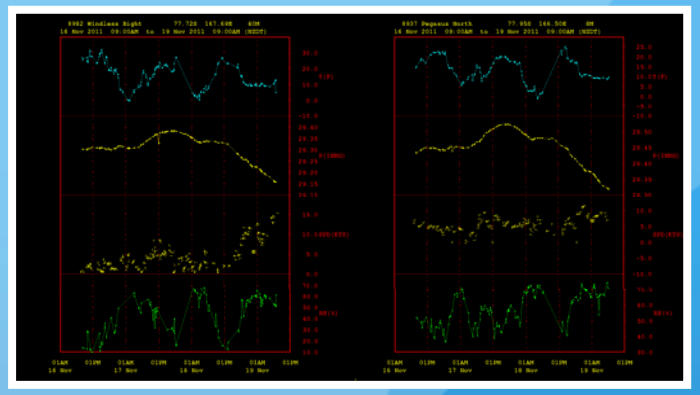
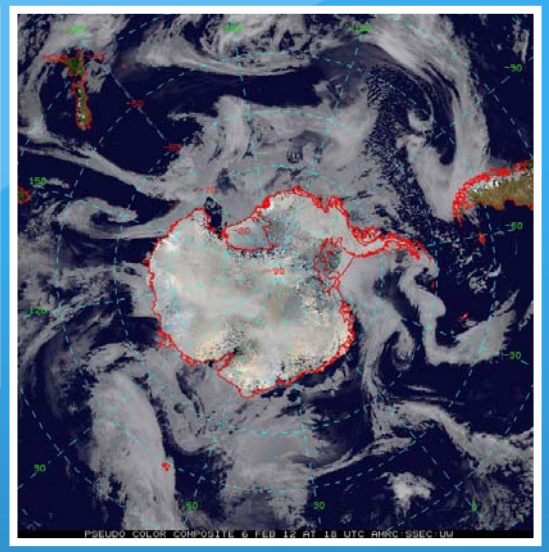
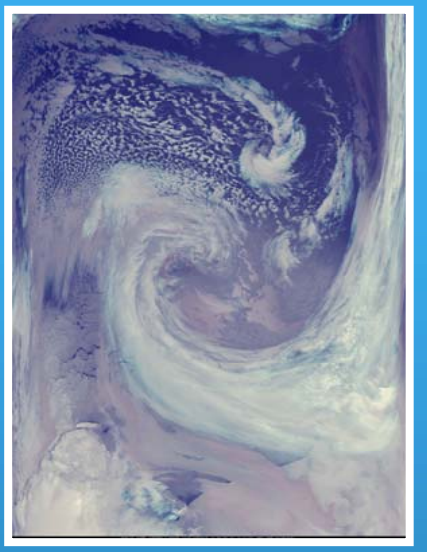






McIDAS at the AMRC

Dr. Matthew A. Lazzara

AMRC - SSEC

UW-Madison

SSEC

THE UNIVERSITY of WISCONSIN MADISON

UNIVERSITY OF WISCONSIN Space Science & Engineering Center

AUTOMATIC WEATHER STATIONS

USAP - NATIONAL SCIENCE FOUNDATION

AMRC

In memory of:

Dr. Neil Adams

1961-2012

Regional Manager Antarctic Meteorological Section

Tasmania/Antarctica Region

Bureau of Meteorology

Australia

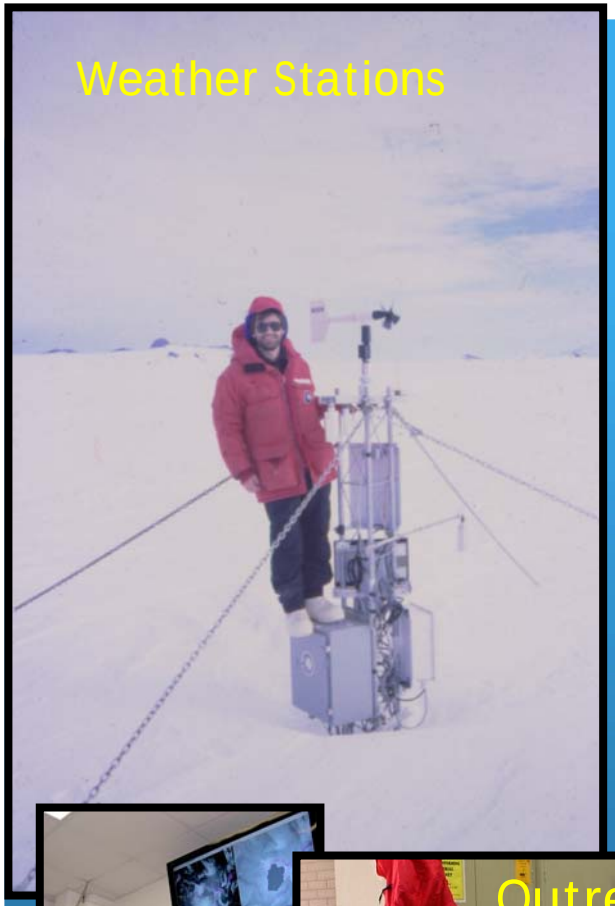
Outline

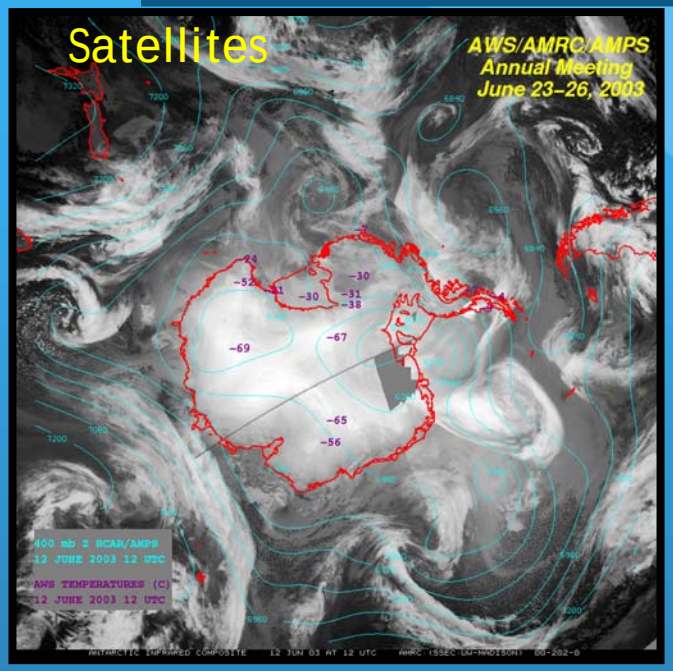
Antarctic Meteorological Research Center
Grantee of the Office of Polar Programs
National Science Foundation
United States Antarctic Program

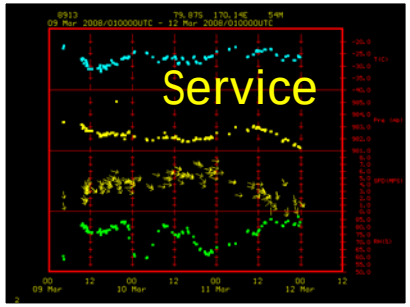
- About the AMRC
  - Who we are, what we do, the US Antarctic Program
- AMRC and McIDAS
  - How we observe Antarctic Weather:
    - Automatic Weather Stations…Records, applications…
    - Satellite Composite Imagery…History, examples…
- Samples of McIDAS Use…
- Servers and Services…
- The other tools we use: McIDAS-V, RAMADDA, etc…

(Sprinkle of photos from the “ice”)

What we do....


Weather Stations


Satellites
AWS/AMRC/AMPS
Annual Meeting
June 23–26, 2003


Service


Teaching


Outreach


Research

Who we are…

Dr. Matthew Lazzara

Melissa Richards, Dr. John Cassano, Dr. Matthew Lazzara, Shelley Knuth

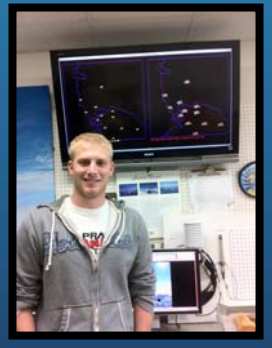
George Weidner

Linda Keller

Jonathan Thom

Elena Willmot

Dave Mikolajczyk



Scott Trevorrow

Joey Snarski

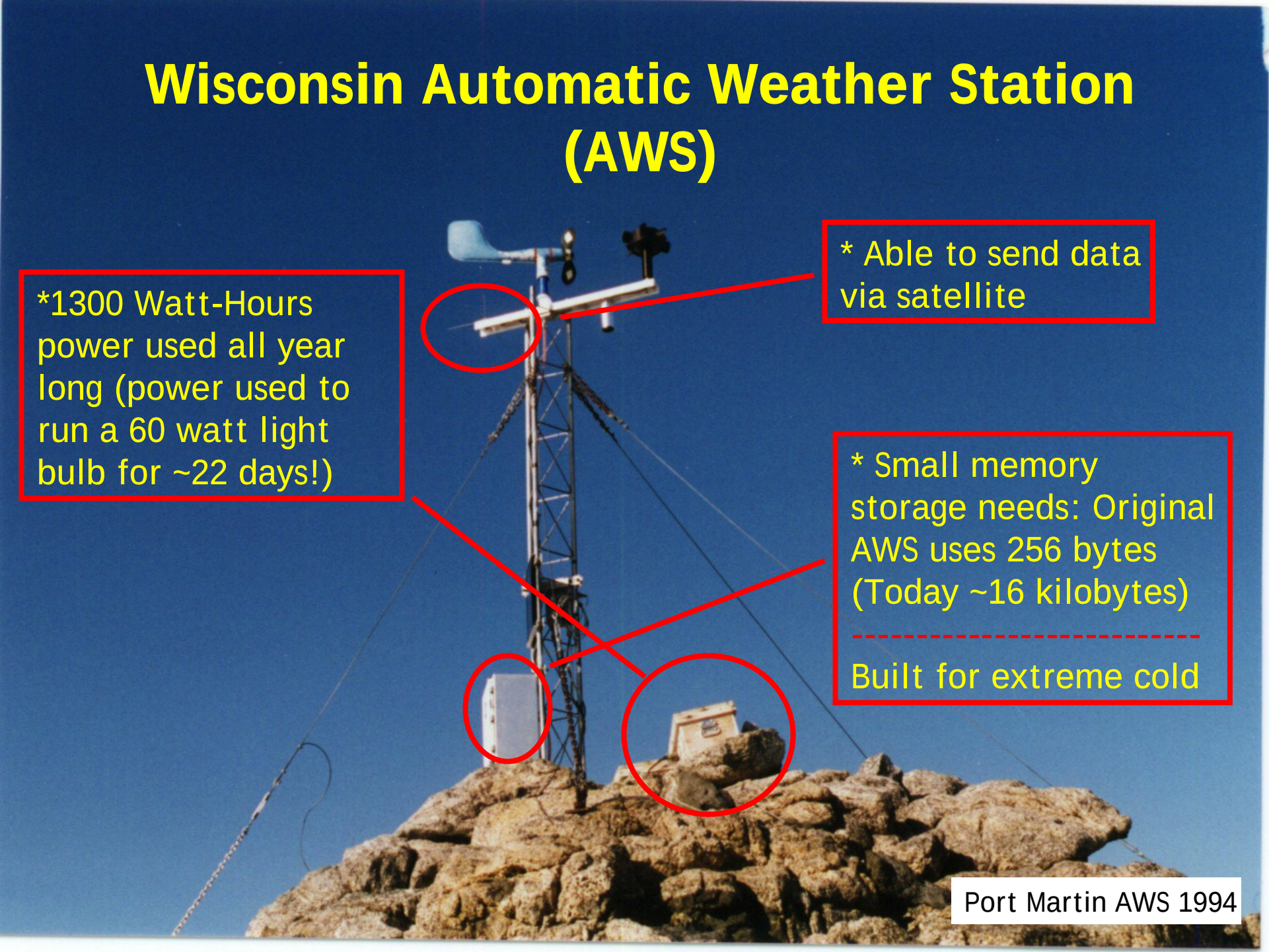
Nick Weber

Lee Welhouse

Antarctic Meteorology
How do we observe the weather?

