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Preview of Award 1543305 - Annual Project Report

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Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1543305
Project Title:	Collaborative Research: Antarctic Automatic Weather Station Program 2016-2019
PD/PI Name:	Matthew A Lazzara, Principal Investigator Mark Kulie, Co-Principal Investigator
Recipient Organization:	University of Wisconsin-Madison
Project/Grant Period:	09/01/2016 - 08/31/2019
Reporting Period:	09/01/2017 - 08/31/2018
Submitting Official (if other than PD\PI):	Matthew A Lazzara Principal Investigator
Submission Date:	08/20/2018
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?**

Work will focus on AWS maintenance at several AWS locations around the Antarctic, installation of a complimentary precipitation sensor at Alexander Tall Tower! AWS, a focus on publishing results of AWS studies (both across the network and at Alexander Tall Tower! AWS), and working on an associated AWS database, etc. Additional activities included in this project are installing AWS replacement parts and 1 to 2 new AWS systems per year in years 1 and 2 along with acquiring any supplies to support AWS servicing and maintenance.

AWS assembly, preparation and servicing work during field deployment are also a feature of the project. The AWS team will also assist with AWS database management, maintenance, quality control, etc. This project will fund an undergraduate student(s) to participate in project activities and tasks. We will encourage the use of AWS observations via honors projects, classwork, etc. with faculty at the University of Wisconsin-Madison, Madison College, and beyond, to learn about the Antarctic, its weather and climate, etc.

Computing upgrades may be accomplished during the project to replace aging and unsupported systems.

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

Major Activities:

The second year of this project focused on the following activities:

- Maintenance, repair, etc. of AWS sites in Antarctica during the 2017-2018 field season.
- Winter Warming research using observations from AWS sites across the continent.
- Manuscript/publications have been worked on over the past year.
- AWS data quality control (QC) has been a routine activity.

A map of the AWS network is provided (Figure 1) along with an international map (Figure 2).

Specific Objectives:

Field activities activities included visiting 17 of 22 AWS sites in the 2017-2018 field season.

1. Nov. 7 – Lorne (99507) clock is set to the correct time, no data card, power system not dugout
2. Nov. 21 – Marble Point II (99503) and Marble Point (8906) Successful inspection
3. Nov. 21 – Cape Bird (99504) Successful inspection
4. Nov. 21 – Minna Bluff (99501) Full of rimming, temperature sensor missing shield, tower leaning
5. Nov. 21 – White Island (99505) Successful inspection
6. Nov. 22 – Phoenix (8908) Installation without HMP and no transmissions
7. Nov. 26 – Phoenix (8908) Check transmissions
8. Nov. 29 – Gill (8911) Station raise with 5' tower section
9. Nov. 30 – Alexander Tall Tower! (99601) Station inspection
10. Dec. 1 – Gill (8911) Install new Paros
11. Dec. 6 – Phoenix (8908) Install HMP
12. Dec. 7 – Pegasus North (99508) and Linda (99603) Pictures of PGN, remove pressure sensor at LDA
13. Dec. 15 – Pegasus North (99508) Successfully remove AWS, including towers and guy wires
14. Dec. 16 – Lorne (99507) Raise power system, lower T, enclosure, boom, and remove Freewave modem
15. Dec. 29 – Kathie (8929) Station raise with 7' tower section
16. Dec. 31 – Bear Peninsula (8922) Station inspection
17. Jan. 02 – Harry (8900) Raise lower instrumentation, dig out power system, install boom with ADG and solar radiation
18. Jan. 03 – Austin (8901) Station raise with 7' and 5' tower section
19. Jan. 04 – Kominko-Slade (21364) Station raise with 5' tower section
20. Jan. 05 – Kominko-Slade (21364) Finish station raise
21. Jan. 11 – Janet (8936) Station raise with 7' tower section
22. Jan. 12 – Janet (8936) Retrieve extra solar panel and power cable left at site; further secure antenna mount to tower with wire
23. Jan. 13 – Evans Knoll (8923) Attempt to install Taylor high wind system, but

crevassing on the hill made the AWS unreachable

24. Jan. 16 – Thurston Island (8930) and Evans Knoll (8923) Boomerang at THI (too cloudy) but get more pictures of Evans Knoll snow/ice field and crevassing

