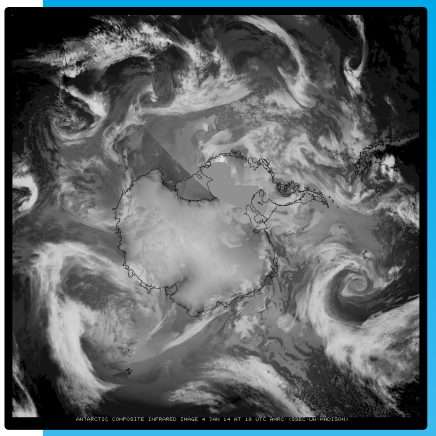
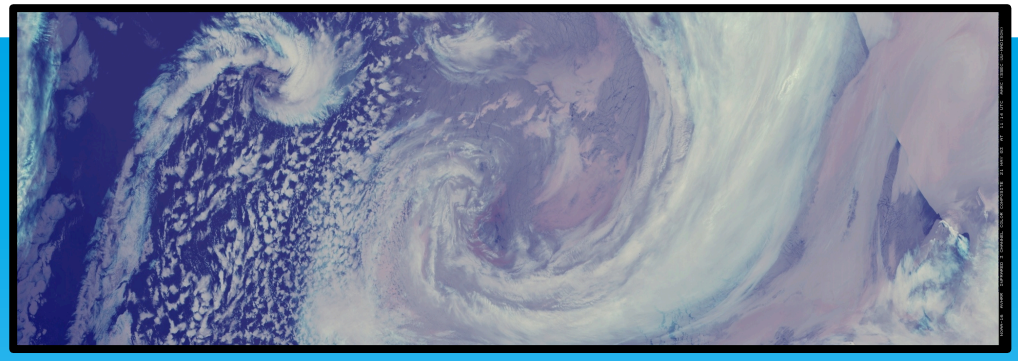




Status and Future of the Antarctic Meteorological Research Center

and USAP Meteorological Enterprise

Dr. Matthew A. Lazzara
Antarctic Meteorological Research Center
Space Science and Engineering Center
University of Wisconsin-Madison

Disclaimer…

* This is ***not*** a plea to get funded personally…
* …the issues presented here are of larger importance than any one PI or Project.
* …If a path forward can be identified, it has a larger impact community-wide.
* …This presentation is a follow-on from a presentation given at the 8th Antarctic Meteorological Observing, Modeling and Forecasting Workshop in Madison, WI, June 2013
* …A version of this presentation was presented to the National Science Foundation, Division of Polar Programs, Geosciences Directorate on March 21, 2014.

Outline

* USAP Meteorological Community Overview…
* Status and Challenges of the data enterprise/infrastructure, etc.
  - ✓ Focus on the Antarctic Meteorological Research Center (AMRC)
  - ✓ Issues, Challenges, Risks, Impacts…
* Outline paths forward
  - ✓ Can research and ops co-exist?
  - ✓ Options outlined
* Discussion
* 4 Laws …
  - Everything is connected to everything else
  - No such thing as a free lunch
  - Everything must go somewhere
  - Nature knows best… nature bats last and wins

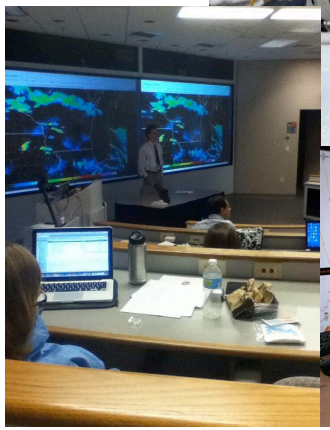
USAP Meteorology Overview

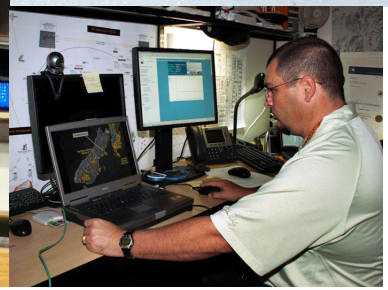
The USAP Weather Community

* Grantees (Scientists, etc.)
* Operations (SPAWAR, etc.)
* Support (ASC, etc.)

* … and more:
  * Primary end-users such as Pilots…
  * Additional end-users e.g. Public, etc.
  * Archivists
    * Enables future end users

* Everyone is connected to everyone else



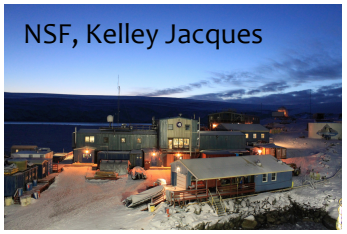


USAP Weather Operations:

Who does what, where?