- Staffed Surface Observations
- Radiosonde/Weather Balloons
- Ships & Buoys
- Aircraft
- Automatic Weather Stations
- Weather Satellite Studies
  - Polar Orbiting
  - Via Satellite Composites

Wisconsin Automatic Weather Station (AWS)



*1300 Watt-Hours power used all year long (power used to run a 60 watt light bulb for ~22 days!)

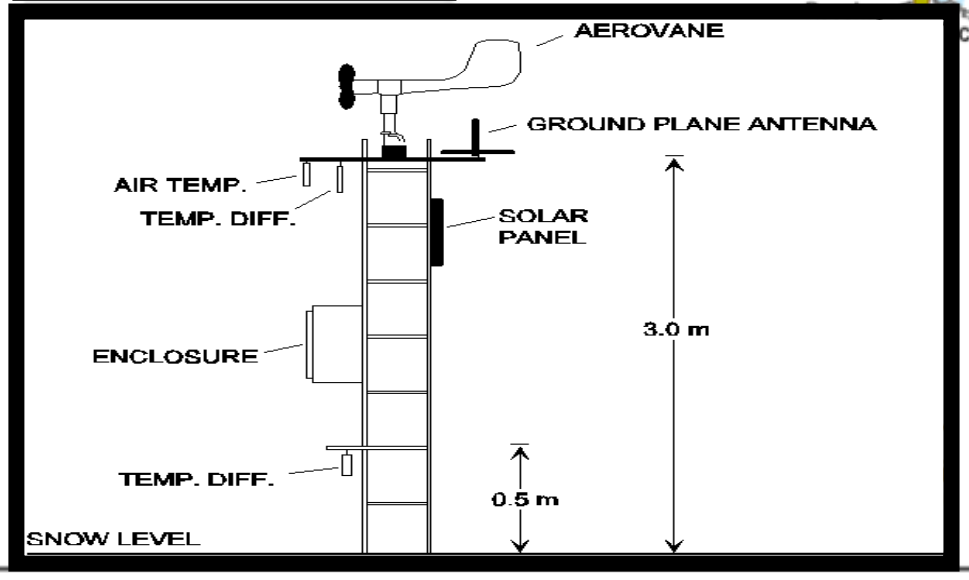
* Able to send data via satellite

* Small memory storage needs: Original AWS uses 256 bytes (Today ~16 kilobytes)

Built for extreme cold

Port Martin AWS 1994

Automatic Weather Stations
Antarctica - 2012



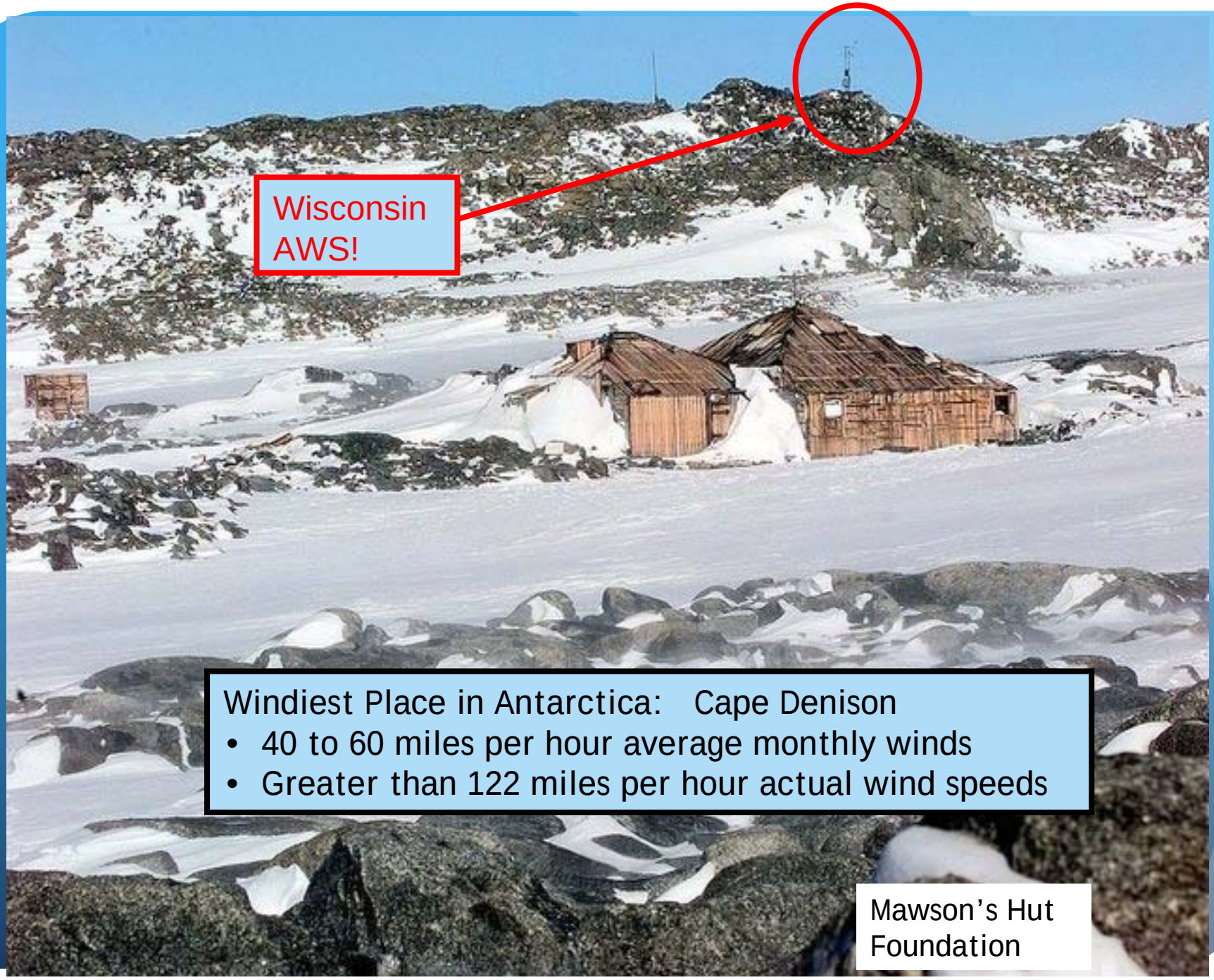
Ekstrom
Atka
Halvfarryggen
Camp Maudheimvida
Svea Cross
Utsteinen
Molodeznaya
Kohnen Base
Mizuho
JASE2007
Relay Station
Mid Point
LGB00-C
Dome Fuji (JPN)
Dome Fuji
Shackleton
Plateau Station B
Joinville Is
AWS 17
AWS 14
AWS 15
Larsen Ice Shelf
Bonaparte Pt
AWS 3
AWS 2
AWS 1
Hugo Is
Bisco Island
Butler Is
Dismal Is
Limbert
Baldrick
AGO-3
Amery G3
Pole of Inaccessibility
Druznaja-4
Whoop Whoop
Fossil Bluff
Sky Blu
PANDA-North
AGO-2
Dome A
Eagle
PANDA-South
Mt Brown
Fletcher Promontory
Union Glacier
Thiel Mountains
Henry
Nico
South Pole
AGO-4
Thurston Island
Kominko-Slade (WAIS)
Theresa
Evans Knoll
Erin
AGO-1
Harry
Brianna
Lindsey Island
Byrd
Sabrina
Tom
Elizabeth
Bear Peninsula
Marlene
Elaine
AGO-5
Haupt Nunatak
Snyder Rocks
Janet
Siple Dome
Lettau
Eric
Skinner Saddle
DC N/S
Dome C
Dome C II
Casey Skiway
Schwerdtfeger
Marilyn
Carolyn
Concordia
Law Dome Summit/A
Darwin Gl
Central Valley
Mary
Margaret
Gill
Cape Poinsett
Mt Siple
Vito
Giulia
Wilkins Runway West 4m / East ICAO
Cape Burks
Nascent
D-85
See Inset Map B
Sofia-B
E-66
See Inset Map A
Modesta
Irene
D-47 (FRN)
Cape Hallett
D-47
D-0
D-1
Possession Is
D-10
D-3
Port Martin
D-17
Leningradskaya
Cp Denison
0
500 km

United States AWS
- Univ. of Wisconsin (UW)
- UW / Australia
- UW / China
- UW / France
- UW / Japan
- UW / New Zealand
- AGO
- SPAWAR
- Other US

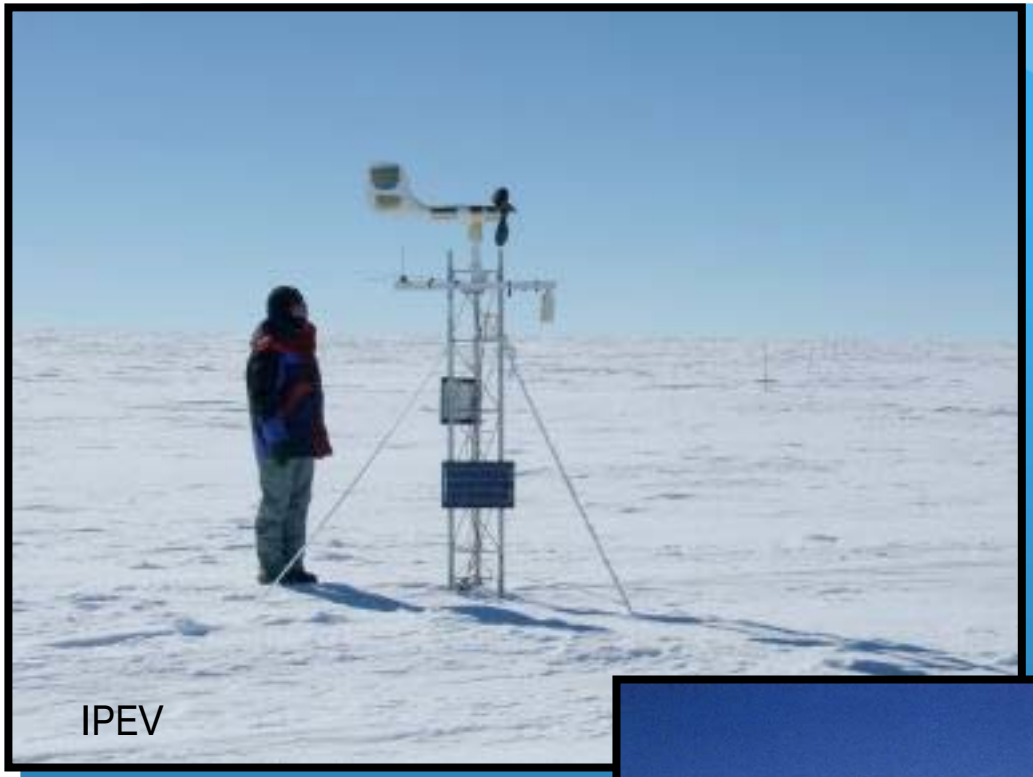
International AWS
- Australia
- Belgium/Netherlands
- Brazil
- China/Australia
- France
- Germany
- Italy
- Japan
- Netherlands
- New Zealand
- Russia
- South Korea
- United Kingdom

Other AWS
- Commercial

Coastline: ADD v4.1, 2003
2012_AWS_Sites_ALL
April 2012 Sam Batzli SSEC
University of Wisconsin-Madison
National Science Foundation ANT-0944018


Wisconsin AWS!
Windiest Place in Antarctica: Cape Denison
• 40 to 60 miles per hour average monthly winds
• Greater than 122 miles per hour actual wind speeds
Mawson's Hut Foundation

Wisconsin AWS Record Antarctic Maximum Wind Speed:
137 miles per hour (61.3 meters per second) at Minna Bluff on July 10, 2001

