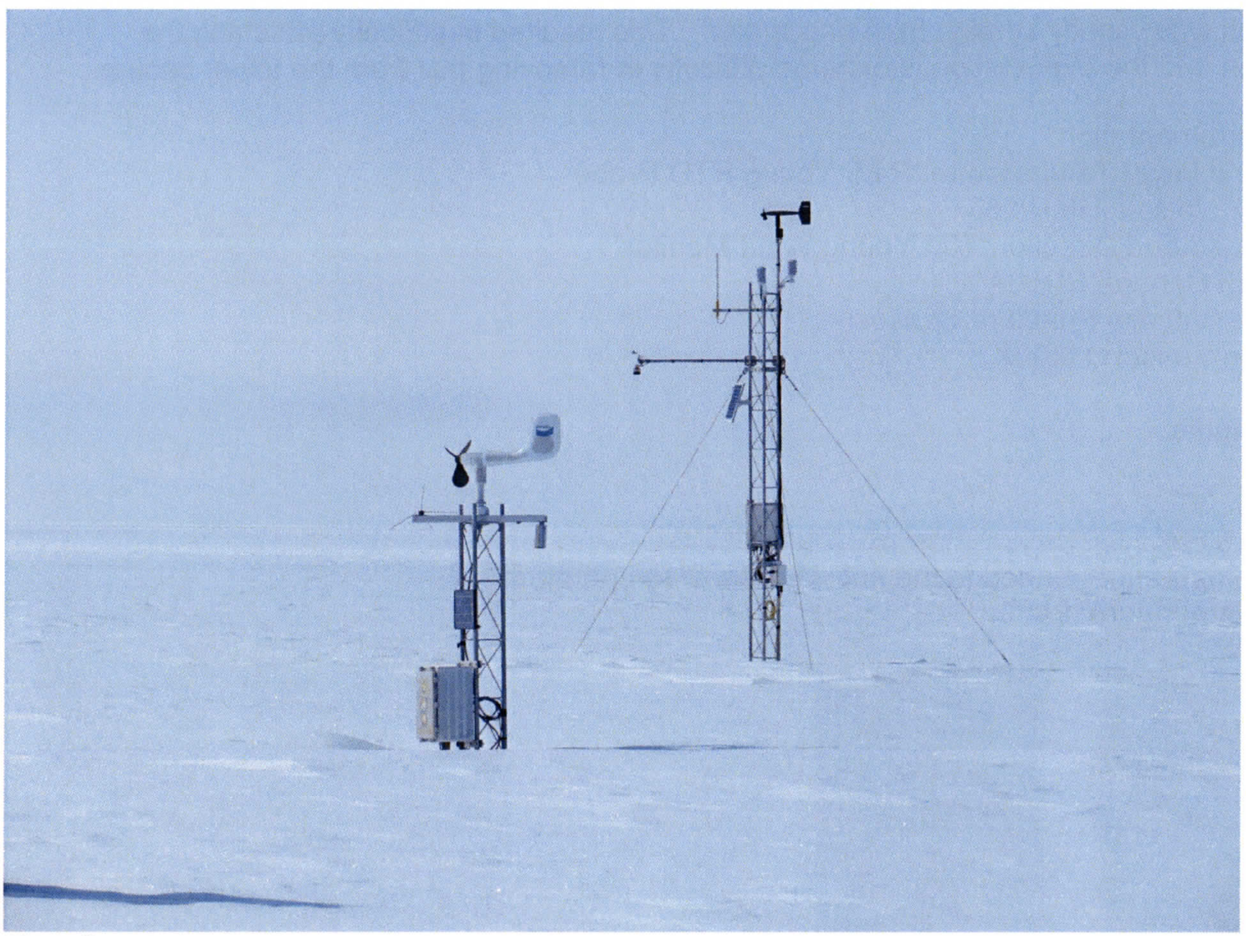
Ferrell

11/15/2011
Field Team: Lee Welhouse and David Mikolajczyk
Location: 84.43°S, 171.48°W

Instrumentation:
Aerovane: Belfort/Bendex Wind monitor
Temperature: Weed
Pressure: Paroscientific Pressure Sensor
Humidity: Vaisala HMP 35a

The station was removed with the old tower section left for future transfer.

Heights:
Enclosure: 9 in
solar panel: 40 in
boom: 69 in



Ferrell

Windless Bight

12/12/2012
Field Team: Lee Welhouse and David Mikolajczyk
Location: 83.094°S, 174.285°E

Initial Instrumentation:
Temperature: Weed RTD Probe
Pressure: Paroscientific Pressure Sensor
Wind speed and Direction: R.M. Young Wind Monitor
ADG: CSI Canada SR50A

Initial Heights:
Instrument Boom: 115"
Enclosure: 42:
ADG: 60"

The station was updated to a new CR1000 with freewave transmitter. Due to colocation with Ozone systems the tower was unable to be added to and raised. Further, the aerovane pipe extension was slightly smaller than anticipated. This resulted in difficulty attaching the extension and the expectation is extreme difficulty in removing this from the tower section.

