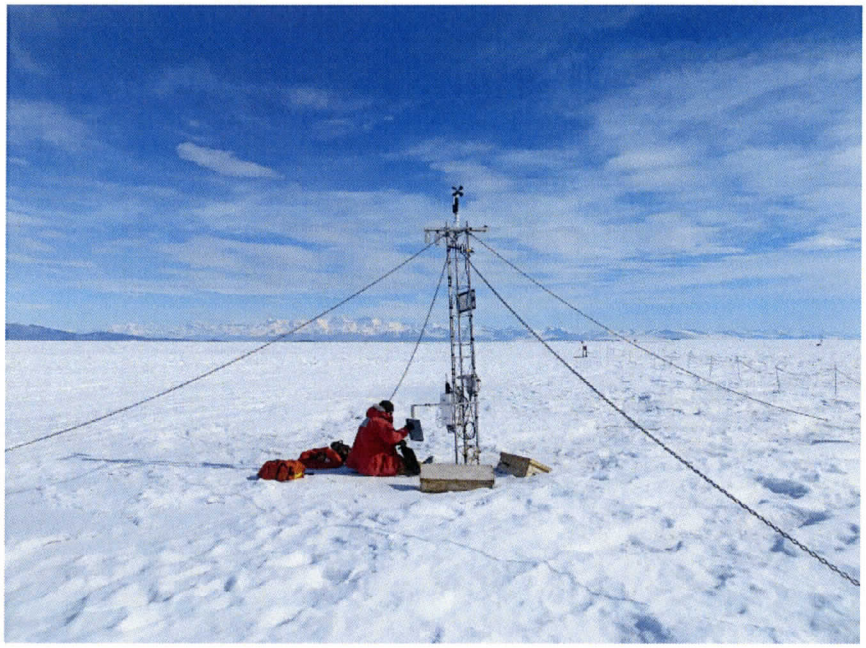
Annual Project Report: NSF-GEO-DPP Grant #ANT-1245663 & 1245737, April 15, 2013 to March 3, 2014

Collaborative Research: Antarctic Automatic Weather Station Program 2013-2017

An Annual Report to
The Division of Polar Programs, Geoscience Directorate, National Science Foundation



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

Antarctic Meteorological Research Center
Space Science and Engineering Center
University of Wisconsin-Madison

Submitted on February 24, 2014

Cover photo and AWS photo collage by David E. Mikolajczyk

Preview of Award 1245663 - Annual Project Report

Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1245663
Project Title:	Collaborative Research: Antarctic Automatic Weather Station Program 2013-2017
PD/PI Name:	Matthew A Lazzara, Principal Investigator
Submitting Official (if other than PD\PI):	Matthew A Lazzara Principal Investigator
Submission Date:	02/13/2014
Recipient Organization:	University of Wisconsin-Madison
Project/Grant Period:	04/15/2013 - 03/31/2016
Reporting Period:	04/15/2013 - 03/31/2014
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?

The Antarctic Automatic Weather Station (AWS) network has been making meteorological observations since the early 1980s. This continent-wide network is positioned to observe significant meteorological events and increase our understanding of the climate of the Antarctic surface. We propose to utilize the AWS network to observe and learn about the Antarctic in a warming world, including the surface climatology of the Antarctic. We will study extreme warming events that have been observed by the AWS network. As a part of this, we aim to improve the AWS observations in the West Antarctic to capture the warming that has been documented in the Peninsula area as well as warming in central West Antarctica. There is a geographic gap in observations in this region and the proposed additional observations can shed light on the progress of this warming, especially when correlated with historic and other regional observations. Additionally, we propose to evaluate if AWS installed at the AGO sites would provide a reliable, robust, and routine set of observations over the East Antarctic to improve the long-term climate observations in the region. A second, but related, focus of this project is to study the lowest portion of the boundary layer over the Antarctic. We propose to estimate surface turbulent fluxes from select AWS sites across the continent and compare these estimates to those from reanalyses and numerical weather prediction models. We also propose an intensive observing period (IOP), using observations from a 30 m tall tower AWS, unmanned aerial vehicles, etc., to improve our understanding of how boundary layer processes are linked to the continuous time series of surface observations from the AWS network. We view the proposed work as an important method of increasing the scientific value of the existing AWS network by providing an improved context for interpreting the AWS observations. Data from the IOP will also be used to evaluate single column and full three-dimensional Weather Research and Forecasting (WRF) model simulations to better characterize errors in weather and climate model representation of the Antarctic boundary layer.