NSF, Reinhart Piuk

NSF, Elaine Hood



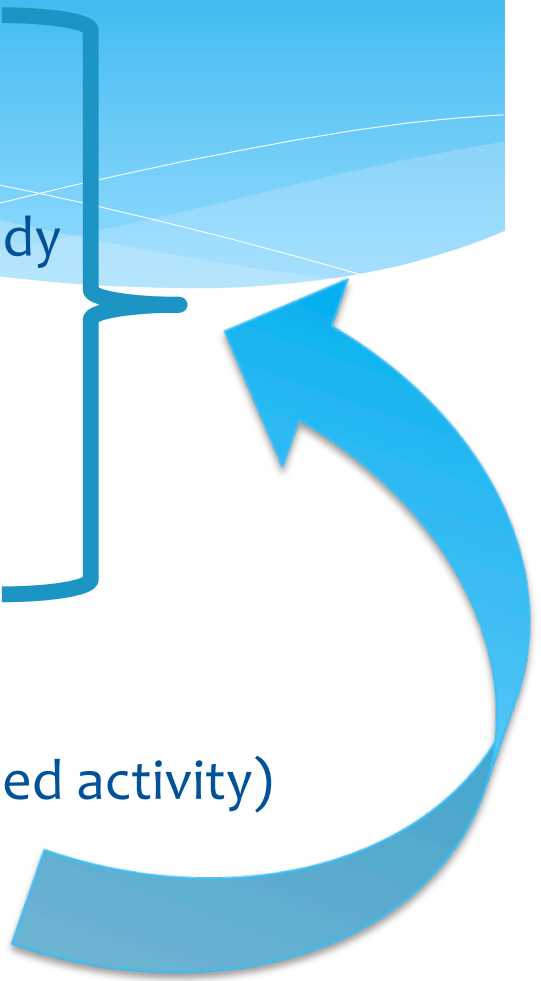
NSF, Kelley Jacques

Peter Rejcek, NSF

* McMurdo
  * SPAWAR – Forecasting and Observing and Upper air
    * Subcontract to SRC and CSSI
    * Few interactions with grantees, mostly referrals to AMRC
* South Pole:
  * SPAWAR – instrumentation
    * Few if any interactions with grantees
  * ASC – observing and upper air
    * Many Interactions with grantees
    * … data does go to AMRC
    * Keller et al. 2009 and Lazzara et al. 2011
* Palmer
  * ASC – Instrumentation & Observing
  * Interactions with grantees and referrals to AMRC
* Field Camps
  * ASC – Observers and Training
  * SPAWAR – Instrumentation (Portable Polar Met. Kits or PPMK)
  * AMRC – Unique holder of the data
* Ships
  * ASC – Instrumentation & Observing
  * Limited interactions with grantees – data is with LDEO (or AMRC)

USAP Science and Data: Examples

* Pure Science:
  - ✓ John Cassano's UAV project
    - ➢ Pure science objective (with field work)
  - ✓ Masha Tsukernik's Cyclone/Moisture/Sea Ice study
    - ➢ Pure science objective (without field work)
* Mix Case 1: AMPS
  - ✓ Has an "operational" side and a "science" side
* Mix Case 2: AWS
  - ✓ No "official" operational side
  - ✓ Used for operations anyways
  - ✓ (Historically was a joint science/operations funded activity)
* Mix Case 3: AMRC
  - ✓ "Data center" activities…
  - ✓ ….& doing science (~15+ internal publications & 7+ coming)
  - ✓ …… and supporting science! (355+ references!!)



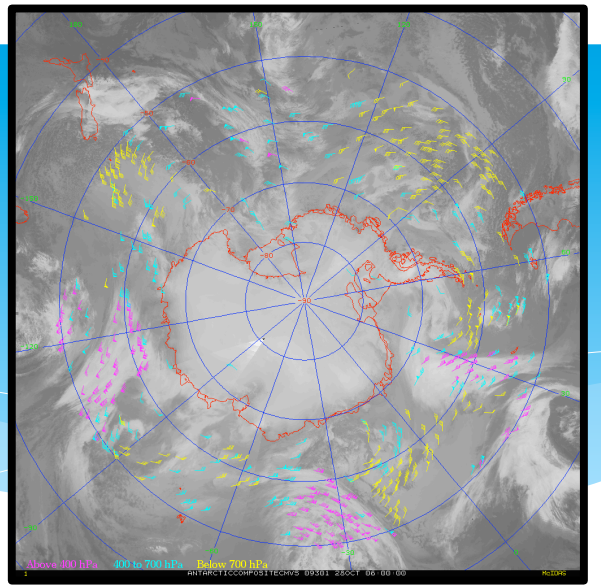
AMRC '*Spectrum*' of Data and Services

3 examples:

1. Automatic Weather Stations
   * Real-time availability via AMRC efforts…
   * Infrastructure that provides real-time observations in need of investment
2. USAP Station/Field Camp Observations
   * Archive available only via AMRC
   * Likely higher resolution/additional data recorded on the SPAWAR PPMKs that is not recovered or made available…
3. Satellite Composites
   * Uniquely created by AMRC
   * Younger Arctic cousin satellite composite to be adopted by NOAA/NESDIS

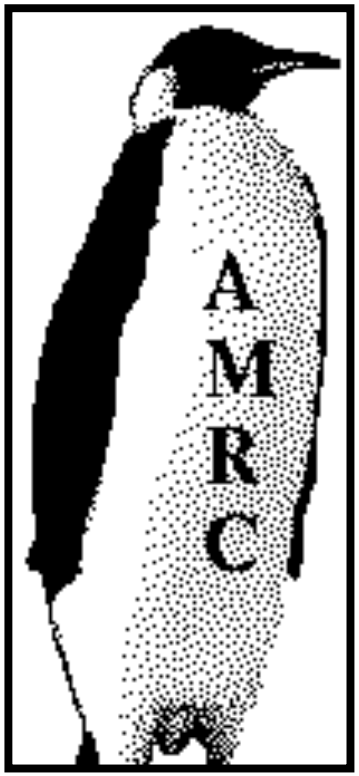
Antarctic Observational Meteorological Data Challenges

AMRC Status

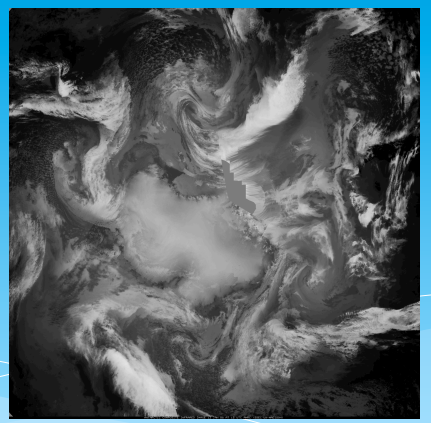


* (The grant – not the group)
* Funding officially ends August 2014
* No funds to extend the project
* Most tasks will be complete this summer
* Future science grant unlikely…
* So, now what?
  * What is impacted?
  * What is next?

* No such thing as a free lunch…

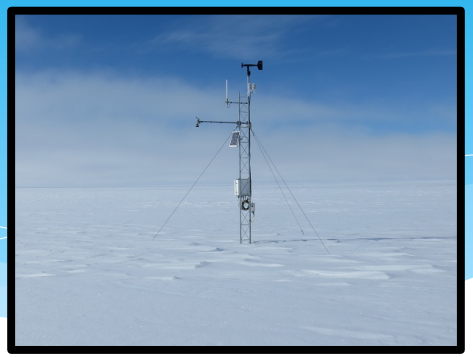


Without the AMRC… What is Affected?



* Specifics Impacts:
  - Satellite composites will stop production Summer of 2014***
  - Real-time AWS observations will degrade or perhaps end
    - This is not "officially"/sufficiently funded under the AWS effort
    - Investment required to continue to have real-time AWS infrastructure
  - Community collaborative resource/support impacted
    - e.g. Relay of data to support CRREL AIL funded efforts
      - McMurdo data for FleetOps
      - Runway temperature data
  - No relay point for USAP station observations (raw/hi-res)
  - No collecting/archiving USAP field camp observations…
  - Additional Antarctic/Southern Hemisphere weather data collection/ relay/archive will cease
  - The Antarctic-IDD/LDM network is at risk…
* Break in the link between the science and operational communities

Real-time AWS Observations



* AMRC developed the real-time AWS decoding system
  * This system needs infrastructure investment
  * Unable to get data from some of the Argos satellites
    - NOAA-19, MetOp-A, MetOp-B,
    - USAP has no ability to get the SARAL satellite in real time
  * Original SSEC Desktop Ingest (SDI) systems have been retired
  * New SDI-104 systems are available, however:
    - Costs to acquire them
    - Effort to update for newer satellites