Final Instrumentation:
Upper and lower Temperature: R.M. Young RTD Probe
Humidity: Vaisala HMP 155
Wind speed and Direction: RM Young Wind Monitor
ADG: CSI Canada SR50A
Pressure: Vaisala Pressure Sensor
Radiation Sensor: LI200X

Final Heights:
ADG: 25"
Humidity: 36"
Enclosure: 44"
Lower temperature: buried in the snow for snow temperature
Upper temperature: 94"
Wind: 118"

Windless Bight before

Windless Bight After

Minna bluff

12/26/2012 and 02/05/2013
Field Team: Lee Welhouse and Maria Tsukernik
Location: 78.555°S, 166.691°E

Instrumentation:
Temperature: Weed PRT
Humidity: Vaisala HMP 45
Wind speed and Direction: Taylor High Wind Speed System
ADG: None installed
Pressure: Vaisala Pressure Sensor
Radiation Sensor: None installed

The wind direction sensor had failed and initial inspection performed by Lee Welhouse was inconclusive as to where the fault was occurring. The secondary visit occurred after a spare wind direction sensor arrived and was installed. This installation seemed to fix the issue.

Heights:
Boom: 87"

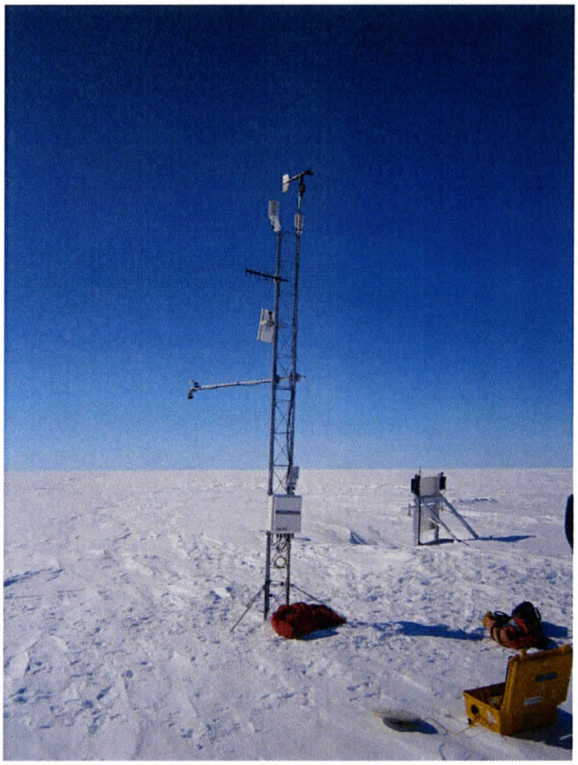
Minna Bluff

Lorne
12/26/2012, 12/27/2012, 12/29/2012, and 1/03/2013
Field Team: Lee Welhouse
Location: 78.222°S, 170.0145°E

Instrumentation:
Upper and lower temperature: R.M. Young RTD probe
Humidity: Vaisala HMP 155
Wind speed and Direction: RM Young Wind Monitor
ADG: CSI Canada SR50A
Pressure: Paroscientific Pressure Sensor
Radiation Sensor: LI200X

During the initial visit the laptop failed due to cold conditions, which resulted in the retrieval of the enclosure. After replacing the Argos transmitter with a freewave modem the station was reinstalled. Further visits were to determine reasons for transmission failures, and resulted in successful transmissions prior to failure of the power system at White Island.

Heights:
Box: 41"
Lower temperature: 65"
Pyranometer/ADG boom: 115"
Upper temperature: 196"
Humidity: 192"
Wind: 212"



Lorne

Marble Point II

12/29/2012
Field Team: Lee Welhouse
Location: 77.439°S, 163.759°E

Instrumentation:
Upper and lower temperature: R.M. Young RTD probe
Humidity: Vaisala HMP 155
Wind speed and Direction: RM Young Wind Monitor
ADG: CSI Canada SR50A
Pressure: Paroscientific Pressure Sensor
Radiation Sensor: LI200X

Due to failures at the receiver site in McMurdo issues occurred at Marble Point II so this visit was primarily to check on the installation, reboot the station, retrieve data, and update the operating system. All data looked good and the system seemed to be operating well.

Heights:
ADG: 116"
Pyranometer: 124"
Box: 34"
Lower temperature: 85"
HMP: 213"
Upper temperature: 213"
Wind: 231"

Marble Point II

Janet

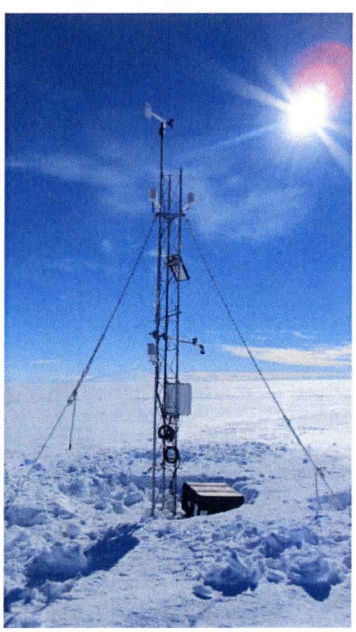
01/15/2013
Field Team: Lee Welhouse and Maria Tsukernik
Location: 77.217°S, 166.439°E

Existing Heights:
Boom: 110"
Box: 43"

Replaced the AWS at Cape Bird with a new Freewave based AWS. The tower section was replaced with a stainless steel tripod. The power system was reused. The power system for the AWS should probably be replaced next year. There was a lot of corrosion on the connectors and the solar panel has lost most of its back coating.