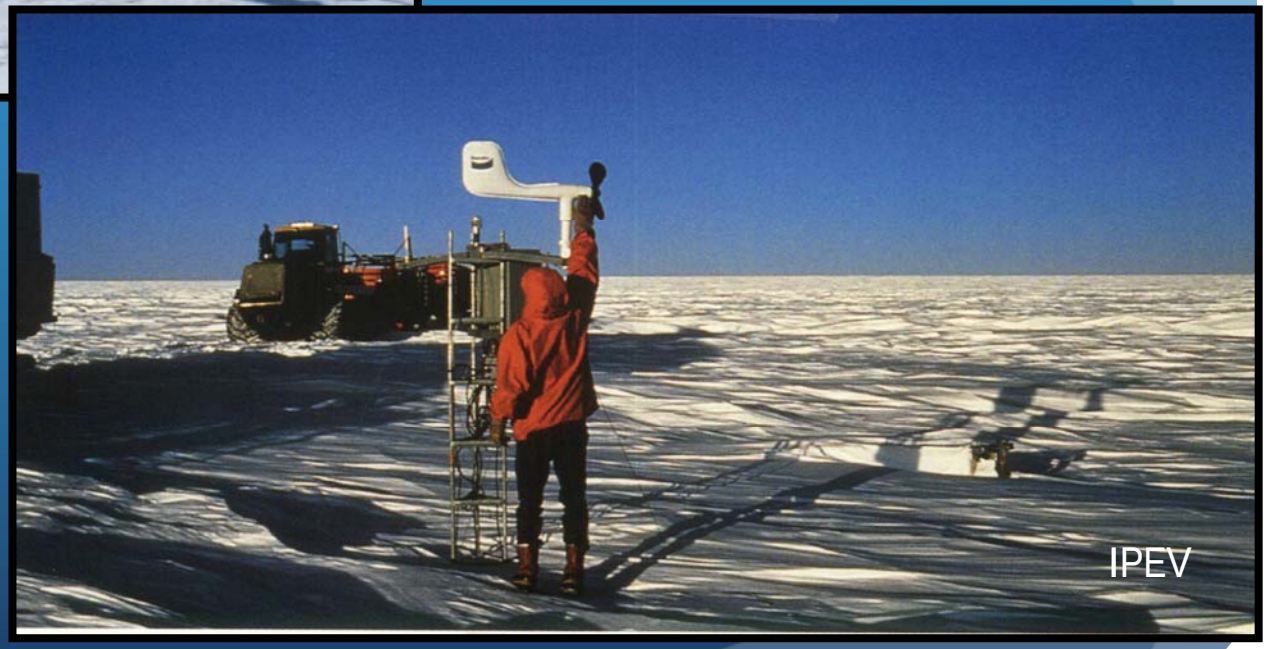


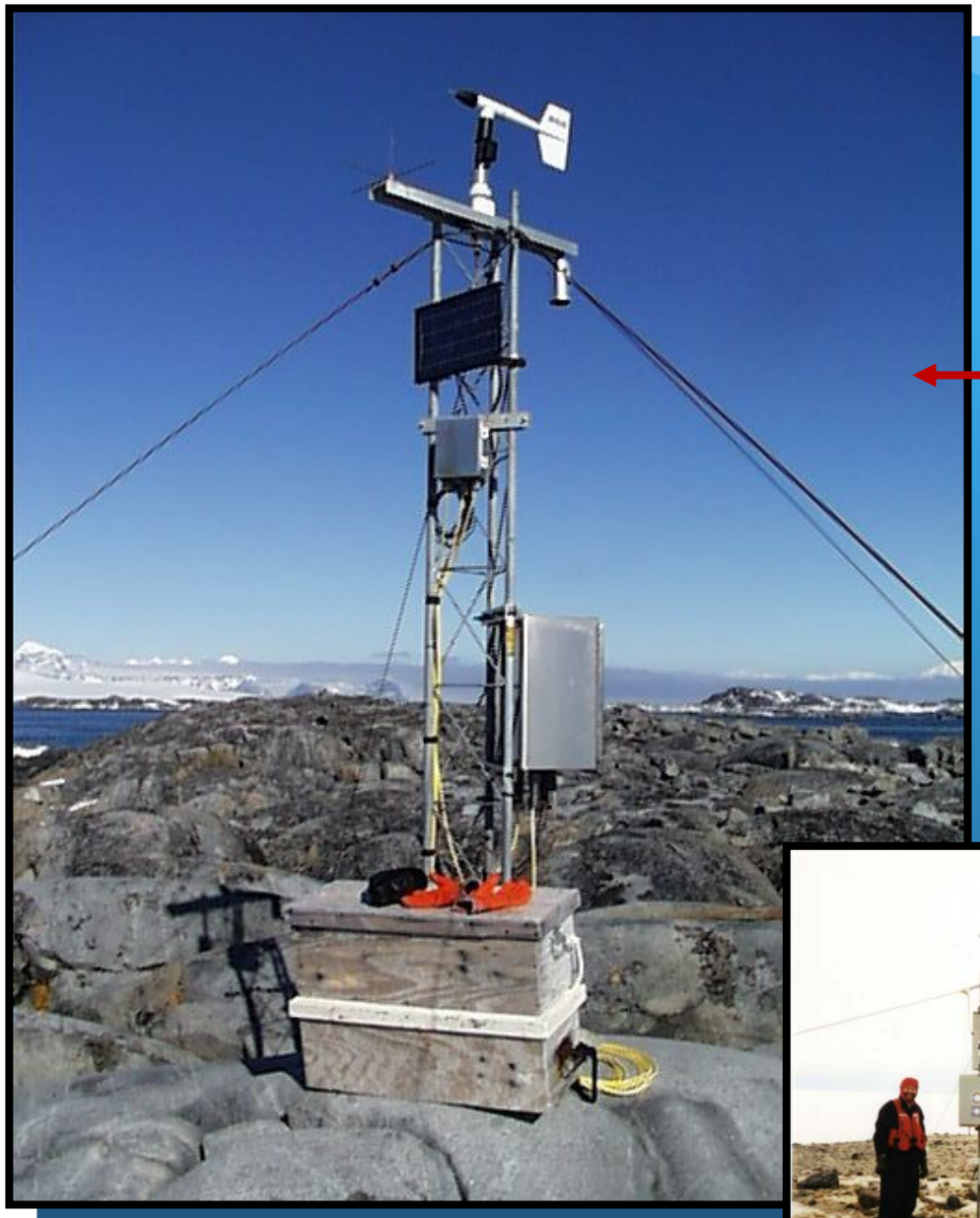
Wisconsin AWS Antarctic Record Low Temperature:

-120.3 F (-84.6 C)

Dome C

August 26, 1982





Wisconsin AWS Record High* Temperature

Bonaparte Point AWS
51 F (10.6 C)

Dec 6, 1992 18:50 UTC

*1991-2001 quality control years

otherwise
Marble Point AWS
44.8 F (7.1 C)
Dec 29, 2001
21:10 UTC

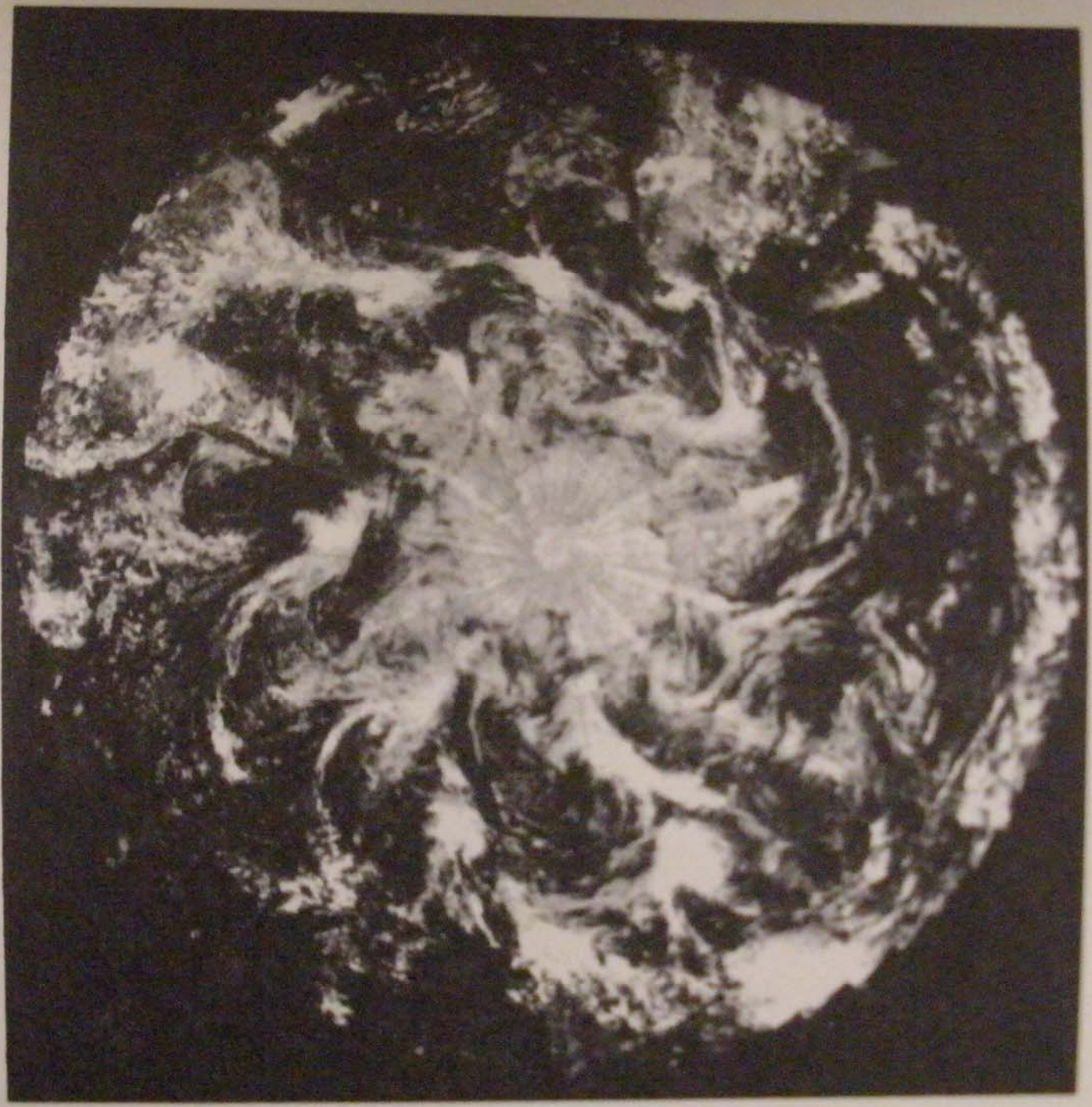
AWS Applications

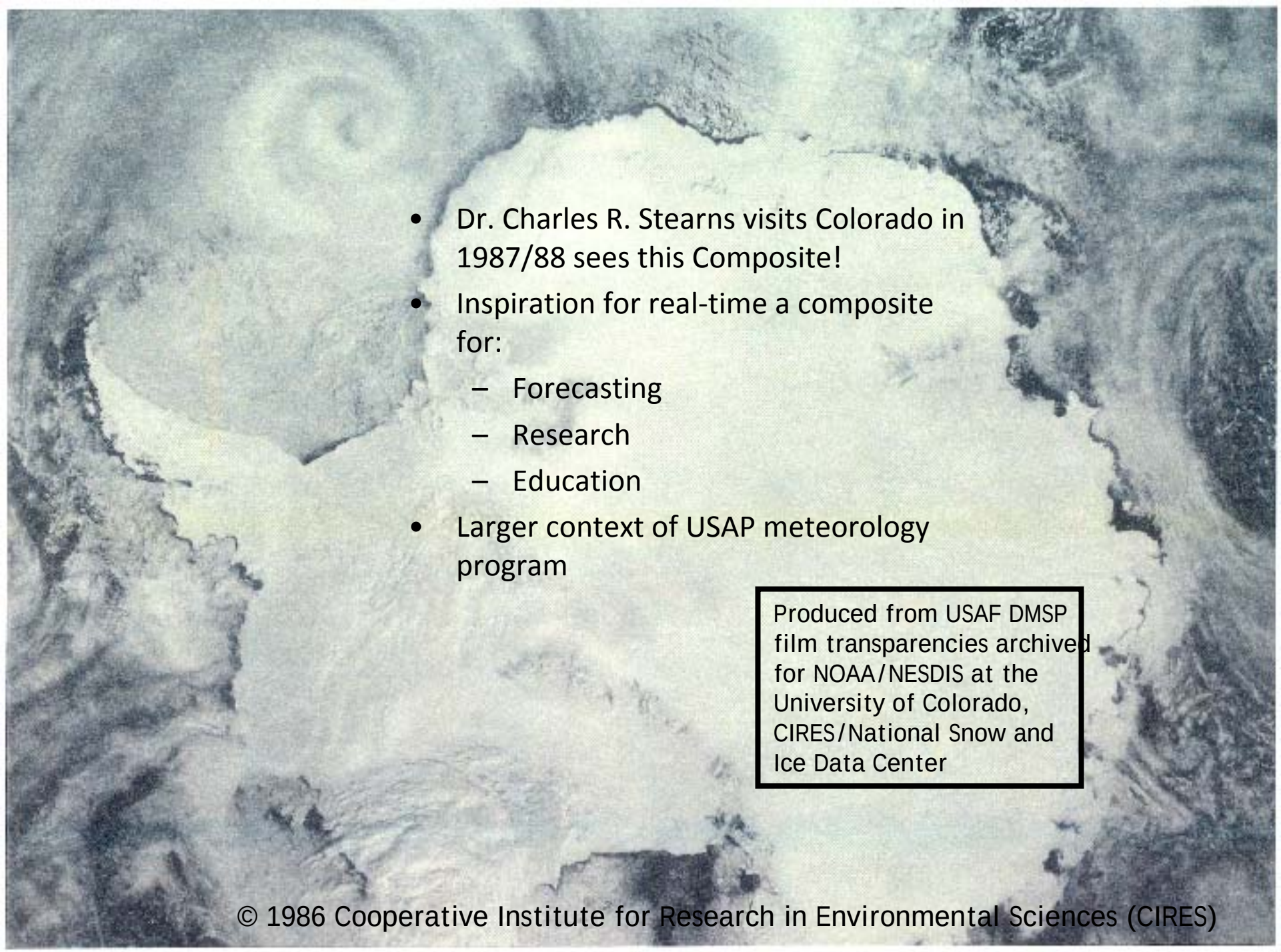
Past:

- Barrier and Katabatic wind studies
- Mesoscale circulations
- Sensible and latent heat flux studies
- Southern Ocean GLOBEC
- Long Term Ecological Research
- Weather forecasting
- Research on Ocean-Atmosphere Variability and Ecosystem Response in the Ross Sea
- West Antarctic Ice Sheet Initiative and International Trans-Antarctic Scientific Expedition
- Iceberg studies
- And more….

Current:

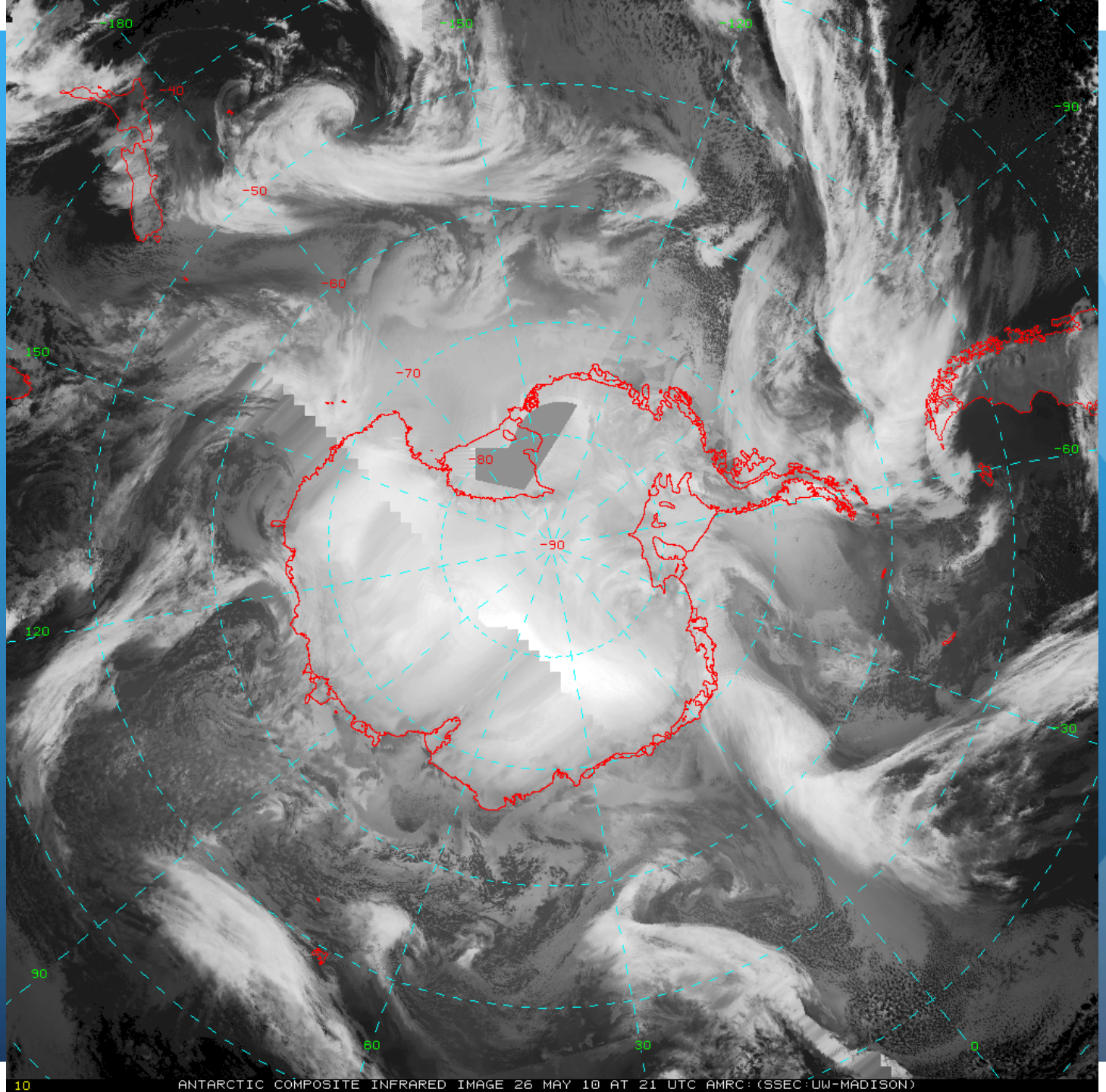
- Long term climatology
- Antarctic ENSO studies
- Precipitation/snow accumulation studies
- Ross Ice Shelf Air Stream (RAS) near surface wind field
- Boundary Layer Studies
- Weather forecasting
- And more…

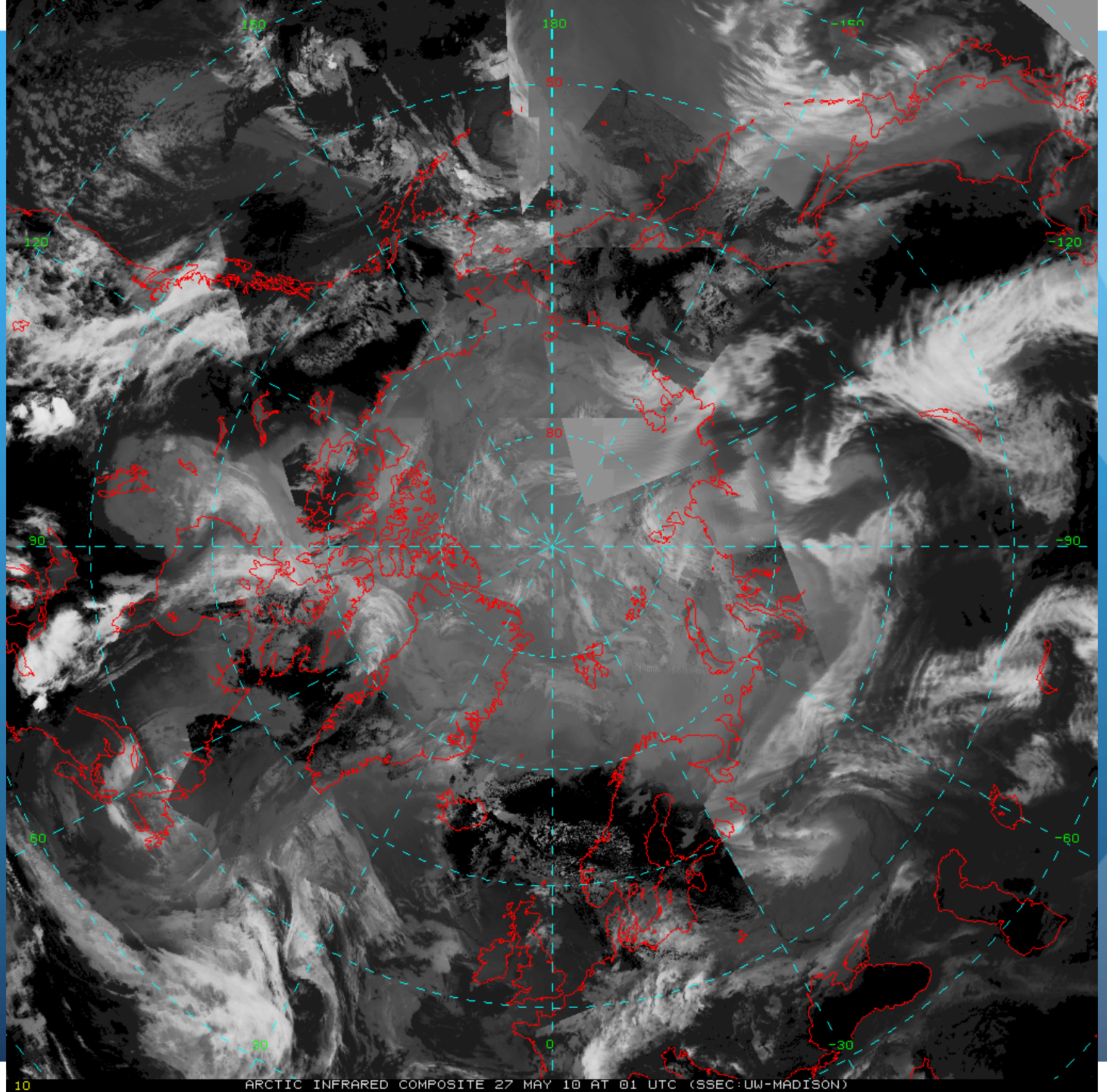




- Dr. Charles R. Stearns visits Colorado in 1987/88 sees this Composite!
- Inspiration for real-time a composite for:
  - Forecasting
  - Research
  - Education
- Larger context of USAP meteorology program

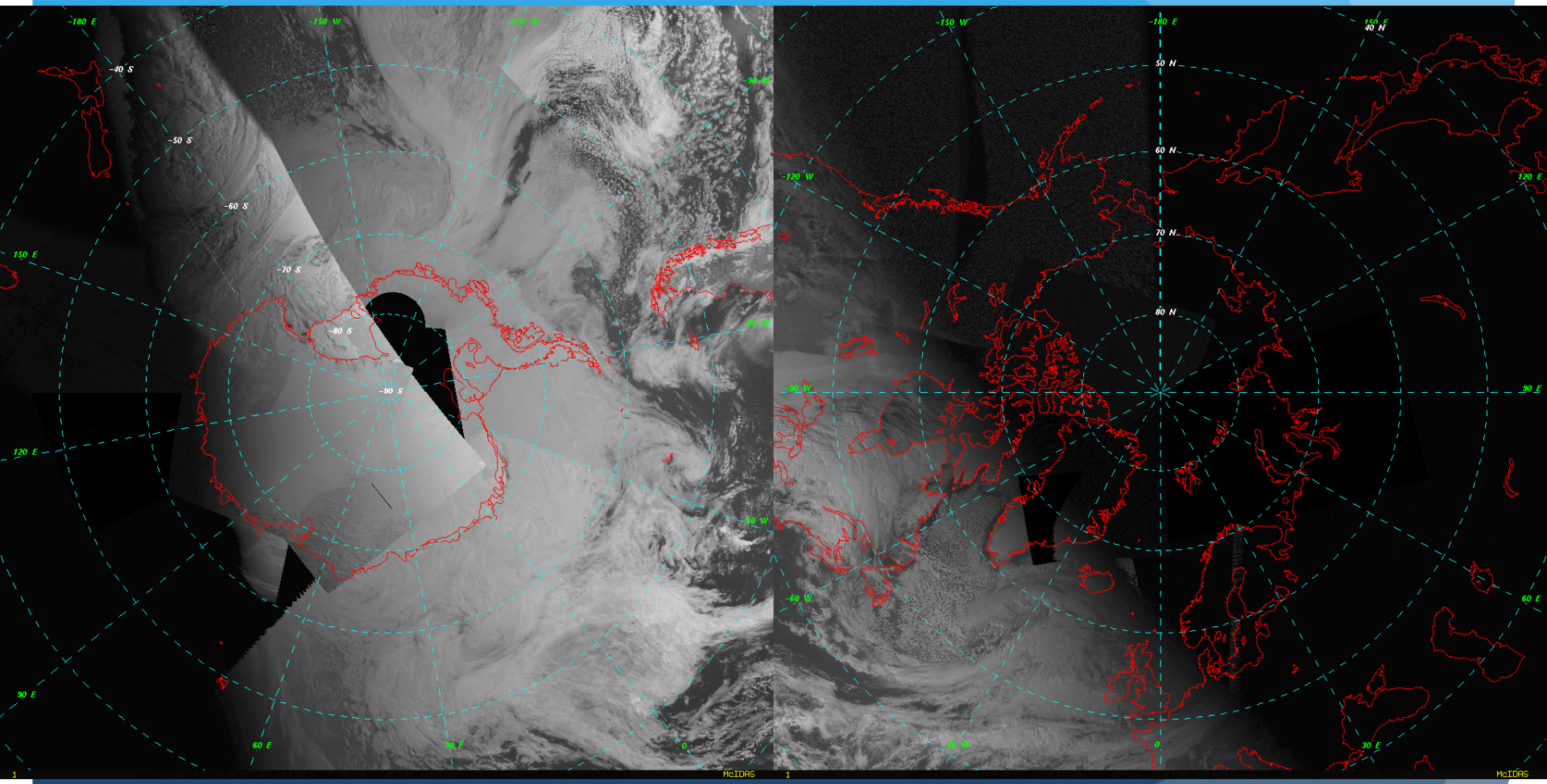
Produced from USAF DMSP film transparencies archived for NOAA/NESDIS at the University of Colorado, CIRES/National Snow and Ice Data Center