25. Jan. 18 – Phoenix (8908) Recce trip to determine why the station is no longer transmitting

26. Jan. 20 – Linda (99603) Install new Paroscientific barometer

27. Jan. 20 – Phoenix (8908) Check Argos transmission issues, remove enclosure to troubleshoot at Crary

28. Jan. 24 – Phoenix (8908) Remove power system and solar panel

29. Jan. 27 – Lorne (99507) Install new Freewave modem, still not transmitting

30. Jan. 27 – Willie Field (99506) Swap power system, raise lower temperature and enclosure

31. Jan. 29 – Phoenix (8908) Reinstall enclosure and install new power system and solar panel

32. Jan. 30 – Elaine (21357) Station raise with 5' tower section and installed a new power system

33. Feb. 1 – Windless Bight (99506) Reinstall instrumentation on new tower

34. Feb. 6 – Alexander Tall Tower! (99601) Install new ADG sensor

35. Feb. 7 – Lorne (99507) Last attempt to fix Freewave modem

36. Feb. 7 – Minna Bluff (99501) Setup new guy system, replace temperature sensor, dig out deadmen

37. Feb. 8 – Willie Field (99506) Install Madison College temperature sensor and new PCWS board, etc.

A winter warming research project has developed a manuscript that is now being internally prepared for submission for review in a peer-reviewed journal.

Quality control (QC) of AWS observations has been an on-going activity over the past year both maintaining QC of recently collected observations as well as filling in a gap in the QC data from the past. A manuscript on the QC process along with unique Antarctic examples is in progress.

Significant Results:

Key outcomes or Other achievements:

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

This specific year saw training and the further professional development of the staff involved in the AWS project and, specifically, new experiences for the team. Marian Mateling and Andy Kurth both had first time experiences deploying to Antarctica to work with the AWS networks. Carol Costanza had her first field team lead role.

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

This project has disseminated results via a few means:

- Data distribution (See Products)
- Manuscripts/peer-review publications (See Products)
- Public presentations and Workshop on Antarctic Meteorology
- Indirect Website (See Products)

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

In the next year the following activities will be worked on:

- Disdrometer sensor installation on Alexander Tall Tower! AWS

- Winter warming study manuscript will be completed and submitted for publication in a peer-review journal, along with other publications including a manuscript on the Quality Control (QC) of Antarctic AWS observations, etc.
- The QC of AWS observations will continue throughout the duration of the project.
- AWS network maintenance will be conducted in the 2018-2019 field season.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
2018_AWS_Sites_UW_03_29_2018.pdf	Figure 1. A map of University of Wisconsin-Madison AWS sites as of late March 2018.	Matthew Lazzara	08/20/2018
2018_AWS_Sites_ALL_03_29_2018.pdf	Figure 2. A map of all known AWS in Antarctica as of late March, 2018.	Matthew Lazzara	08/20/2018

Products

Books

Book Chapters

Inventions

Journals or Juried Conference Papers

Clem, K.R., S. Bareira, R.L. Fogt, S. Colwell, C. Costanza, L.M. Keller, and M.A. Lazzara (2018). Atmospheric circulation and surface observations. *[in "State of the Climate in 2017"] Bull. Amer. Meteor. Soc.* 99 (8), S176. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1175/2018BAMSStateoftheClimate.1

Mateling, M.E., M.A. Lazzara, L.M. Keller, G.A. Weidner, and J.J. Cassano (2018). Alexander Tall Tower! A Study of the Boundary Layer on the Ross Ice Shelf, Antarctica. *J. Appl. Meteor. Climatol.* 57 421. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1175/JAMC-D-17-0017.1

Mikolajczyk, D.E., M.A. Lazzara, L.M. Keller, L.J. Welhouse, C.A. Costanza, and J.J.Cassano (2017). Antarctic Winter Warming Events Observed by Automatic Weather Stations: An Analysis of Extreme Temperature Increases. *Mon. Wea. Rev.* . Status = OTHER; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Scambos, T.A., G.G. Campbell, A. Pope, T. Haran, A. Muto, M. Lazzara, C.H. Reijmer, and M.R. van den Broeke (2018). Ultralow Surface Temperatures in East Antarctica from Satellite Thermal Infrared Mapping The Coldest Places on Earth. *Geophysical Research Letters*. 45 (12), 6124. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1029/2018GL078133

Licenses

Other Conference Presentations / Papers

Lazzara, M.A. and A. Cayette (2018). *AWS Wisconsin and Antarctic Stations (USA)*. Year of Polar Prediction - Southern Hemisphere. Madison, WI, USA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Norton, T., M. Lazzara, L., Keller, and C. Costanza (2018). *Antarctic Extremes: Support for the next generation polar weather and climate station*. 43rd North Eastern Storm Conference. Saratoga Springs, NY, USA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Lazzara, M.A., L.J. Welhouse, D.E. Mikolajczyk, and M. Penn. (2018). *Future Wisconsin AWS Field Season 2018-2019*. The 13th Workshop on Antarctic Meteorology and Climate. Madison, WI, USA. Status = PUBLISHED; Acknowledgement of