Instrumentation:
Temperature: R.M. Young RTD probe
Humidity: Vaisala HMP 155
Wind speed and Direction: RM Young Wind Monitor
ADG: CSI Canada SR50A
Pressure: Paroscientific Pressure Sensor
Radiation Sensor: None installed

Heights:
Box: 20"
Pressure: 39"
HMP: 70"
ADG: 113"
Wind: 127"
Temperature: 135"



Janet

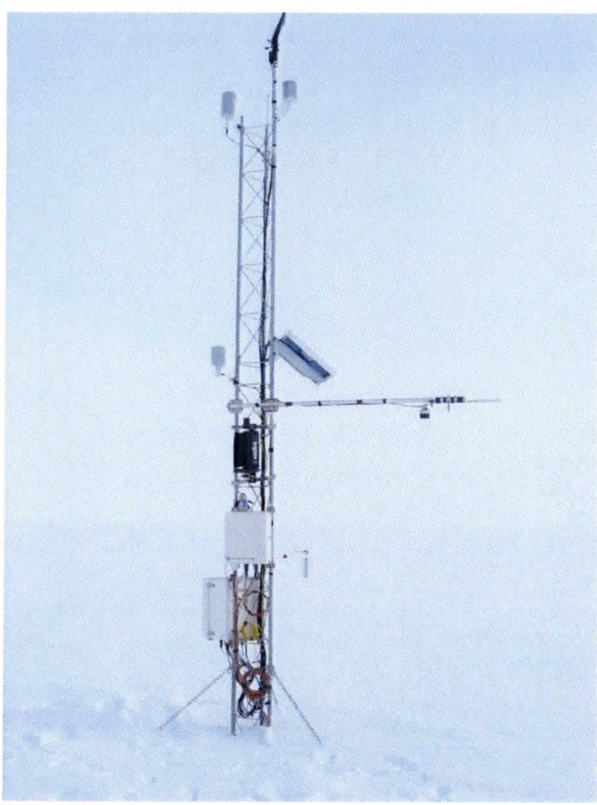
Kominko-Slade

01/11/2013
Field Team: Lee Welhouse and Maria Tsukernik
Location: 79.466°S, 112.1062°W

Station data collected and operating system updated.

Instrumentation:
Temperature: R.M. Young RTD probe, Weed PRT and snow profiles
Humidity: Vaisala HMP 155
Wind speed and Direction: RM Young Wind Monitor
ADG: CSI Canada SR50A
Pressure: Paroscientific Pressure Sensor
Radiation Sensor: CNR2

Heights:
Lower Enclosure: 27"
Upper Enclosure: 53"
HMP: 196"
ADG/Radiation boom: 98"
Wind: 213"
High Temperature: 197"
Low Temperature: 111"



Kominko-Slade

Erin:

1/21/2013
Field team: Lee Welhouse and Maria Tsukernik
Location: 84.90269°S, 128.8528°W

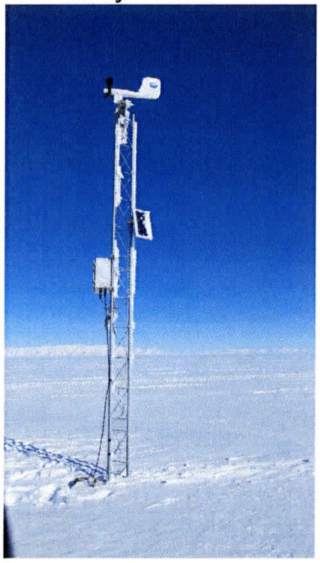
The station was having power and instrumentation issues. We replaced the AWS2B station with a new CR1000 system.

Original Instruments:
Temperatures: Weed PRT
Wind speed and direction: RM Young Wind Monitor
Humidity: Vaisala HMP 45
Pressure: Paroscientific Pressure Sensor

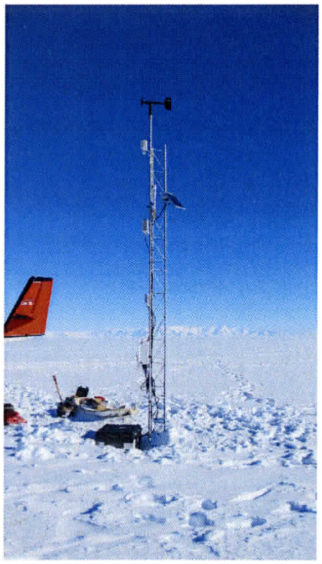
New Instruments
Upper and Lower Temperature: Thermometrics
Wind Speed and direction: RM Young
Pressure: Paroscientific Pressure Sensor
Humidity: Vaisala HMP155

Initial heights:
Boom: 221"
Enclosure: 112"
Lower temp: 99"

Heights after raise:
Aerovane: 221"
Enclosure: 53"
Lower temp: 85"
Upper Temperature: 199"
Humidity: 139"



Erin before



Erin after

Alexander Tall Tower

01/30/2013 and 2/02/2013
Field Team: Lee Welhouse and Maria Tsukernik
Riggers: Michiel Lofton
Location: 79.0387°S, 170.661°E

The rigger inspected the tower and it was vertical. The station was updated to an iridium transmission system unsuccessfully and currently is transmitting incorrectly. The lowest two booms were close to the surface so they were raised.

Original Heights:
Level 1: Surface
Level 2: 29"

Heights after raise:
Level 1: 42"
Level 2: 55"

Tall tower before

Tall Tower after

Schwerdtfeger

02/02/2013
Field team: Lee Welhouse and Maria Tsukernik
Location: 79.837°S, 170.271°E

The station was replaced with a CR1000 station. Issues with the battery system were fixed in the field. In future visits bring quick connect equipment, a new solar panel, and a replacement charge controller.