-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
-40
-50
-60
-70
-80
-90
10
ANTARCTIC COMPOSITE INFRARED IMAGE 26 MAY 10 AT 21 UTC AMRC:(SSEC:UW-MADISON)


180
-150
-120
-90
-60
-30
0
30
60
90
120
150
10
ARCTIC INFRARED COMPOSITE 27 MAY 10 AT 01 UTC (SSEC:UW-MADISON)

Visible Composites...

...thanks to Rick Kohrs!



Satellite Data Flow

GOES (3)

FY-2C,D,E,F

Aqua/Terra
NASA/NOAA

Kalpana-1

Meteosat (2)

NOAA
GAC/LAC

MTSAT

U.Wisconsin/SSEC

NOAA
HRPT

Aqua/Terra DB
(McMurdo only)

DMSP
RTD

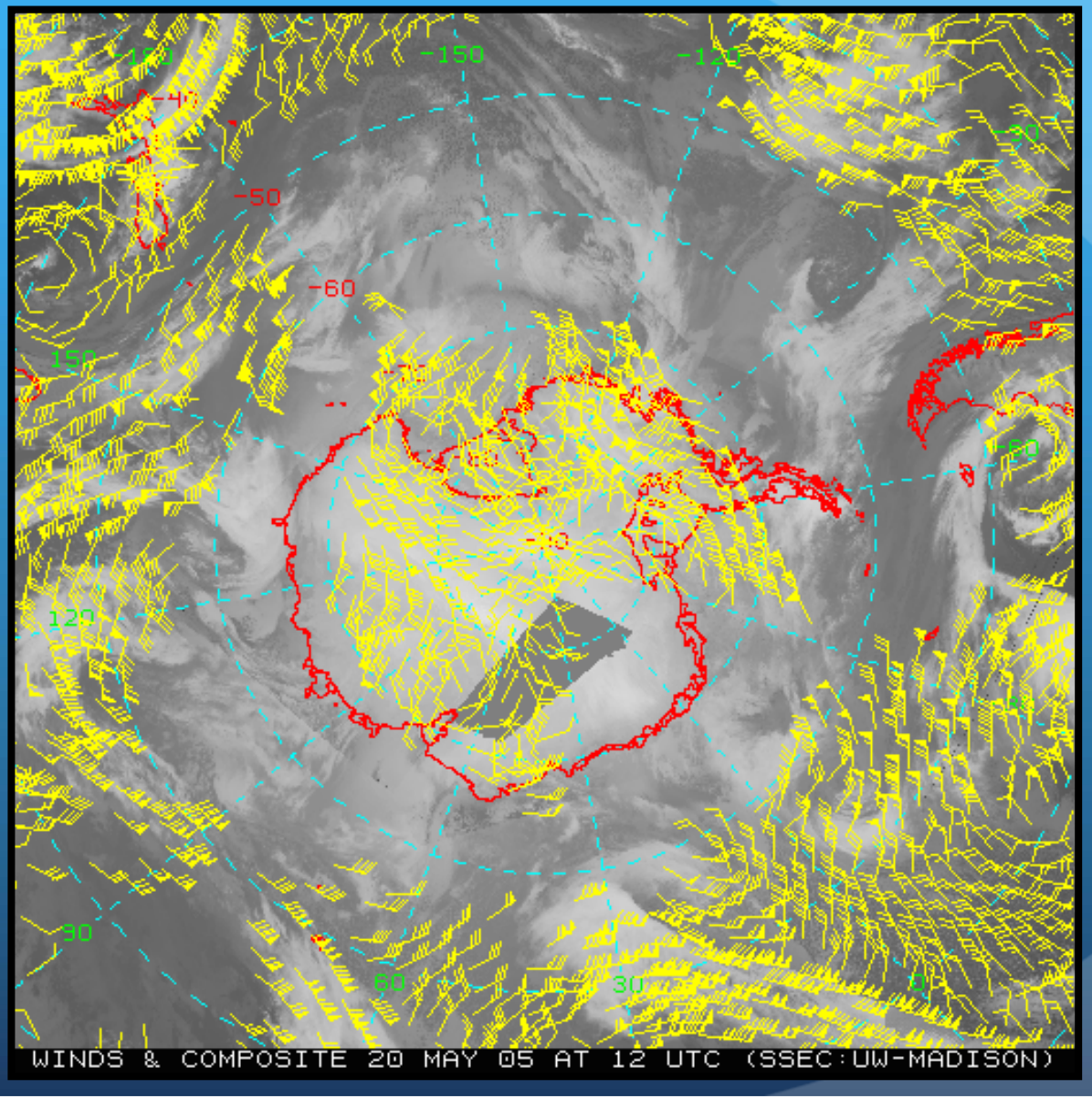
McMurdo & Palmer Station - SDI

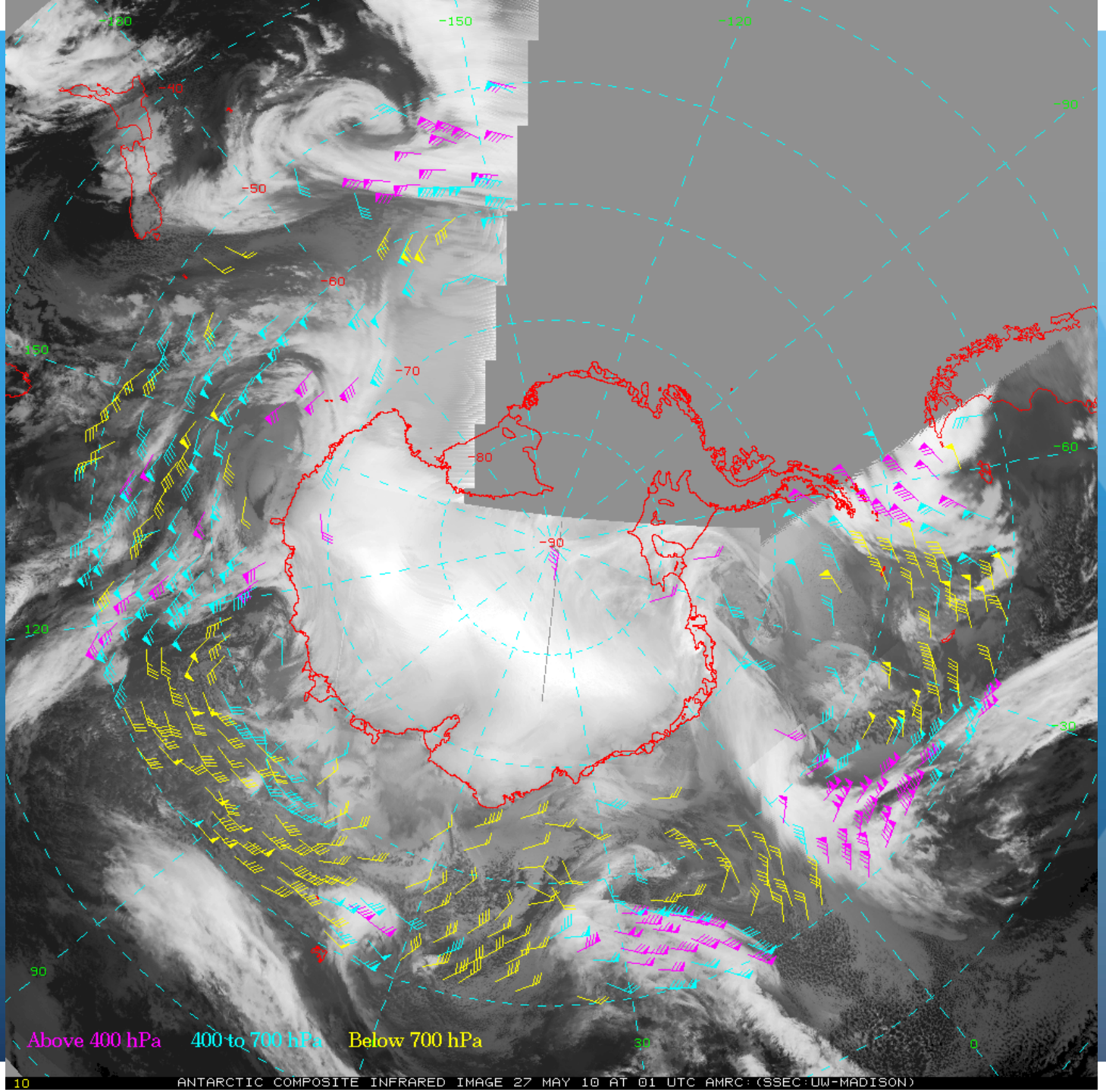
AMRC

Real-time Distribution

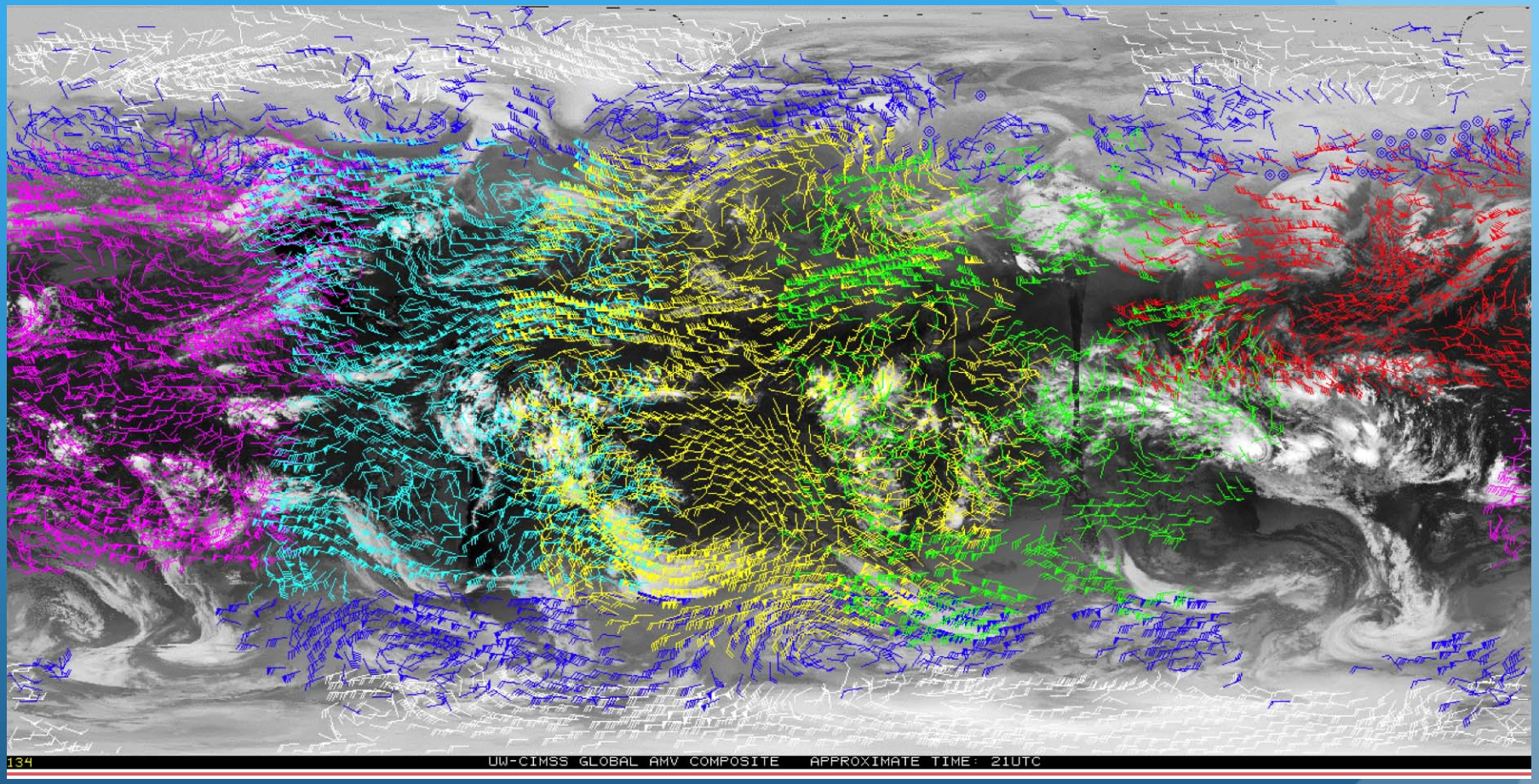
Archive

Atmospheric Motion Vectors

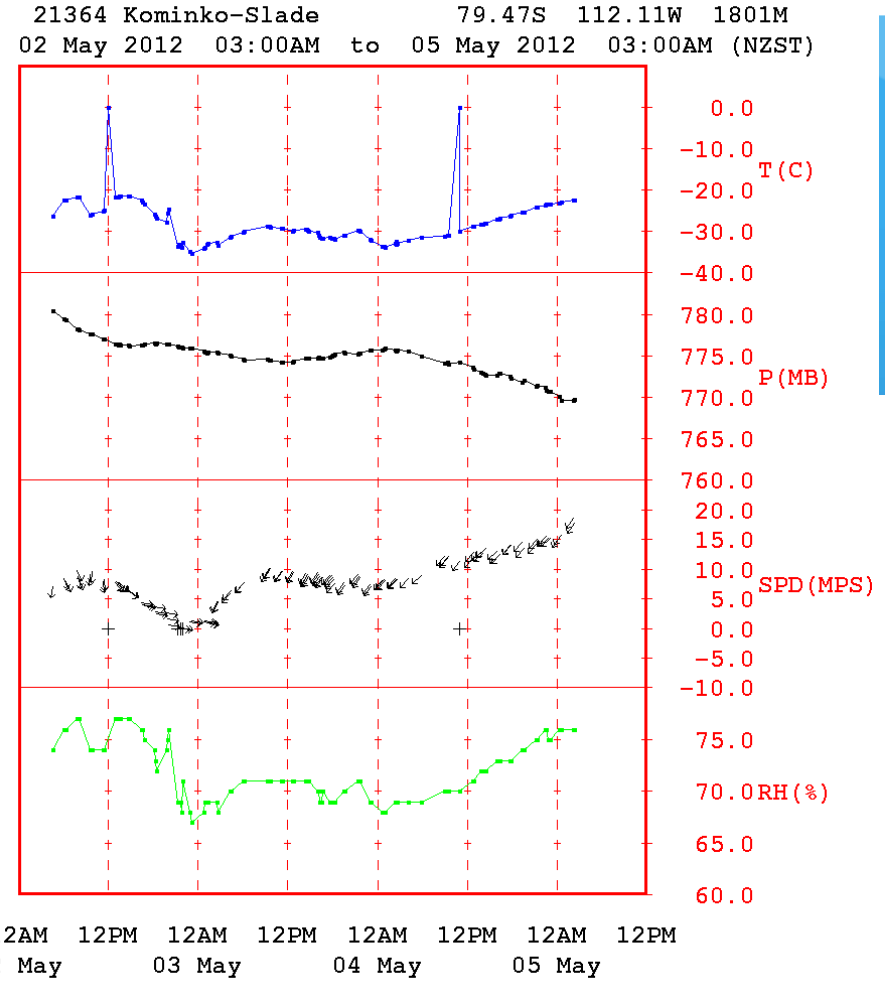



Above 400 hPa
400 to 700 hPa
Below 700 hPa
ANTARCTIC COMPOSITE INFRARED IMAGE 27 MAY 10 AT 01 UTC AMRC:(SSEC:UW-MADISON)

With LEO/GEOAMV – Global Coverage!

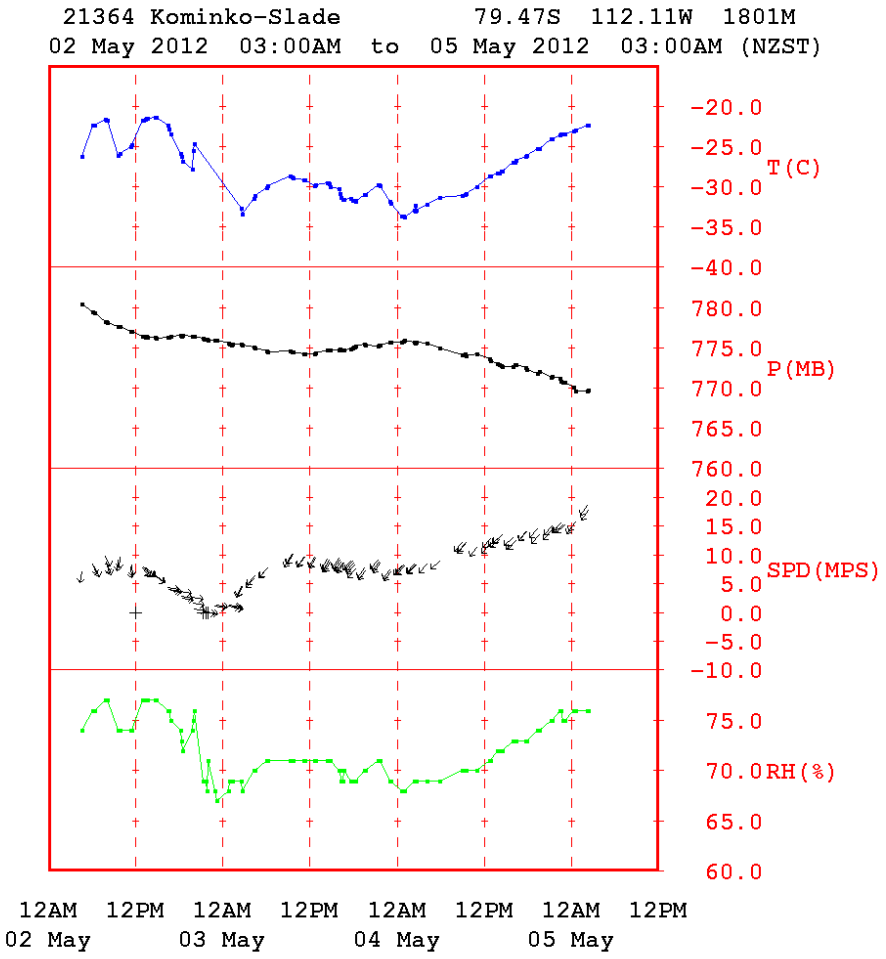


IMGPARAM contributed to this effort!!!



AWS Meteorogram….