Federal Support = Yes

M.A. Lazzara and Working Group for Observational Data (WG/OD), Office of Federal Coordinator for Meteorological Services and Supporting Research/ Interdepartmental Committee for Meteorological Services and Supporting Research (OFCM/ICMSSR) (2018). *The US Antarctic Program and WIGOS*. The 13th Conference on Antarctic Meteorology and Climate. Madison, WI, USA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Mikolajczyk, D.E., C. Costanza, M. Mateling, M.A. Lazzara, A. Kurth, and G. Hademenos (2018). *Wisconsin AWS Field Season 2017-2018*. The 13th Workshop on Antarctic Meteorology and Climate. Madison, WI, USA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Other Products

Databases.

The AWS data collection is made available via FTP as well as via a web interface to a database:

<ftp://amrc.ssec.wisc.edu/pub/aws/q10/>

<ftp://amrc.ssec.wisc.edu/pub/aws/q1h/>

<ftp://amrc.ssec.wisc.edu/pub/aws/q3h/>

<ftp://amrc.ssec.wisc.edu/pub/aws/10min/rdr/>

<ftp://amrc.ssec.wisc.edu/pub/aws/antrdr/>

<http://amrc.ssec.wisc.edu/aws/api/form.html>

AWS Metadata Directory Interchange Format (DIF).

AWS Data - Metadata Directory Interchange Format (DIF) entries for the AWS observation in the Antarctic Master Directory via the Global Change Master Directory can be found here:

https://gcmd.gsfc.nasa.gov/search/Metadata.do?entry=SSEC-AWS-AWS_3hour#metadata

https://gcmd.gsfc.nasa.gov/search/Metadata.do?entry=SSEC-AWS-AWS_1hour#metadata

https://gcmd.gsfc.nasa.gov/search/Metadata.do?entry=SSEC-AWS-AWS_10minute#metadata

Other Publications

Patents

Technologies or Techniques

Thesis/Dissertations

Websites

AMRC & AWS Web Site

<http://amrc.ssec.wisc.edu/>

The AMRC & AWS web site showcases both information as well as real-time observations from the AWS network along with some links to other Antarctic weather information. Some key sections of the sites include the archive database offering quality controlled 1-hourly data, and at this time the raw 10-minute non-quality controlled data, in either .csv or netCDF format:

<http://amrc.ssec.wisc.edu/aws/api/form.html>

<ftp://amrc.ssec.wisc.edu/pub/aws/q10/>

<ftp://amrc.ssec.wisc.edu/pub/aws/q1h/>

<ftp://amrc.ssec.wisc.edu/pub/aws/q3h/>

<ftp://amrc.ssec.wisc.edu/pub/aws/10min/rdr/>

<ftp://amrc.ssec.wisc.edu/pub/aws/antrdr/>

Real-time observations can be found here:

<https://amrc.ssec.wisc.edu/data/view-data.php?action=list&product=surface/awsmeteorograms>

<https://amrc.ssec.wisc.edu/data/view-data.php?action=list&product=surface/awstext>

<https://amrc.ssec.wisc.edu/data/view-data.php?action=list&product=surface/plot>

The main information on the AWS project can be found here:

<https://amrc.ssec.wisc.edu/aws/index.html>

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Lazzara, Matthew	PD/PI	0
Kulie, Mark	Co PD/PI	0
Costanza, Carol	Other Professional	4
Mateling, Marian	Other Professional	2
Mikolajczyk, David	Other Professional	8
Welhouse, Lee	Other Professional	6
Batzli, Sam	Staff Scientist (doctoral level)	0
Norton, Taylor	Undergraduate Student	0
Orendorf, Sophie	Undergraduate Student	0

Full details of individuals who have worked on the project:

Matthew A Lazzara

Email: mattl@ssec.wisc.edu

Most Senior Project Role: PD/PI

Nearest Person Month Worked: 0

Contribution to the Project: Matthew Lazzara directs the AWS project. In the past year he has worked on development

of manuscripts and publications that make use of the AWS data with collaborators as well as deployed to the Antarctic to help with the care and maintenance of the AWS network.

Funding Support: N/A

International Collaboration: No

International Travel: No

Mark Kulie

Email: mkulie@mtu.edu

Most Senior Project Role: Co PD/PI

Nearest Person Month Worked: 0

Contribution to the Project: Mark's role in the past year was limited as he has moved to a full-time faculty position at Michigan Tech. University.