  * AWS communications changes have introduced unreliability
    - AOAS push to reduce Argos usage
    - Freewave VHF has some unreliability…..
    - Iridium should be o.k. but does have some issues
      - Cold (costs to mitigate for that…Xeos…which requires lots of batteries, more cargo weight… or more funding to go with some type of Lithium Ion battery)
      - Limited processing infrastructure…Setting one up now…. is impacting science
      - As a note: Compact Flash cards (record onboard the AWS) have a poor working rate (roughly 70%-80% successes only…AWS is more than 87% to the low 90% + reliable from Argos…)
  * No ability to have collaborations with others (e.g. SPAWAR) to maintain network that is MUTUALLY beneficial to science and operations:
    - e.g. Pegasus Airfield High Wind Warning system uses Wisconsin AWS network

Issues & Lost Opportunities ….

Issues

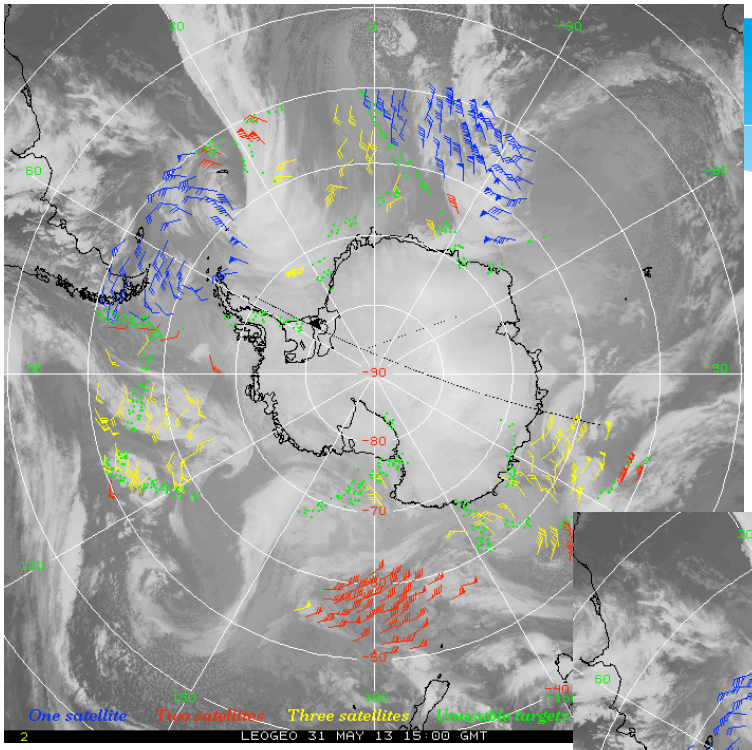
* USAP AWS CLIMAT messages (Climate)
  - Funded by NOAA/NCDC- ***not NSF*** – new funding will be needed in the near future
* USAP AWS synoptic (surface) observations on GTS
  - What isn't "default" handled by CLS America/Service Argos is handled by the British Antarctic Survey
  - What is done by CLS America/Service Argos isn't always well decoded
    - Difficulties in maintaining that….
* Palmer CLIMAT messages*
  - Created by the British Antarctic Survey
  - Source data from Palmer is relayed via the AMRC

Lost Opportunities

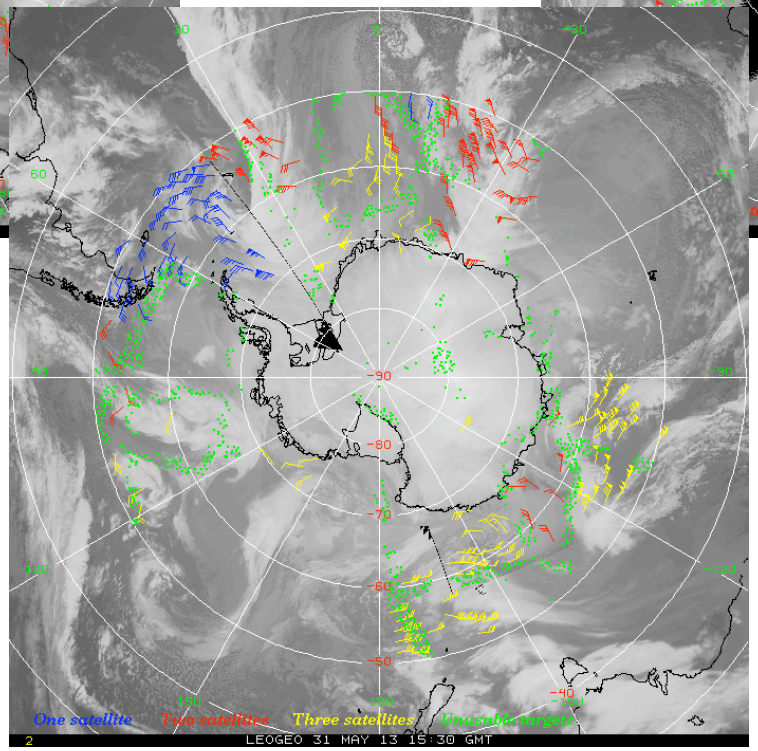
* US Coast Guard weather observations…
  - Not being placed on GTS
  - (AMRC is holding a collection for now…)
* POLENET Met data
  - Not used or included in AMRC's archive despite request from the POLENET PIs..no funding to work on this…
* AIREPS from the aircraft….
  - Not being relayed around
  - Could have been used in Lazzara et al. 2014…