Original Instruments:
Temperature: Weed PRT
Wind speed and direction: Belfort/Bendex Aerovane
Humidity: Vaisala HMP 45
Pressure: Paroscientific pressure sensor

New Instruments:
Upper Temperature: Thermometrics PRT
Wind Speed and Direction: RM Young
Humidity: HMP155
Pressure: Paroscientific Pressure Sensor

Instrument heights:
Jct. box: 35"
AWS enclosure: 48"
Solar panel: 74"
Boom: 152"


Schwerdtfeger before visit


Schwerdtfeger after visit

Marilyn

02/02/2013
Field team: Lee Welhouse, and Maria Tsukernik
Location: 79.9172°S, 165.6059°E

Station boom was replaced as there were issues with data transmissions. The tower is currently slightly askew, and should be reinstalled to ensure the tower is level.

Instruments:
Aerovane: Belfort/Bendex Wind Monitor
Temperature: Weed PRT
Humidity: Vaisala HMP45
Pressure: Paroscientific Pressure Sensor

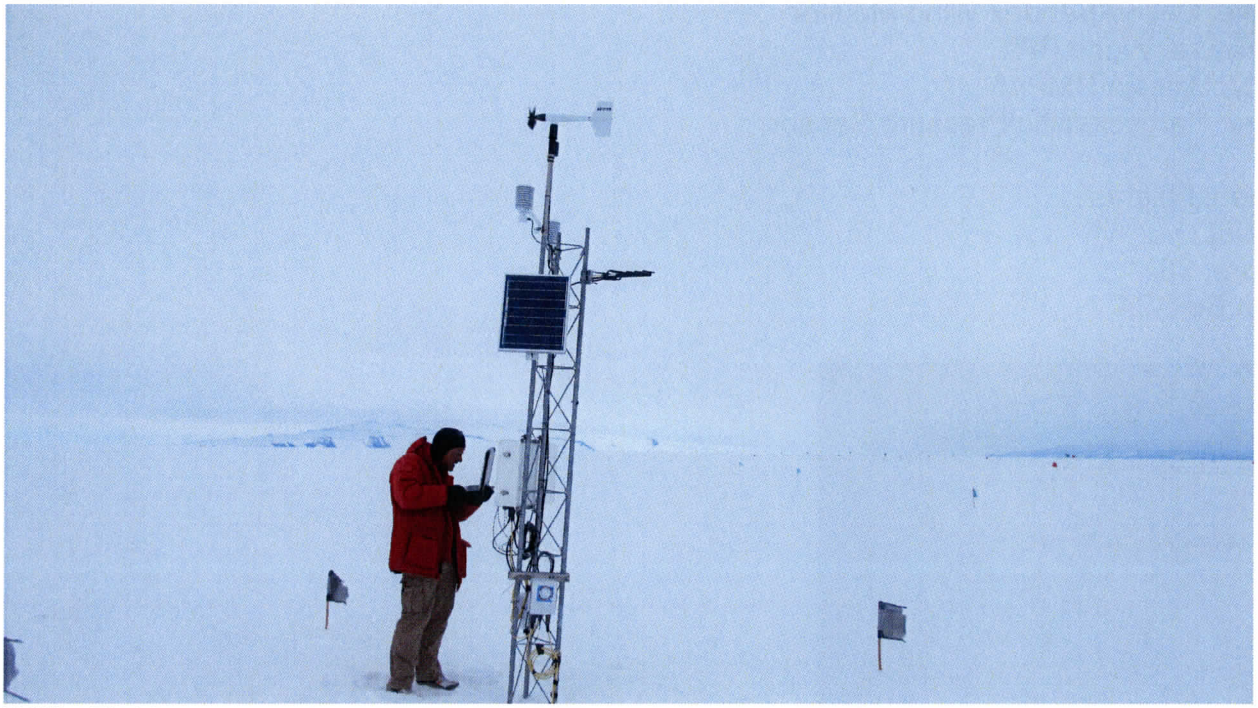
Instrument heights:
Boom: 98”
Enclosure: 38”
Junction Box: 24”

Marilyn

Willie Field

02/03/2013
Field Team: Lee Welhouse and Maria Tsukernik

The electronics on Willie Field were having issues, as such they were replaced and the program reinstalled. No measurements were taken but the station is now transmitting nominally.



Willie Field

French Station updates

Both D-1 and D-47 stations have been removed. Other stations are in need of work/replacement in the future seasons. (See Appendix at the end of this report).

2013 06/028/2013 status update

olor code available AWS for As 13/14 | Sites with issues | * new issues | Serviced in AS 12/13 | Madison AWS IDs