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

Major Activities: The major objectives of this project include:

- Analysis of warming events witnessed by the AWS network
- Conducting analysis of the climate of the Antarctic surface via the AWS network
- Boundary layer study at Alexander Tall Tower! AWS site (joint/complimentary effort with the University of Colorado-Boulder)

Specific Objectives: The specific objectives include:

- Installation of two new AWS sites in West Antarctica
- Removal of some older AWS sites no longer needed or in use supporting research activities.
- Finish the evolution of the Ross island area AWS subnetwork from satellite to VHF data relay
- Quality control of AWS observational datasets

Significant Results: No significant results to report, as of yet.

Key outcomes or Other achievements: There are no outcomes to report, as of yet.

As of the submission of this report, the 2013-2014 AWS servicing field season is nearly complete. There have been some successes, considering the sigificant impact the October 2013 US government shutdown had on the US Antarctic Program, which in turn did limit originally planned AWS project field activities.

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

This project includes opportunities for the training of undergraduate students who participate on that project and continued learning opportunities for the staff also engaged on the project. The undergraduate students have been gaining skills in data analysis along with data distribution and standard meteorological software and programming. These efforts benefit the project, the students, and their careers. Several of the students bring their AWS project work into the classroom in their seminars as a part of their major studies in Atmospheric and Oceanic Sciences. The staff members on the project gain experience both in the field and in the laboratory. Field work is a critical part of the project, and important for the maintenance of the network. The assembly, fabrication, and repair of the AWS equipment is an equally important skill set staff members are engaged in.

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

There are no formal results yet to disseminate, however the AWS observations are made available to the community via the AMRC in real-time as well as quality controlled archive quality data sets via the Web, FTP, RAMADDA, Antarctic-IDD/LDM, etc.

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

Effort in the next reporting period will have a two-pronged approach:

1. Field Season Activities - As outlined in more detail in the changes/problems section, some extra effort will need to be put into the 2014-2015 AWS servicing field season to stay on track with the original proposal plans

2. Science Objectives - Efforts are underway with all science objectives, however each are at different levels of maturity as of this report. In the next reporting period some of these activities will be reaching fruition, and others will be in the middle of their analysis phases.

Supporting Files

Filename	Description	Uploaded	Uploaded

		By	On
2013_AWS_Sites_UW_07_11_2013.pdf	A map of the UW AWS network for 2013	Matthew Lazzara	02/07/2014
2013_AWS_Sites_UW_RossIslandVicinity.pdf	A map of the UW AWS network for 2013 in the Ross Island area.	Matthew Lazzara	02/07/2014
2013-2014-AWS.pdf	A sample set of photographs of the AWS sites serviced in the 2013-2014 field season	Matthew Lazzara	02/10/2014

Products

Journals

olwell, S., L.M. Keller, M.A. Lazzara, and A. Setzer (2014). Surface staffed and automatic weather station observations [in State of the climate in 2013"]. *Bulletin of the American Meteorological Society*. .

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

Books

ook Chapters

Thesis/Dissertations

Conference Papers and Presentations

azzara, M.A. (2013). *AWS Field Season Plans for 2013-2014 and Beyond*. 8th Antarctic Meteorological Observing, odeling and Forecasting Workshop. Madison, WI, USA.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

azzara, M.A., N. Weber, C. Costanza, L.M. Keller, G.A. Weidner, J.E. Thom, and J.J. Cassano (2014). *The History of the Antarctic Automatic Weather Station: The Holy Grail of Antarctic Meteorology Observing*. 12th History Symposium, 2014 nnual American Meteorological Society Meeting. Atlanta, GA.

Status = OTHER; Acknowledgement of Federal Support = Yes

ther Publications

echnologies or Techniques

othing to report.

atents

othing to report.

ventions

othing to report.

icenses

Nothing to report.

Websites

Title: Antarctic Automatic Weather Station Web Page

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

Description: This website, which is a part of the Antarctic Meteorological Research Center web site, hosts maps, lists and other information about the AWS project and AWS locations/sites. There are individual, dynamically created web pages for each AWS location which include photographs, station repair histories, etc.

Other Products

Product Type: Databases

Description: The observations made by the Antarctic Automatic Weather Station (AWS) network is a large collection, made available to the community by several means including:

- Web site
- FTP sevice
- RAMADDA service
- McIDAS ADDE server
- Antarctic-IDD/LDM service

Some of this distribution is real-time observations and some is archive.

Other:

Participants

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Matthew A Lazzara	PD/PI	2
Samuel Batzli	Other Professional	1
Carol Costanza	Undergraduate Student	3
Marian Mateling	Undergraduate Student	1
David Mikolajczyk	Other Professional	4
Lee Putman	Other Professional	0
Nick Weber	Undergraduate Student	0
Lee Welhouse	Other Professional	6

What other organizations have been involved as partners?