*Some of this is like having US domestic weather summaries/relays done by another country

Are we comfortable with this?



15:00 UTC



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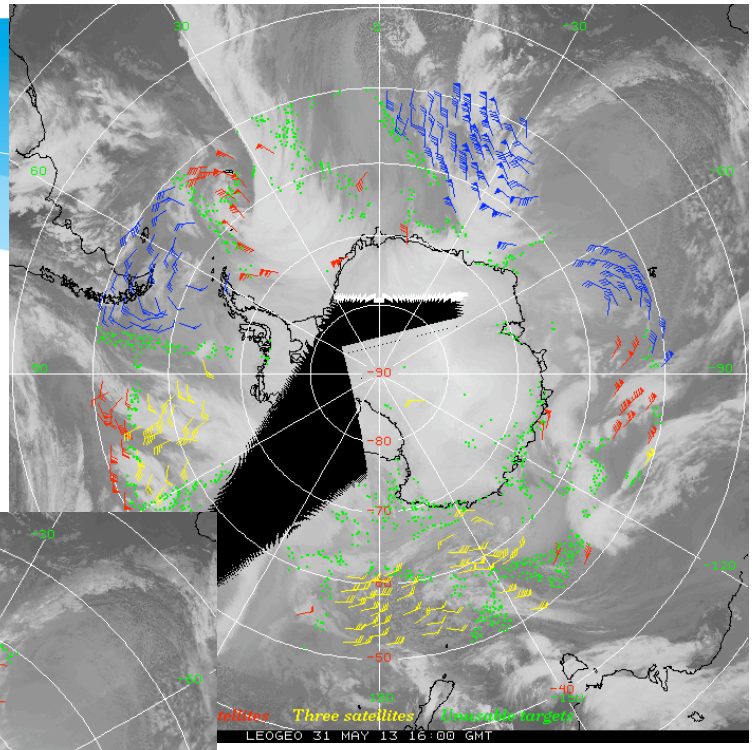