Argos AWS	Site Name	AWS TYPE	Latitude	Longitude	Elevation	WMO	Status/Action
8695	Vito	AWS2S	78.509oS	177.746oE	@+52		TX OK /LT level (burie
***8697**	**Eric**	**AWS2S**	**81.504oS**	**163.940oE**	**@+45**		**OFF day163/LT level (bu**
8722	**returned**	**AWS2S**					**Spare RMY-VM/Telon**
8900	Harry	AWS2B	83.003oS	121.393oW	945		TX OK/Low Batteries,DT
8901	Cape Bird	AWSCR1000	78.250oS	170.000oE	@45		Freewave AWS
Inactive 8902	Butler Island	AWSCR1000	72.207oS	60.160oW	91	89266	Inactive Argos, Iridium A
8903	Byrd	AWSCR1000	80.007oS	119.404oW	1530	89324	TX OK
8904	Dome Fuji	AWSCR1000	77.31oS	39.70oE	3810	89734	TX OK
8905	Manuela	AWSCR1000	74.946oS	163.687oE	80	89864	TX OK
8906	Marble Point	AWS2B	77.439oS	163.754oE	@108	89866	TX OK
Freewave	Marble Point	AWSCR1000	77.439oS	163.754oE	@108	89866	Freewave AWS
8907	**Madison**	**AWS test ID**					**Madison WI**
8908	Marlene	AWSCR1000	*83.65oS*	*167.40E*	*TBD*		TX OK
8909	Cape Denison	AWSCR1000HWS	66.82oS	141.40oE	39		OFF
8910	Roosevelt Island	AWSCR1000	80.00°S	165.00°W	@67		TX OK/Turn off NL115?
8911	Gill	AWSCR1000	*79.985oS*	*178.611oW*	*@54*	89376	TX OK
8912	D85	AWS2B	68.912oS	134.655oE	2682		TX OK
8913	**Schwerdtfeger**	**AWSCR1000**	**79.875oS**	**170.105oE**	**@54**	**89868**	**New install Jan 2013**
8913	**Removed Jan 2013**	**AWS2B**	**79.875oS**	**170.105oE**	**@54**	**89868**	**removed Jan 2013 repl**
8914	**Madison**	**AWS 2outreach DT**					
8915	Sabrina	AWSCR1000	84.25 S	169.98 W	@88		TX OK
8916	D-47	AWSCR1000	70,426oS	134.146oE			TX OK
Inactive 8917	Ski-Hi	AWSCR1000	74.792oS	70.488oW	1395	89272	Argos inactive, TX on da
8918	Relay Station	AWSCR1000	74.017oS	43.062oE	3353	89744	TX OK
8919	Tom	AWSCR1000	*84.43 S*	*171.46 W*	*TBD*		TX OK
Inactive 8920	Fossil Bluff	AWSCR1000	71.33oS	68.283oW	63	89065	Argos Inactive, Iridium A
8921	Bonaparte Point	AWSCR1000	64.778oS	64.067oW	8	89269	TX OK
8922	Bear Peninsula	AWSCR1000	TBD	TBD	TBD		TX OK
8923	Evans Knoll	AWSCR1000	TBD	TBD	TBD		TX OK
8924	Nico	AWS2B	89.000oS	89.669oE	2935	89799	TX OK/LOW Battery vo
Inactive 8925	Limbert	AWSCR1000	75.422oS	59.851oW	40	89257	Argos Inactive, Iridium
Inactive 8926	Larsen Ice	AWSCR1000	66.949oS	60.897oW	17	89262	Argos Inactive, Iridium
8927	AGO 4	AWSCR1000	82.0167°S	96.7667°E	3565	89598	TX OK
8928	Mcmurdo	AWSCR1000	82.518oS	174.452oW	55	89377	McMurdo not deployed?
8929	**Madison**	**AWS2B**	**77.865oS**	**170.819oE**	**@45**	**89872**	**removed Jan 2013**
8930	Thurston Island	AWSCR1000	TBD	TBD	TBD		TX OK
8931	Brianna	AWS2B	83.889oS	134.154oW	@525		TX OK, Low Battery
8932	Dismal Island	AWSCR10X	68.087oS	68.825oW	10		TX OK/Wind out
8933	**New AWS - HWS**	**AWSCR1000HWS**					**Transmitted day 178?**
8934	Marilyn	AWS2B	79.954oS	165.130oE	(72)@64	89869	TX OK/WS out on Belfor