Name	Location

University of Colorado - Boulder Boulder, CO, USA

Have other collaborators or contacts been involved? N

Impacts

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

There is nothing to report at this time with regards to specific research activities that are a part of this project.

The installation of the new AWS sites proposed in this project are likely to begin an important climate record in West Antarctica where multiple published research papers (and more in progress) have and are calling for additional observations to capture the climate, and its change, in this sensitive portion of the continent.

The whole AWS network furthers our understanding of the Antarctic environment - weather and climate. Specific research tasks that are a part of this project will be reported in the coming year.

What is the impact on other disciplines?

The Antarctic AWS observation data sets are used by other disciplines, particularly glaciology and including biology, logistics and of course, operational weather forecasting. These uses are beyond the research of the Antarctic atmospheric and ocean science community. Weather observations from the AWS network inform decisions related to planning and support research in the ice sheets, climate change (pursued by several disciplines), etc.

What is the impact on the development of human resources?

One of the biggest impacts of this project on the development of human resources is on the mentoring of undergraduate students in the AWS research group. These students are working over a range of tasks associated with the project including, data flow, manipulation and science analysis to name a few. The skills the students are learning are able to propel them into jobs in the workforce or give them an edge into graduate school. The staff members of the project, especially the younger staff members, are also developing skills in accomplishing the field work along with AWS operations, design, fabrication, and maintenance.

What is the impact on physical resources that form infrastructure?

The AWS network is a significant observing infrastructure network in Antarctica. The broad expanse of the Antarctic covered by the network, and the fact that this network roughly contains half of all known AWS over the entire continent, lend to this being a critical infrastructure for research and operations.

Changes started under the prior Antarctic AWS project and continuing under this project, involve the switch of a segment of the network in the Ross Island region from the Argos satellite relay system, to the use of a VHF "Freewave" relay system. While this system saves on satellite costs after the investment in the infrastructure, the design of the VHF network does have some unavoidable single point failures. Roughly 9 AWS have been successfully switched to this system.

What is the impact on institutional resources that form infrastructure?

Nothing to report.

What is the impact on information resources that form infrastructure?

Data services and preservation of the AWS observations are important outcome of this effort. Having the observations made available to the broader community will be invaluable for future research efforts. The AMRC has been a part of the Antarctic

Data Consortium, and it keeping in touch with the Arctic and Antarctic Data Consortium (A2DC), and hopes to continue to provide AWS observations to the larger community. Some items of need here include handle revisioning, metadata, and acknowledgment. Efforts for these are on-going as the project allows.

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

What is the impact on society beyond science and technology?
Nothing to report.

Changes

Changes in approach and reason for change
Nothing to report.

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

The shutdown of the US federal government in October 2013, and the result of the United States Antarctic Program going into caretaker status has indeed impacted the field work goals of this project. The West Antarctic field camp WAIS Divide was not opened this season (2013-2014) and as such, it prevented the installation of two new AWS sites along with the servicing of 3 to 4 more AWS sites in the region. Efforts to mitigate this will be addressed in the Support Information Package (SIP) to be filed with the NSF subcontractor, Antarctic Support Contract (ASC) due on April 1. Requests will be made for additional flights and field time to accomplish these goals not completed during this past field season. Additional personnel may be deployed to Antarctica to make sure next season's tasks are successful in addition to the tasks in need of completion.

Changes that have a significant impact on expenditures

At this time, the actual problem will not likely have an impact on expenditure from the grant awarded to the University of Wisconsin, however it may impact the expenditure needed to support the project in the field in the Antarctic next field season.

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 1245737 - Annual Project Report

Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1245737
Project Title:	Collaborative Research: Antarctic Automatic Weather Station Program 2013-2017
PD/PI Name:	John J Cassano, Principal Investigator
Recipient Organization:	University of Colorado at Boulder
Project/Grant Period:	04/15/2013 - 03/31/2016
Reporting Period:	04/15/2013 - 03/31/2014
Submitting Official (if other than PD\PI):	N/A
Submission Date:	N/A
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?**

The major goals for the University of Colorado portion of this project are:

- Analysis of the atmospheric boundary layer using standard AWS, 30 m Tall Tower AWS, and unmanned aerial vehicles (UAVs)

- Assist in maintenance of Antarctic AWS network

Broader Impacts

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

- Public outreach via blogs and school visits

- Post-doctoral research scientist training

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

Major Activities: During the first year of this project (April 2013 – March 2014) the Cassano group at the University of Colorado focused on three main research activities:

- analysis of the atmospheric surface layer in the vicinity of the Tall Tower AWS on the Ross Ice Shelf

- a dedicated boundary layer observing field campaign during the 2013-14 Antarctic field season

- on-going analysis of the dynamics of the low-level winds over the Ross Ice Shelf.