Funding Support: N/A

International Collaboration: No

International Travel: No

Carol Costanza

Email: carol.costanza@ssec.wisc.edu

Most Senior Project Role: Other Professional

Nearest Person Month Worked: 4

Contribution to the Project: Carol has participated in the field assisting with the servicing and repair of AWS units in Antarctica. She also historically oversaw the AWS datasets and is training to be able to quality control the AWS observations. This past year she was a lead in the field work on the AWS network. As of July, Carol has left the group to pursue other career opportunities

Funding Support: N/A

International Collaboration: No

International Travel: No

Marian Mateling

Email: mateling@wisc.edu

Most Senior Project Role: Other Professional

Nearest Person Month Worked: 2

Contribution to the Project: Marian deployed to Antarctica to assist with AWS field work during the 2017-2018 field season.

Funding Support: N/A

International Collaboration: No

International Travel: No

David Mikolajczyk

Email: david.mikolajczyk@ssec.wisc.edu

Most Senior Project Role: Other Professional

Nearest Person Month Worked: 8

Contribution to the Project: Dave has become a lead in the effort to prepare for and execute the field work for the AWS project. He has been learning assembly, fabrication, programming, and deployment of the AWS systems in the Antarctic. Dave also assists with troubleshooting any problems with the datasets, has assumed the role as leader of the quality control of AWS observations, and led field work in West Antarctica in the past year. Further, he is researching short-term warming events seen in the observations.

Funding Support: N/A

International Collaboration: No

International Travel: No

Lee Welhouse

Email: lee.welhouse@ssec.wisc.edu

Most Senior Project Role: Other Professional

Nearest Person Month Worked: 6

Contribution to the Project: Lee has led the effort to prepare for and execute the field work for the AWS project. He is assembling, fabricating, programming, and deploying the AWS systems in the Antarctic. Lee also assists with troubleshooting any problems with the AWS datasets and the UHF network throughout the year.

Funding Support: N/A

International Collaboration: No

International Travel: No

Sam Batzli

Email: sabatzli@wisc.edu

Most Senior Project Role: Staff Scientist (doctoral level)

Nearest Person Month Worked: 0

Contribution to the Project: Sam has assisted the project in helping to maintain one of the databases for the AWS project that is used for the AWS web site and the AWS map.

Funding Support: N/A

International Collaboration: No

International Travel: No

Taylor Norton

Email: tnorton2@wisc.edu

Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 0

Contribution to the Project: Taylor has recently joined the project in the last few weeks.

Funding Support: N/A

International Collaboration: No

International Travel: No

Sophie Orendorf

Email: orendorf@wisc.edu

Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 0

Contribution to the Project: Sophie recently joined the project in the last few weeks.

Funding Support: N/A

International Collaboration: No

International Travel: No

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
University of Colorado-Boulder	Academic Institution	Boulder, Colorado, USA

Full details of organizations that have been involved as partners:

University of Colorado-Boulder

Organization Type: Academic Institution

Organization Location: Boulder, Colorado, USA

Partner's Contribution to the Project:

Collaborative Research

More Detail on Partner and Contribution: The Cassano Polar Meteorology group worked with the Wisconsin team on atmospheric boundary layer research using the Alexander Tall Tower! AWS and Unmanned Aerial System (UAS). In the coming year, we will collaborate on the winter warming studies manuscript.

What other collaborators or contacts have been involved?

Work on the The Coldest Place on Earth included work with Ted Scambos and the National Snow and Ice Data Center.

Collaborations with Madison Area Technical College, including Andy Kurth, who deployed with the group in the 2017-2018 field season.

Impacts

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

The AWS network is a critical link in the overarching observing system for Antarctica. The observations generated from the network have enabled us to understand how Antarctic meteorology works, and characterize the climate of the surface. This data has enabled us to not only describe the state of the climate the past year (2017), but to also work toward learning about winter time warming events that play a significant role in affecting Antarctica's winter climate.

What is the impact on other disciplines?

The AWS network and the observational datasets that results from this network have continued to add to our understanding of the Antarctic in other disciplines as well as real-time weather forecasting (both directly by numerical model data

assimilation as well as use by line weather forecasters).

What is the impact on the development of human resources?

This year the project impacted team members' field experiences with two new field team members: Marian Mateling and Andy Kurth. Additionally, two new undergraduate students have joined the project and are getting their first experiences with a research team.

What is the impact on physical resources that form infrastructure?

The AWS network itself is a significant physical infrastructure that is a direct result of this project. With roughly half of all AWS operating in Antarctica today as a part of this network, it has a critical role in capturing the largest set of observations of surface weather and climate across the Antarctic.

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?

Team members involved in this project continue to bring the AWS project to members of the public via outreach activities (University events such as Science Expeditions), laboratory tours at the AMRC/SSEC for K-12, and talks to public groups (Kiwanis, Rotary Club, etc).

Changes/Problems

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.