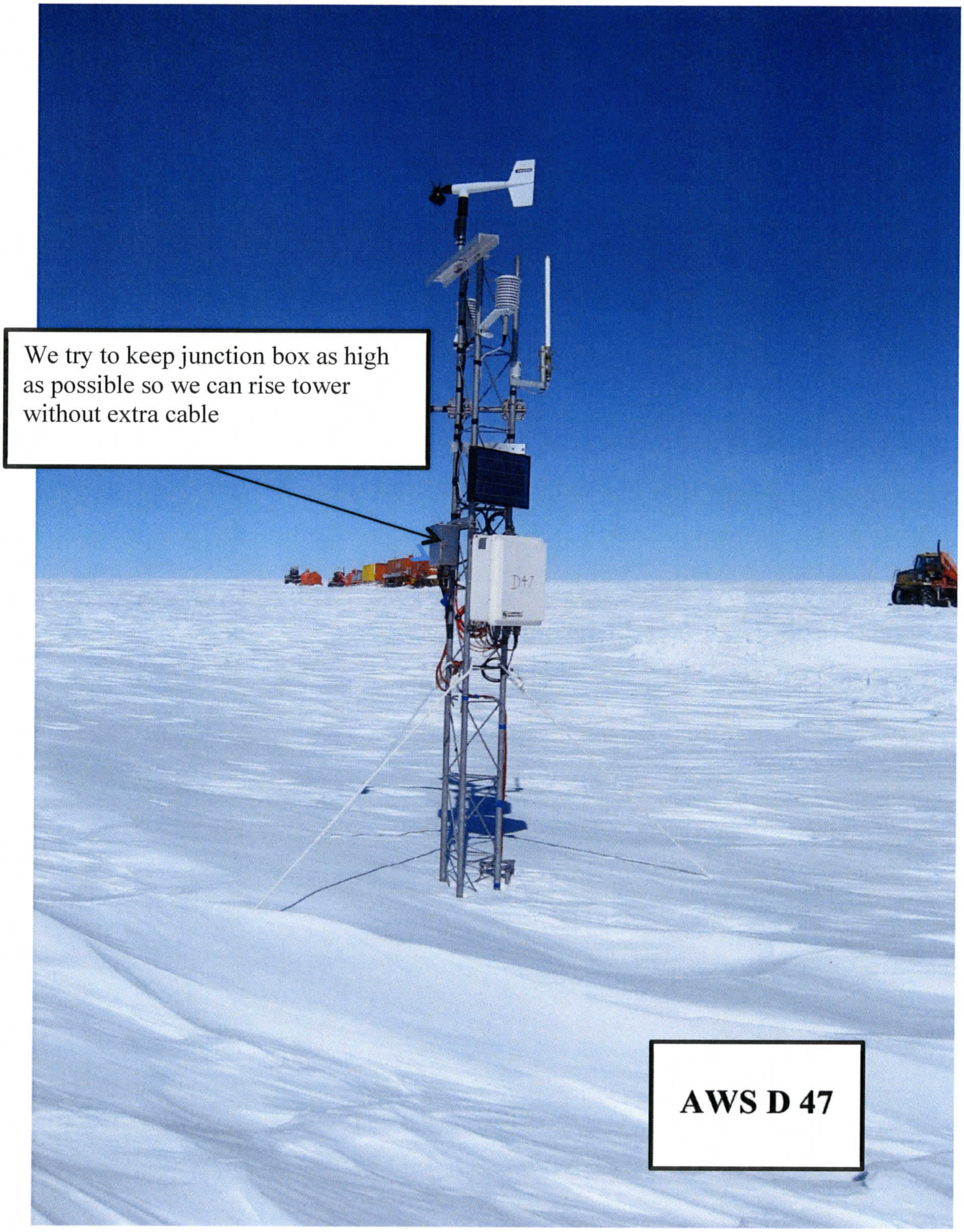
8935	Santa Claus I	AWSCR1000	64.964oS	65.670oW	25		TX OK
8936	Janet	AWSCR1000	77.17 S	123.39 W			TX OK
8937	Pegasus North	AWSCR1000	77.990oS	166.568oE	@5		TX OK
8938		AWSCR1000					To be replacement for 303
8939	Madison	AWS2LT Spare					Testing In MSN/Spare for
8947	Ferrell II	AWSCR1000	77.865oS	170.819oE	@45	89872	TX OK
8980	Emilia	AWSCR10X	78.509oS	173.114oE	@+50		TX OK
8981	Mount Siple	AWS2DH	73.198oS	127.052oW	230	89327	TX Infrequent?Low Bats
Not active	Windless Bight	AWSCR10X	77.728oS	167.703oE	61		removed Jan 2013
	Windless Bight	AWSCR1000	77.728oS	167.703oE	61		Installed as Freewave
8983	**Carolyn**	**AWSCR10X**	**79.964oS**	**175.842oE**	**@+52**		**Last TX Day 177**
8984	Possession Is.	AWSDH	71.891oS	171.210oE	30	89879	TX OK/Low Battereies
8985	Henry	AWS2B	89.011oS	1.025oW	2755	89108	TX OK
8986	Mcmurdo	AWS2B					In Mcmurdo spare AWS2I
Not active	Alex	AWSCR3000	79.045oS	170.651oE	TBD		Last TX February 2, 2013
8988	Whitlock	AWSCR1000	76.144oS	168.392oE	(275)@206	89865	TX OK
8989	Dome C II	AWS2B	75.121oS	123.374oE	3250	89828	TX OK
9116	M83 (BAS) Baldrick	AWSCR1000	82.774 S	13.054 W	1968		TX OK
21355	Spare - Madison	AWS2B					Spare RMY/Telonics/No I
21356	McMurdo	AWS2B					Spare AWS2B
21357	Elaine	AWSCR1000	77.952oS	166.500oE	@8	89667	TX OK
21358	Theresa	AWS2B	84.599oS	115.811oW	1463	89314	TX OK/Lower deltaT buri
21359	Mizuho	AWS2B	70.70oS	44.29oE	2260		TX OK/Low Batteries
21360	Laurie II	AWS2B	77.509oS	170.797oE	@37		TX OK
21361	Elizabeth	AWS2B	82.607oS	137.078oW	@519	89332	Off day 123
21362	Linda	AWS2B	78.439oS	168.406oE	@43	89769	NO TX since day 268
21363	Erin	AWS2B	84.904oS	128.828oW	@990		Removed Jan 2013
21363	Erin	AWSCR1000	84.904oS	128.828oW	@990		Installed Jan 2013
21364	WAIS K-S	AWSCR1000	79.468oS	112.086oW	@1833		TX OK
No PTT	WAIS K-S	AWSCR1000	79.468oS	112.086oW	@1833		Snow temp profile
28336	Nascent	AWSCR10X	78.127oS	178.497oE	30		NO TX since day ? Part T
ar 28338	Madison	AWSCR10X	72.190 S	170.160 E	@14		returned 2011/12
28338	Cape Hallet	AWSCR1000	72.190 S	170.160 E	@14		TX OK
Tr Argos 28339	**Madison**	**AWSCR10X/Seimac**					**Not program ID as of 6/2**
30305	JARE 2008	AWS2B	77.000 S	20.000 E	3400		TX OK
30374	D-10	AWSCR10X	66.71oS	139.83oE	243	89832	TX OK
ar 30393	Siple Dome	AWSCR1000	81.656oS	148.773oW	@668	89345	TX OK
are 30393	Madison	AWSCR10X/Seimac					
30416	Panda South	AWS2B	82.246 S	75.989 E	4027		NO TX since day 125/Lov
30423	Nascent T string	AWSCR10X/Seimac	78.127oS	178.497oE	30		TX OK/Snow temp data
Freewave AWS							
Freewave	Willie Field test	AWSCR1000	77.866oS	166.983oE	@14		Data received
Freewave	Minna Bluff	AWSCR1000	78.555oS	166.691oE	@47	89769	Data received
Freewave	Cape Bird	AWSCR1000	77.224oS	166.440oE	@42		Data received
Freewave	Marble Point	AWSCR1000	77.439oS	163.754oE	@108	89866	Data received
Freewave	**Lorne**	**AWSCR1000**	**78.250oS**	**170.000oE**	**@45**		**New for 2013**
Freewave	**White Island**	**AWSCR1000**					**New for 2013**