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 an objective identification of the potential temperature profiles observed during the two year period. The frequency of occurrence and seasonality of the 30 potential temperature profiles identified by the SOM algorithm were determined. Mean profiles of temperature, wind speed, and differences in temperature and wind speed over the height of the AWS were 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, in summer, and strong near surface inversions, in winter. 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.

In January 2014 two members of the AWS field team (Cassano and Nigro) conducted a 2-week intensive observing period at the Tall Tower AWS site. Cassano and Nigro used Small Unmanned Meteorological Observer (SUMO) UAVs as the primary observing tool. Two Snow Web AWS were deployed 10 km south and west of the Tall Tower AWS to characterize advection during the field campaign. These AWS were installed through a collaborative effort with

Professor Adrian McDonald's research group at the University of Canterbury.

During the two-week field campaign a total of 41 SUMO flights were conducted. These flights documented nearly continuous well-mixed boundary layer conditions with only a few cases of weakly stable boundary layers. The depth of the boundary layer was shallow (less than 400 m) throughout this field campaign. Temporal evolution of the boundary layer (observed as frequently as hourly) showed evidence of both surface based heating as well as large advective changes in temperature and large-scale forcing for changes in boundary layer depth.

Analysis of the data from the SUMO UAVs, Tall Tower AWS, and Snow Web AWS is on-going. We expect to publish a data paper in *Earth System Science Data* to coincide with publication of this data in the United States Antarctic Program Data Coordination Center, a paper describing the boundary layer features observed during the intensive observing period, and to collaborate with colleagues at Ohio State University and the National Center for Atmospheric Research to use the SUMO data to evaluate boundary layer features simulated by AMPS.

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. In the past year we have finalized this work, which had been started as part of the previous AWS award. A manuscript analyzing the surface wind patterns over the Ross Ice Shelf using 2 years (2008 to 2010) of Antarctic Mesoscale Prediction System (AMPS) and AWS output is currently in press in *Monthly Weather Review* (Nigro and Cassano 2014a). This manuscript builds upon previous research into the low level wind field over the Ross Ice Shelf by using a higher resolution version of AMPS output and focusing the wind pattern identification on only those winds over the Ross Ice Shelf rather than the broader Ross Sea sector of the continent. This work has shown the Ross Ice Shelf airstream is present over 30% of the time and that when present barrier wind corner jets occur adjacent to the Transantarctic Mountains over 40% of the time. Barrier wind corner jets in the Ross Ice Shelf airstream were first identified by Nigro et al. (2012).

A second paper analyzing the dynamics of the low level winds over the southern Ross Ice Shelf (Nigro and Cassano 2014b) has been submitted to *Monthly Weather Review*. This research has found that the barrier parallel flow that occurs during RAS events is not driven by classic barrier wind dynamics as previously thought. These winds are driven primarily by the thermal contrast between the elevated East Antarctic plateau and the free atmosphere over the

Ross Ice Shelf. The forcing that arises due to this baroclinic zone results in a low level wind field that is similar to what would be expected from barrier wind dynamics but is not driven by the presence of cold air pooled at the base of the barrier.

Members of the University of Colorado also contributed to an overview of the 2012-2013 Antarctic AWS field season (Lazzara et al. 2014).

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

Our analysis of two years of Tall Tower AWS data will contribute to an improved understanding of Antarctic surface layer features. We expect to submit a manuscript describing these results in 2014.

The SUMO UAV intensive observing period during January 2014 will increase our knowledge of Antarctic boundary layer processes. Several manuscripts are planned based on this data.

Two manuscripts (one in press and one under review) describing the climatology of the low level wind regime over the Ross ice shelf and the dynamics of this low level flow have been submitted (Nigro et al. 2014a, 2014b).

Significant Results: 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.

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. The manuscript describing these results is currently in review (Nigro et al. 2014b).

Key outcomes or Other achievements: A very successful SUMO UAV intensive observing period was completed in January 2014 at the Tall Tower AWS. Data from this intensive observing period will allow us to analyze the temporal evolution of the Antarctic boundary layer on an hourly time scale. Data from this field campaign will be used to evaluate the simulation of boundary layer features in AMPS.

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

This project supported post-doctoral research scientist Melissa Nigro. On this project Dr. Nigro has acquired the necessary skills to analyze observational data (AWS and UAV) and numerical model output (AMPS). She has become proficient in the use of self-organizing maps (SOMs) to identify patterns in large data sets and has pioneered the use of SOMs for the analysis of boundary layer profiles. She has also gained Antarctic field experience using UAVs from her participation in the 2013-14 AWS field season.