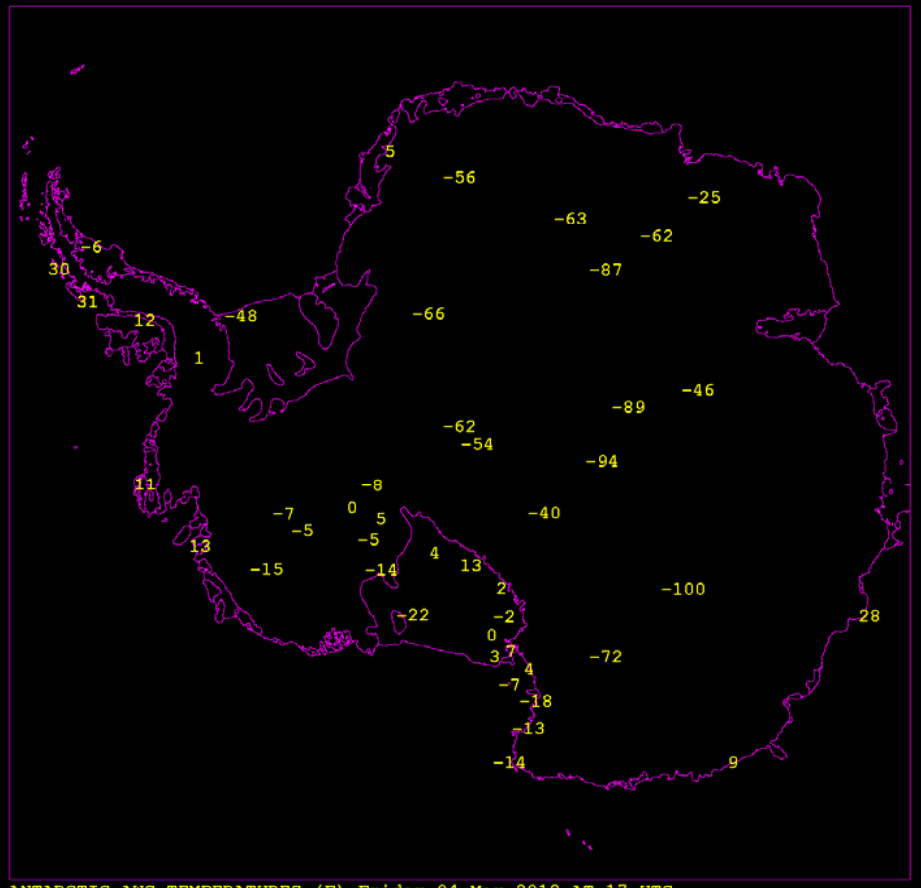
…Thanks to Russ Dengel

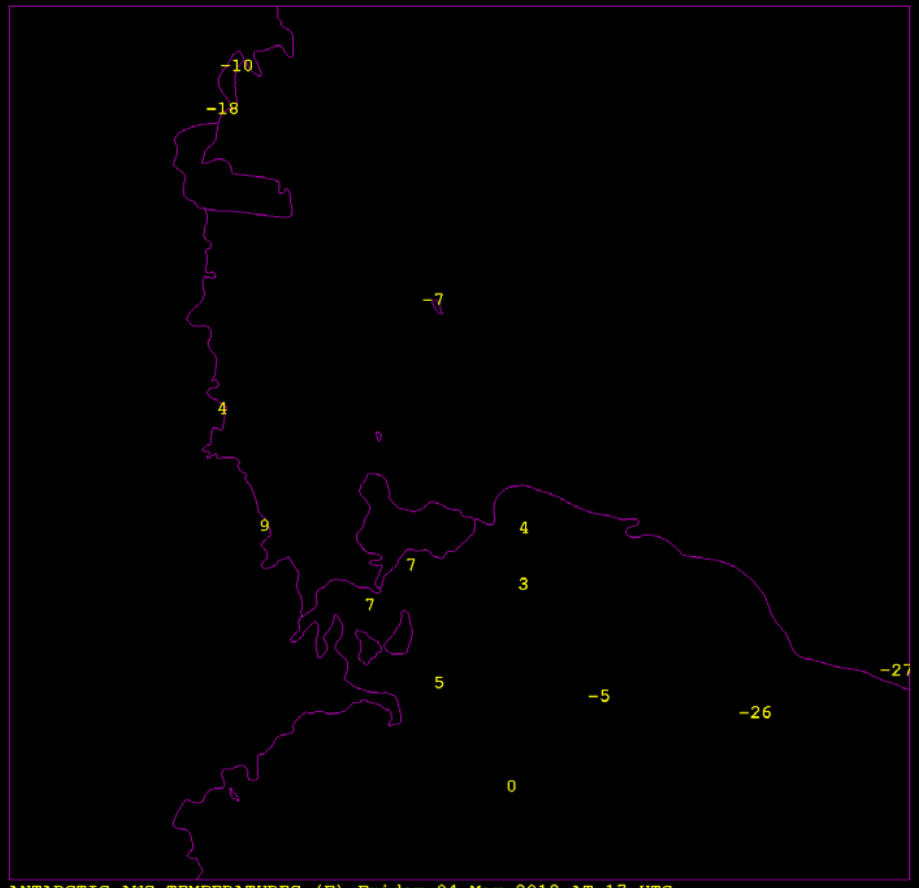


AWSMG Command…

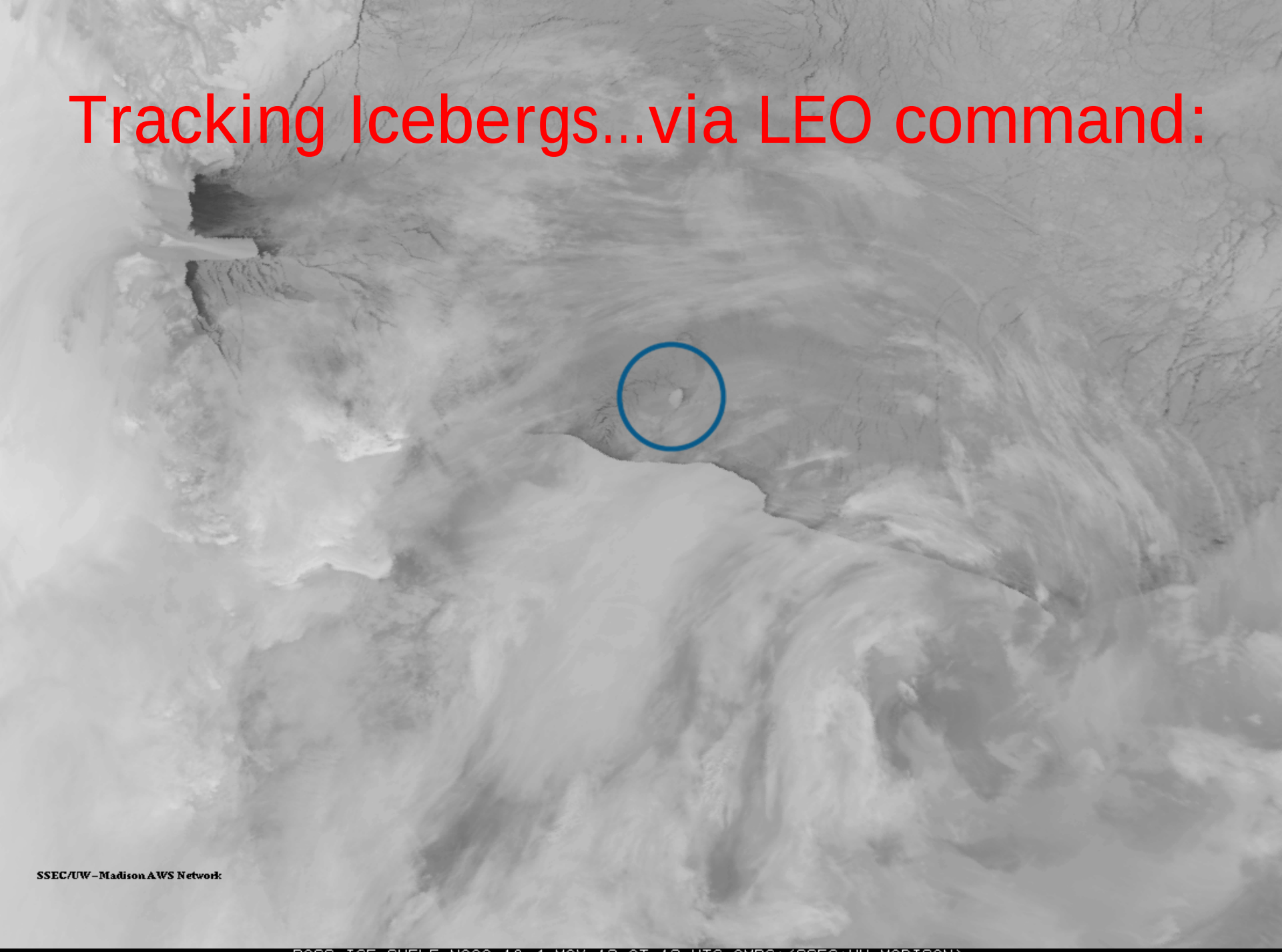
…with DELTA= “filtering”

AWS Observations – SDI * DCS * ARGOS





Tracking Icebergs...via LEO command:



Additional Examples of AMRC Special McIDAS-X usage….

- AWSLOC AWS text listings from AWS decode calibration file (works with *new* AWSMG)
- MAKE_AWIP (with server) to generate Arctic Composite for AWIPS I
- TXT2MDA – SDI decoded AWS observations into McIDAS MD file format
- …and others for support in composite work…

Servers, Services…

ADDE Servers:

DATALOC ADD AWS AWS.SSEC.WISC.EDU (Primary – realtime)

DATALOC ADD AMRC AMRC.SSEC.WISC.EDU (Backup – realtime)

DATALOC ADD ARCHIVE AWS.SSEC.WISC.EDU

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

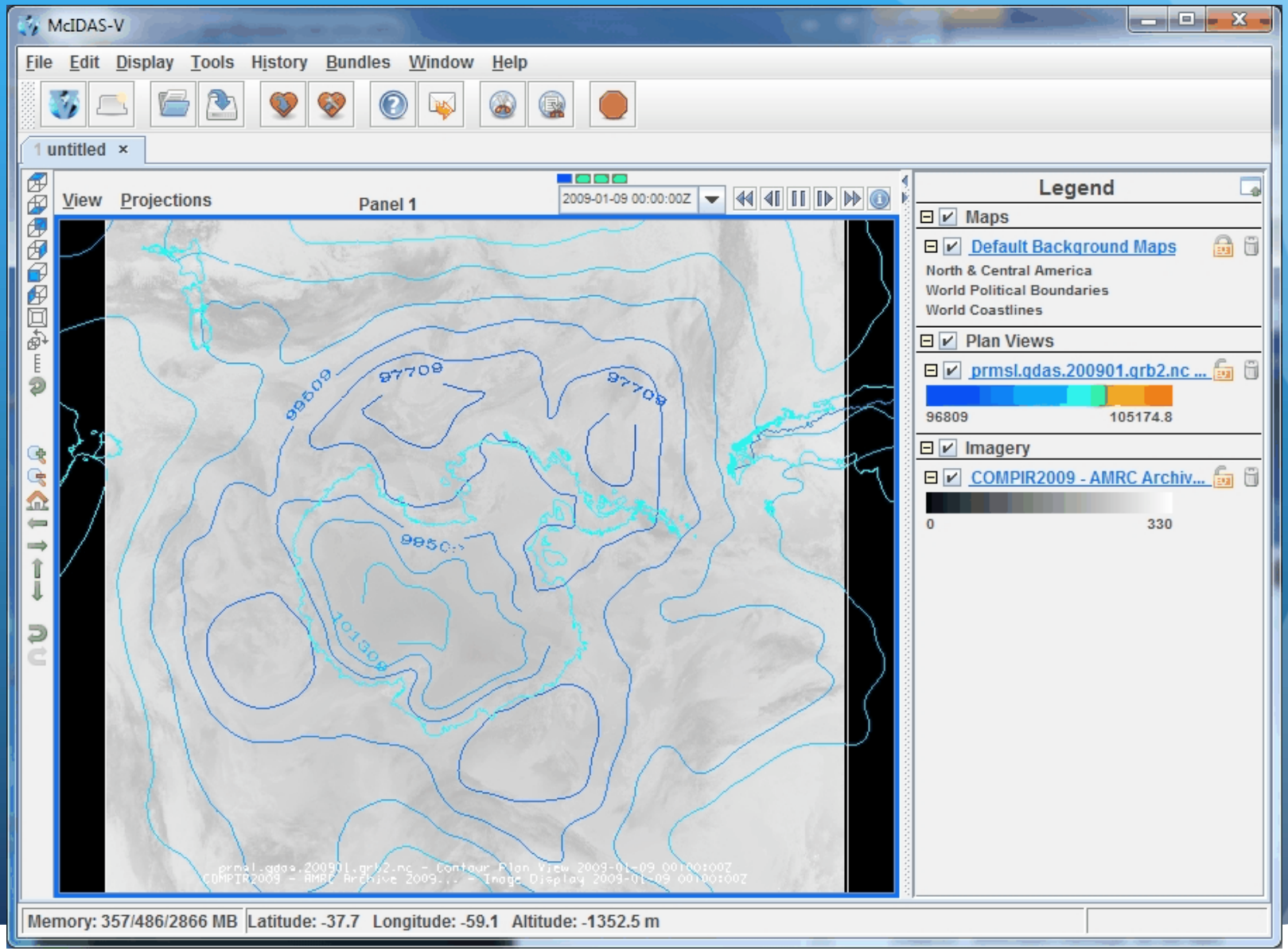
FTP: ftp://amrc.ssec.wisc.edu ftp://aws.ssec.wisc.edu

RSYNC Service: amrc.ssec.wisc.edu, aws.ssec.wisc.edu

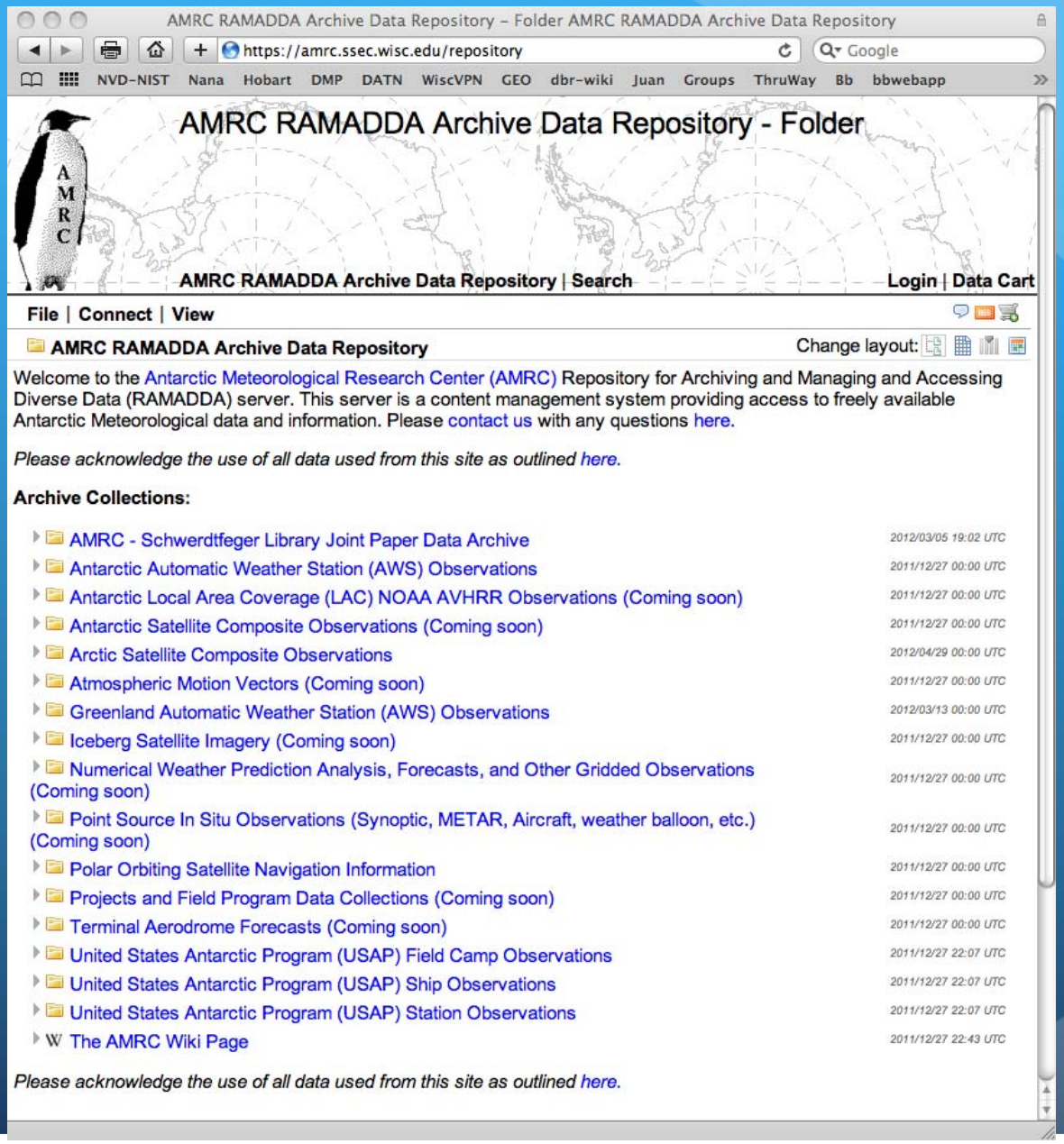
LDM: Antarctic-IDD: aws.ssec.wisc.edu, amrc.ssec.wisc.edu, & fog.ssec.wisc.edu