Freewave	Windless Bight	AWSCR1000	77.728oS	167.703oE	61		New for 2013
Iceberg AWS							
RTN gos15930	C16	CR10X lost					AWSCR1000 Test ID da
ecording Only							
	Mt Fleming	AWSCR10X	77.533oS	160.276 E	@1868		Converted to logging, 12
	Mt Friis	AWSCR10X	77.747oS	161.516 E	@1581		Converted to logging, 12/2
Inactive Sites							
	E-66	AWS2B	68.912oS	134.655oE	2485		
	Mary	Not active	79.303oS	162.968oE	@+58		
	J.C.	Not active	85.070oS	135.516oW	549		
	Doug	Not active	82.315oS	113.240oW	1433		
	Scott Island	Not active	67.37oS	179.97oW	30	89371	
	Young Island	Not active	66.229oS	162.275oE	30	89660	
	Penguin Point	Not active	67.617oS	146.180oE	30	89847	
	Pegasus South	Not active	77.990oS	166.568oE	@5		
	Mary	Not active 1/2012	79.303oS	162.968oE	@+58		
	Racer Rock	Not active	64.067oS	61.613oW	17	89261	

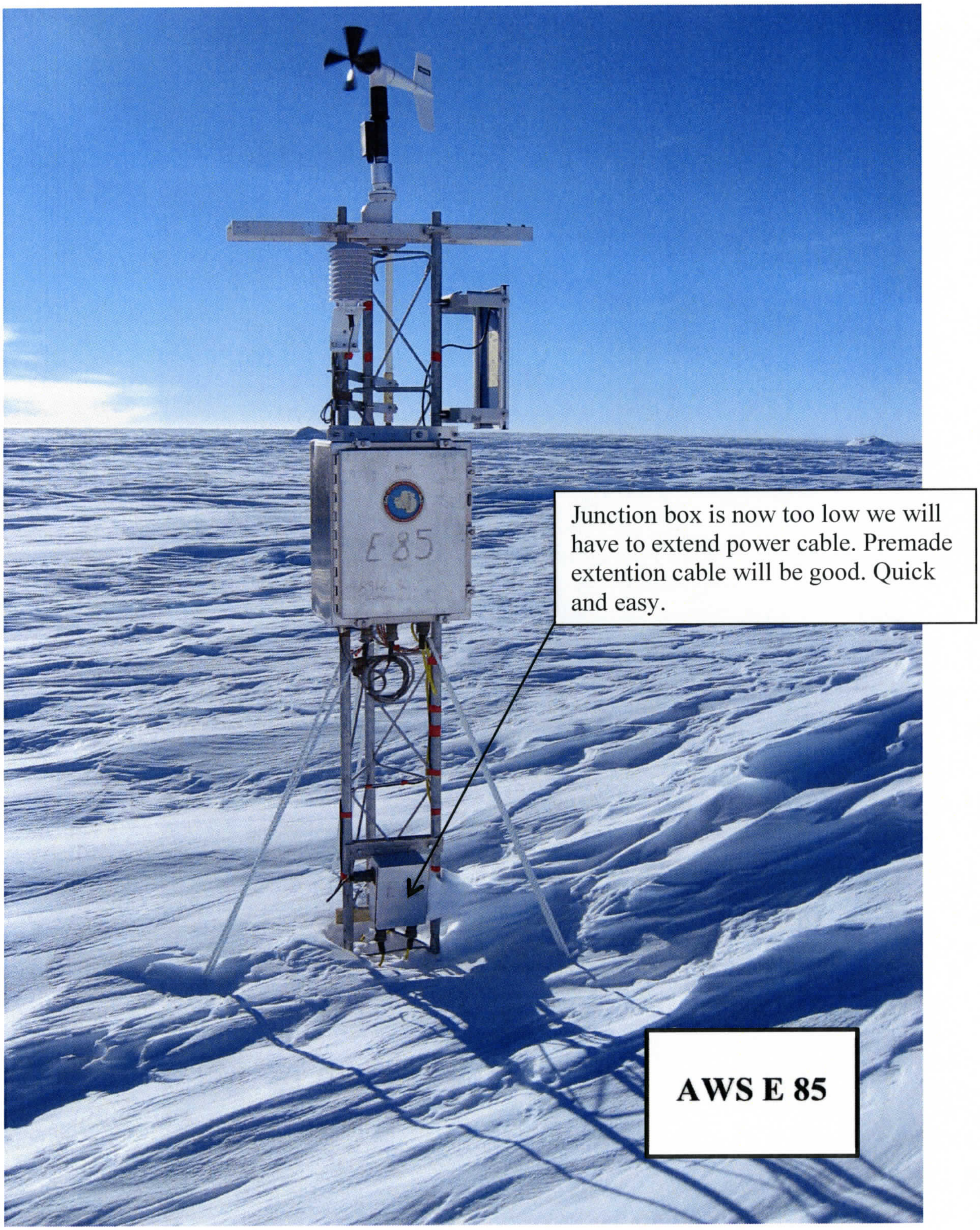
Summary of AWS 2012-2013 Field Season Meeting:

Station visits planned:
Two new stations to be installed in West Antarctica
French stations to be updated
Thurston Island wind bird requires replacing
Harry requires repairs
Janet is having battery issues
White island is having power failure
Ferrell, Linda, and Pegasus North will be updated to Freewave
Lettau remains uninstalled
Alexander Tall Tower! Requires updates to get iridium transmissions working
A number of other stations require raising to ensure they do not get buried.

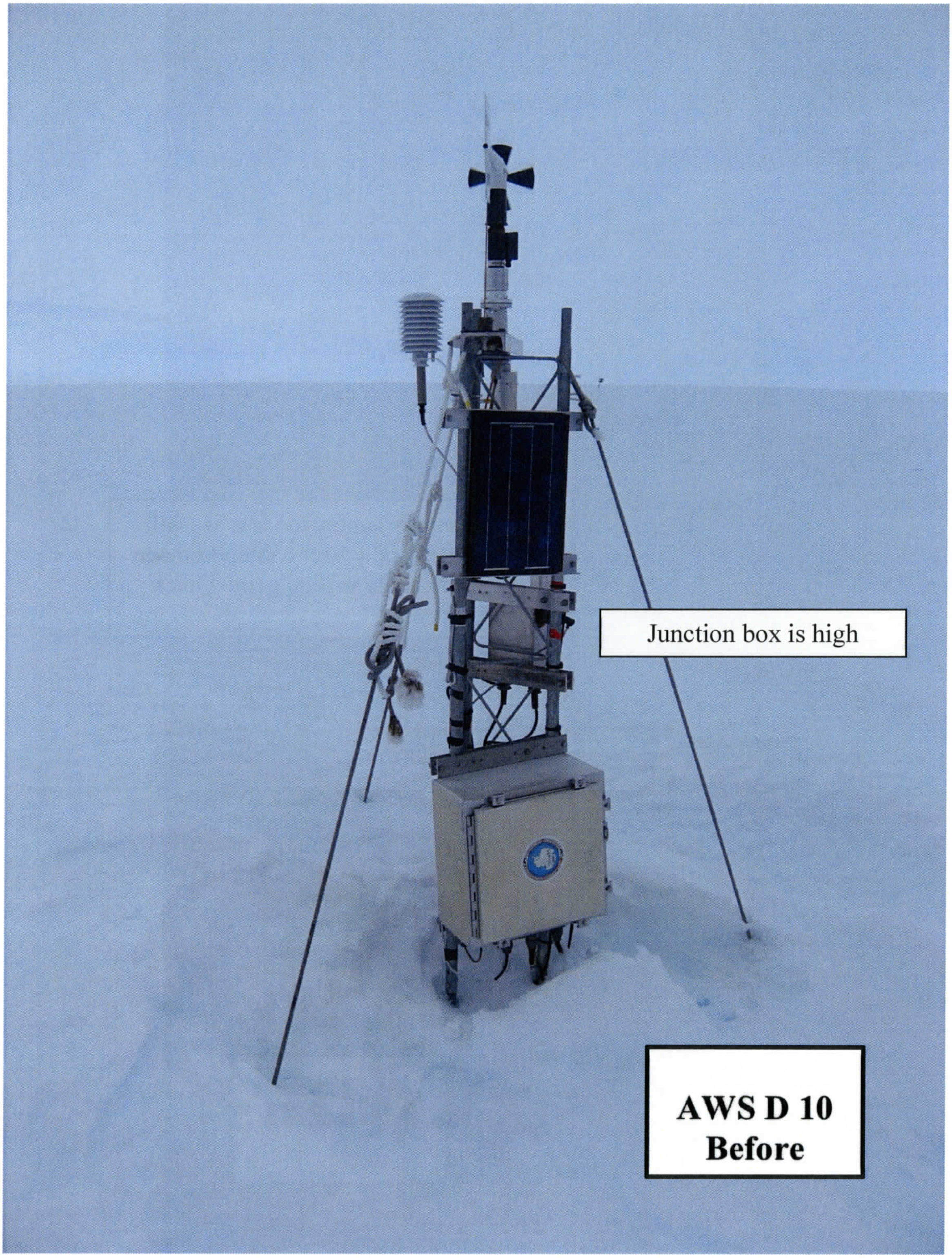
AWS STATIONS - SEASON 2012 – 2013
FRENCH POLAR EXPEDITIONS



AWS STATIONS - SEASON 2012 – 2013
FRENCH POLAR EXPEDITIONS



AWS STATIONS - SEASON 2012 – 2013
FRENCH POLAR EXPEDITIONS



AWS STATIONS - SEASON 2012 – 2013
FRENCH POLAR EXPEDITIONS