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

The Cassano research group has led the preparation of two manuscripts (one in press and one in review) and contributed to one additional manuscript (in review) in the last year. The Cassano research group contributed to or gave 7 oral presentations in the last year. One of these presentations was an invited presentation.

Both Cassano and Nigro maintained blogs during the 2013-14 Antarctic field season.

Cassano's blog can be found at:

http://cires.colorado.edu/blogs/antarcticuavs/

This blog had 2600 page views during January and February 2014, over 2000 of which were unique. This blog was responsible for 2 to 3% of all web traffic to the CIRES web page during these months and was the most widely read blog ever published by CIRES. The CIRES outreach and education group is using this blog as an example of CIRES outreach activities to develop potential collaboration with the Denver Museum of Nature and Science.

Cassano has also contributed an interview and videos for a documentary on ice runways that is being prepared for the Travel Channel.

Conferences attended / presentations:

Attend 12th Conference on Polar Meteorology and Oceanography. Seattle, WA, 29 April – 1 May 2013.

Mikolajczyk, D.E., M.A. Lazzara, L.J. Welhouse, L.M. Keller, J.E. Thom, M. Tsukernik, and J.J. Cassano, 2013: The Antarctic automatic weather station network: The challenges and rewards of making polar observations. 12th Conference on Polar Meteorology and Oceanography. Seattle, WA (oral).

Nigro, M.A. and J.J. Cassano, Analysis of low-level winds over the Ross Ice Shelf, Antarctica: Barrier winds along the Transantarctic Mountains. 12th Conference on Polar Meteorology and Oceanography. Seattle, WA (oral).

Collaborative visit with Lindenberg und Müller GmbH & Co., Hildesheim, Germany, 24-28 May 2013 for SUMO UAV testing.

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. 8th Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI (oral).

Nigro, M., J. Cassano, L. Keller, and M. Lazzara, 2013: Observations of vertical temperature profiles over the Ross Ice Shelf from Alexander tall tower. 8th Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI (oral).

Nigro, M. and J. Cassano, 2013: Forcing mechanisms of the Ross Ice Shelf airstream. 8th Antarctic Meteorological Observation, Modeling, and Forecasting workshop, Madison, WI (oral).

Attend Davos Atmosphere and Cryosphere Assembly 2013, Davos, Switzerland, 8-12 July 2013.

Lazzara, M., L.J. Welhouse, D.J. Mikolajczyk, J.E. Thom, L.M. Keller, and J.J. Cassano, 2013: Antarctic automatic weather station program. Davos Atmosphere and Cryosphere Assembly 2013, Davos, Switzerland (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.J., 2013: Observations of the Antarctic atmosphere using unmanned aerial vehicles. Planning and operational meeting on polar atmospheric measurements related to the DOE ARM program using small unmanned aerial systems and tethered balloons. (invited).

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

*** 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 a manuscript based on our analysis of two years of Tall Tower AWS data using the method of self-organizing maps. We will prepare data from the January 2014 SUMO intensive observing period for submission to the United States Antarctic Program Data Coordination Center. We will analyze data from the January 2014 SUMO intensive observing period and plan to prepare two manuscripts based on this analysis. We will also work with the AWS group at the University of Wisconsin on manuscripts they will lead.

Products

Books

Book Chapters

Conference Papers and Presentations

Inventions

Journals

Lazzara, M.A., L.J., Welhouse, D.E., Mikolajczyk, M., Tsukernik, J.E., Thom, L.M., Keller, G.A., Weidner, J., Snarski, J.J. Cassano, and L. Kalnajs (2014). University of Wisconsin Antarctic automatic weather station program 2012-2013 field season report: Challenges and successes. *Antarctic Record*. . Status = SUBMITTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Nigro, M.A. and J.J. Cassano (2014). Analysis of Ross Ice Shelf airstream forcing mechanisms using self organizing maps. *Mon. Wea. Rev.*. . Status = SUBMITTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Nigro, M.A. and J.J. Cassano (2014). Identification of surface wind patterns over the Ross Ice Shelf, Antarctica using self organizing maps. *Mon. Wea. Rev.*. . Status = ACCEPTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Products

Other Publications

Patents

Technologies or Techniques

We completed a successful intensive observing period at the Tall Tower AWS on the Ross Ice Shelf using SUMO UAVs. This SUMO-based dedicated field campaign follows successful test deployments in January and September 2012.