RAMADDA: https://amrc.ssec.wisc.edu/repository

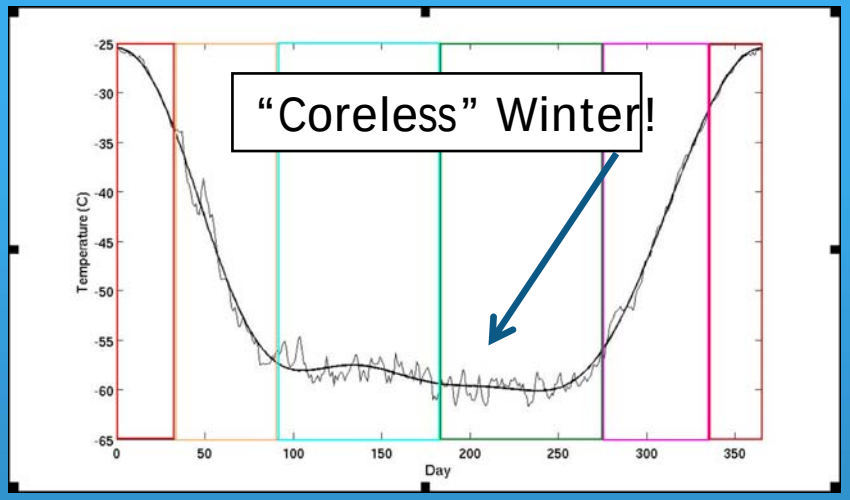
Time-ordering Reanalysis with Antarctic Composites: McIDAS-V ... thanks to Jay Heinzelman + others



AMRC's RAMADDA (Thank you Unidata)

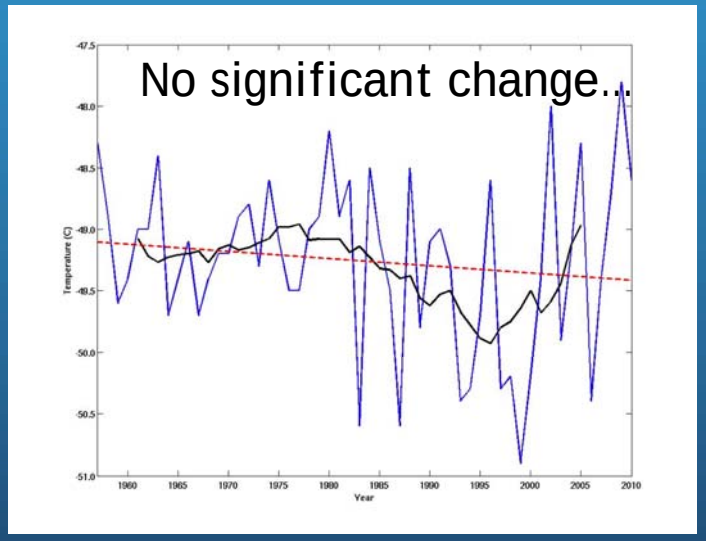


South Pole Climatology Project: MatLab

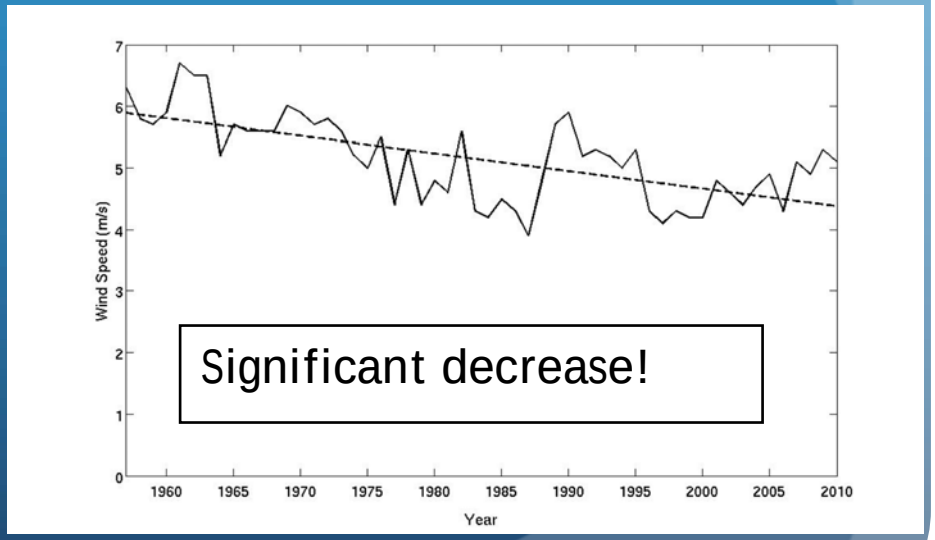


Average Temperatures Jan - Dec

Lazzara et al. 2012



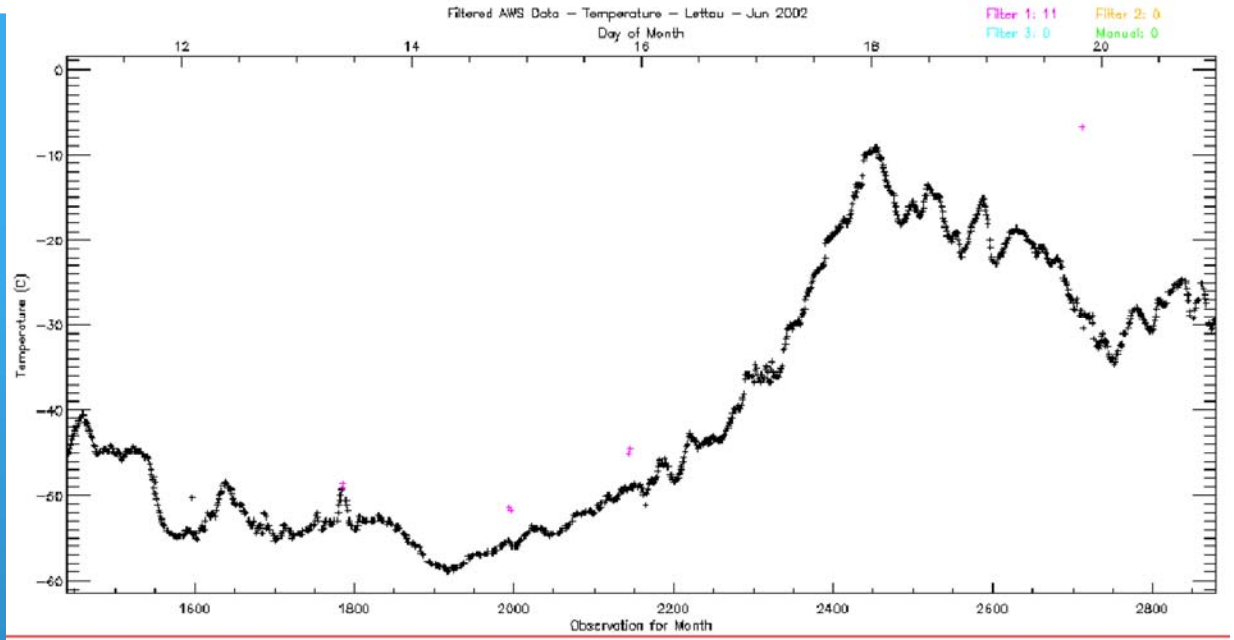
Temperatures:1956-2010

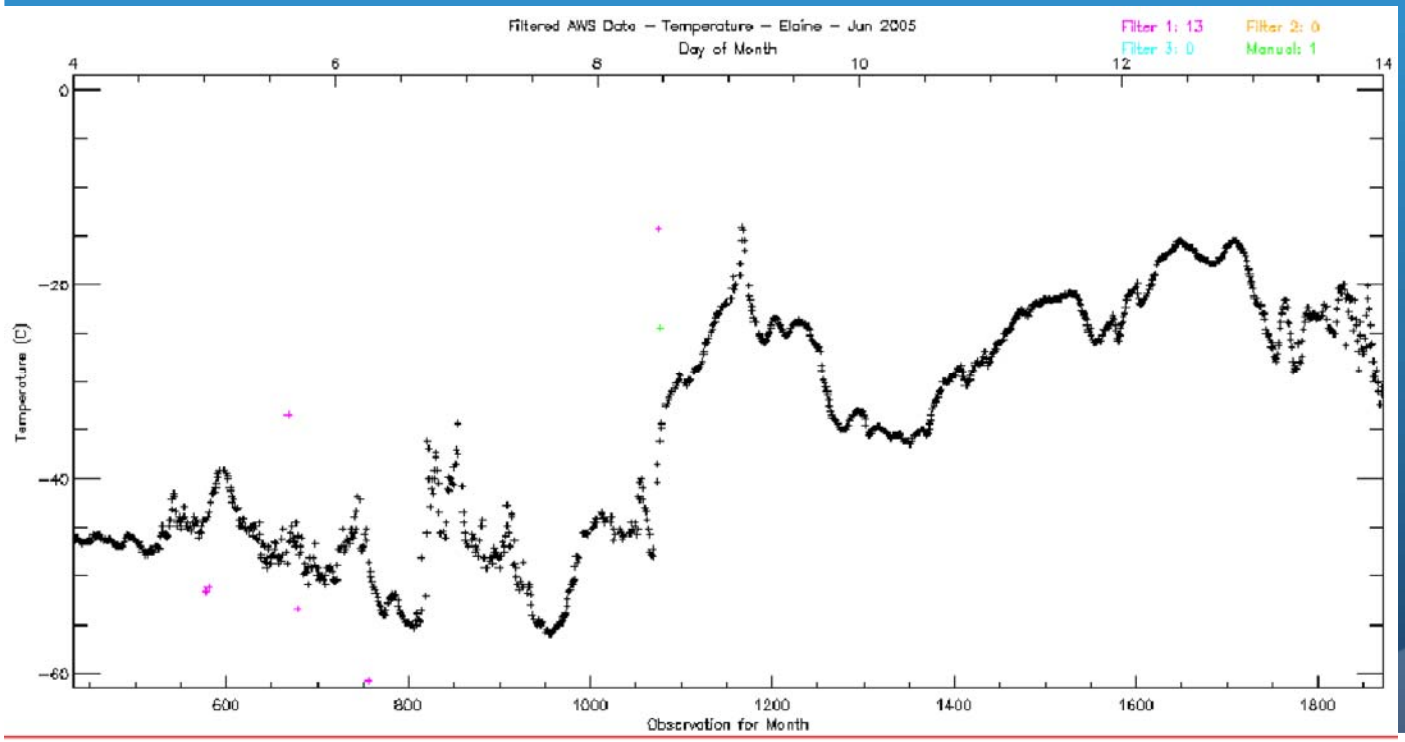


Wind Speed:1956-2010

AWS Quality Control: IDL

Seefeldt and Keller, 2006





Thank you! Questions?

Marble Point AWS Ozone Site – photo courtesy of Lars Kalnajs, CU

Thanks to NSF OPP Grants #ANT-0838834, #ANT-0944018, & #ANT-1043478