Thesis/Dissertations

Websites

http://cires.colorado.edu/blogs/antarcticuavs/

This site is a blog maintained by co-PI Cassano during the 2013-14 Antarctic field season.

Participants/Organizations

What individuals have worked on the project?

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

Full details of individuals who have worked on the project:

John J Cassano
Email: john.cassano@colorado.edu
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Cassano is the University of Colorado PI for the AWS project. He supervises University of Colorado post-doc Melissa Nigro and is leading the analysis of boundary layer processes over the Ross Ice Shelf and led the SUMO UAV intensive observing period at Tall Tower AWS in January 2014.

Funding Support: 9-month salary from University of Colorado

International Collaboration: Yes, New Zealand
International Travel: Yes, New Zealand - 0 years, 2 months, 0 days; Switzerland - 0 years, 0 months, 5 days; Germany - 0 years, 0 months, 5 days

Melissa Nigro
Email: Melissa.Nigro@Colorado.EDU
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Nigro is assisting in the analysis of boundary layer processes over the Ross Ice Shelf. She took part in the 2013-14 Antarctic field season and assisted with the SUMO intensive observing period.

Funding Support: None

International Collaboration: Yes, New Zealand
International Travel: Yes, New Zealand - 0 years, 1 months, 0 days

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location

Name	Type of Partner Organization	Location
Lindenberg und Müller	Industrial or Commercial Firms	Germany

Full details of organizations that have been involved as partners:

Lindenberg und Müller

Organization Type: Industrial or Commercial Firms
Organization Location: Germany

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Lindenberg und Müller have provide the Small Unmanned Meteorological Observer (SUMO) UAVs and training in the use of these UAVs.

Have other collaborators or contacts been involved? No

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 one paper in press and have two papers in review over the past year. These papers describe the dynamics of the low level wind field over the Ross Ice Shelf and provide an overview of the 2012-13 Antarctic field season. We are continuing our analysis of surface layer observations from the Tall Tower AWS and UAV observations of the boundary layer at the Tall Tower AWS.

What is the impact on other disciplines?

It is hoped that our successful 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 post-doctoral research scientist Melissa Nigro. 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 is a mentor for the Association of Polar Early Career Scientists (APECS).

What is the impact on physical resources that form infrastructure?

A portable flux tower was purchased using funds from this project and will be deployed during an upcoming Antarctic field season.

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 taken an active role in public outreach activities, mainly through his field season blog which had over 2600 hits during January and February 2014. These activities expose the public to federally funded research being conducted in Antarctica.

Changes/Problems

Changes in approach and reason for change

We plan to conduct a second SUMO intensive observing period during WinFly 2015 at the Pegasus runway. Our original plans involved an early season intensive observing period at the Tall Tower AWS site. This change in plans will allow us to sample more winterlike conditions and with less expenditure of logistics resources than the original plan. We have discussed this change with our program manager.

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.

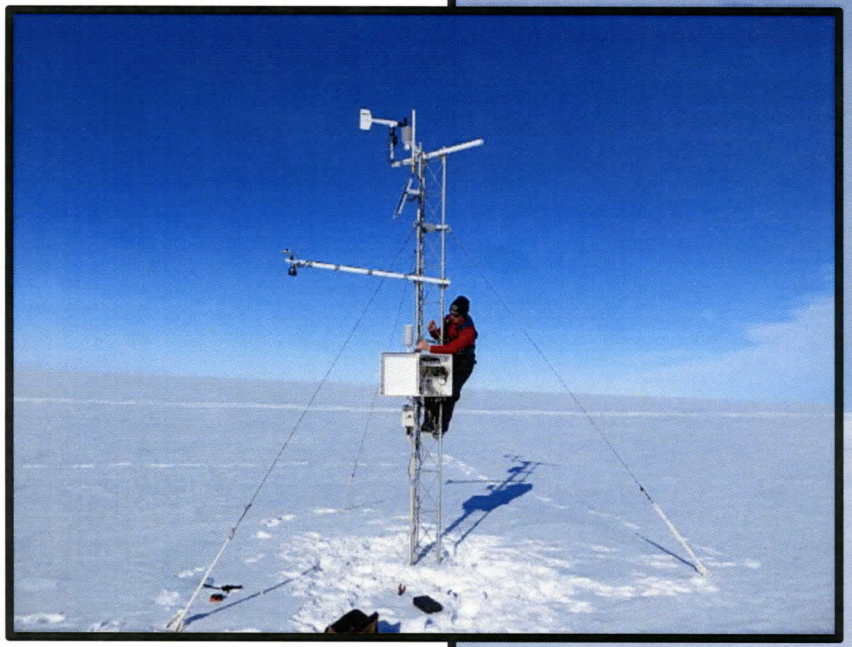
Significant changes in use or care of vertebrate animals
Nothing to report.

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

AWS Field Season 2013-2014

Margaret AWS

Ferrell AWS

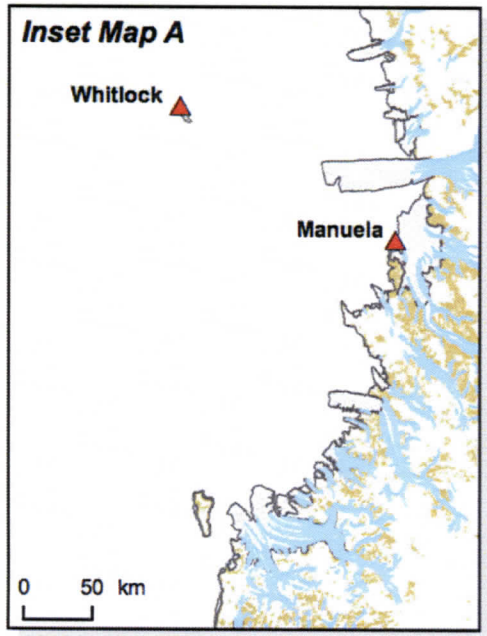


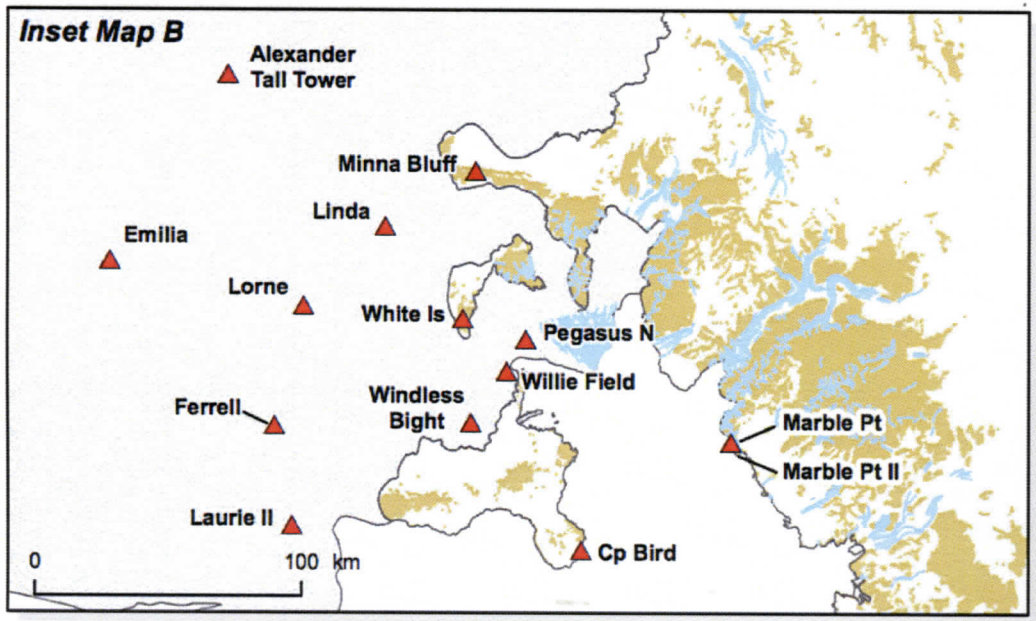
Lettau AWS

Alexander Tall Tower! AWS

White Island AWS

Automatic Weather Stations
University of Wisconsin
2013



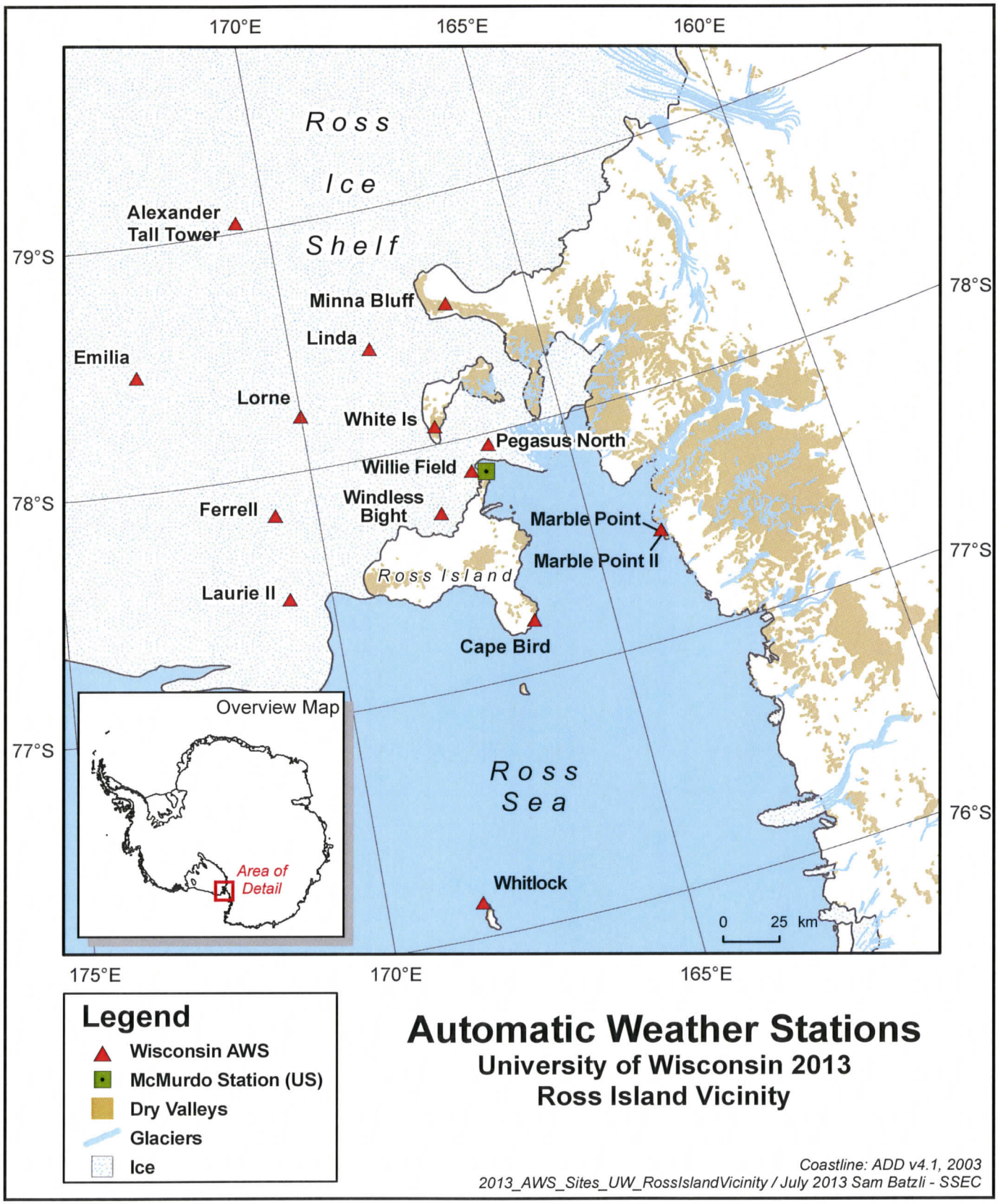


Bonaparte Pt
Hugo Is
Dismal Is
Thurston Island
Evans Knoll
Bear Peninsula
Kominko-Slade (WAIS)
Byrd
Janet
Mt Siple
0
500 km
Harry
Theresa
Erin
Brianna
Sabrina
Tom
Elizabeth
Marlene
Elaine
Siple Dome
Lettau
Eric
Schwerdtfeger
Carolyn
Marilyn
Margaret
Gill
Vito
Nascent
See Inset Map B
See Inset Map A
Cape Hallett
Possession Is
Baldrick
JASE2007
Mizuho
Relay Station
Dome Fuji
Henry
Nico
PANDA-South
AGO 4
Dome C II
D-85
D-47
D-10
Port Martin
Cp Denison

University of Wisconsin AWS

- Univ. of Wisconsin (UW)
- UW / Australia
- UW / China
- UW / France
- UW / Japan
- UW / New Zealand
- UW / United Kingdom

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


170°E
165°E
160°E
Ross
Ice
Shelf
Alexander
Tall Tower
79°S
78°S
Minna Bluff
Linda
Emilia
Lorne
White Is
Pegasus North
Willie Field
78°S
Windless
Bight
Ferrell
Marble Point
Marble Point II
77°S
Ross Island
Laurie II
Cape Bird
Overview Map
77°S
Ross
Sea
Area of
Detail
76°S
Whitlock
0
25 km
175°E
170°E
165°E
Legend
Wisconsin AWS
McMurdo Station (US)
Dry Valleys
Glaciers
Ice
Automatic Weather Stations
University of Wisconsin 2013
Ross Island Vicinity
Coastline: ADD v4.1, 2003
2013_AWS_Sites_UW_RossIslandVicinity / July 2013 Sam Batzli - SSEC