16:00 UTC

Antarctic Satellite Composite Atmospheric Motion Vectors AMV

NSF Research

NOAA/GOES-R Risk Reduction Project

NOAA Grant to have them become operational

Lazzara et al. 2014

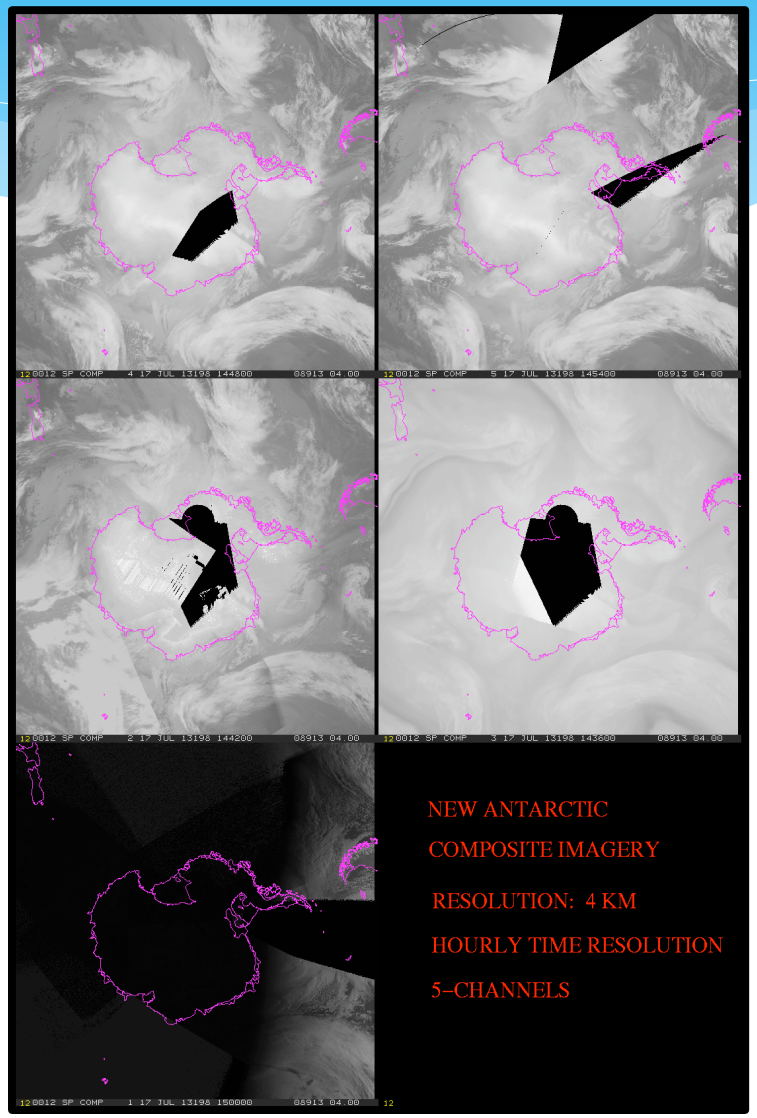
Side Note:
Palmer Observing System (PalmOS)

* Needs to be…
  * … Replaced
  * … More than a data collection point
  * … Support local operations
  * Marine
    – Expanded boating area (e.g. hard sided zodiacs)
  * … a Remote Sensor
    – With remote communications in RF
    – Be it UHF/VHF

Being authorized for replacement??

Future Data Risks: Satellite Composites

* The end of AMRC Antarctic composite generation….
  * There is no driving funded *science* at present
    * There is funded science to use the *historic* archive, but does not **yet** justify the future creation
  * No NOAA customer/user requesting this (yet), so NOAA/NESDIS does not (yet) have justification to make these
    * It does for the Arctic composites….



Additional Data Risks…

* Long term archive unclear
  * Flaw in the funding model, no one is funding long-term archive (the "forever" archive)
  * No funding to move it to another archive (e.g. NCDC, etc.)
    * To meet that archive's standards/criteria/rules
    * ….If another archive wants it
  * Data may be around per UW-Madison standards
    * "7 years"
  * Unclear options, for what is left behind, if it all ends:
    * May or may not be part of the SSEC Data Center collection
    * May or may not be part of the Schwerdtfeger Library
    * Options are limited…
* Everything must go somewhere

Paths Forward

Path Forward: Option Set #1

* Keep the AMRC as is
  * Fund AMRC at the same Level
  * Not really sustainable effort in the long run
  * We need to reassess the level of support
    * It's NOT enough to support science or operations

* End the AMRC effort
  * Not desired by the community ?
  * How will the USAP handle moral equivalent?

* The Central Repository Path
  * Data goes to NCAR or NCDC and is made "model ready"
    * No more AMRC
    * Business model that may see unused data tossed out
    * No regional data center construct – a hard switch
    * No "care"/attachment for the data
    * Outside the Earth Cube model ?

Paths Forward Option Set #2

* Cooperative agreement – Become a T-event – be like PGIC, etc.
  * Steering committee and the works
  * Do we want this?? Perhaps…

* Research Coordinated Network (RCN) – the pending proposal from U. Minnesota (in line with the Earth Cube effort)

  Pros:
  * Long term goal with RCN is to pave a path to get data into a National Center,
  * Short term/Mid-term evaluating the "regional" data center NSF has in AMRC.
  * AMRC would have a target specific and finite lifetime…

  Cons:
  * Facility succession planning is NOT soon enough via A2CD…
  * AMRC can't do work on the RCN… no dollars to even get the data into a national center
    * RCN Requirements to get data into alignment…
  * The proposed RCN will NOT solve 95% problems being thrown at it….
    * … with only ONE person coordinating…
  * Only 5% of the issues would be handled in such an RCN...

Paths Forward: My Suggestion

* A Multi-prong Path:
  * No one path works
  * A Combination:
    * Short term : AIL support
    * Mid term: Cyberinfrastructure/RCN
      * Having the U. Minnesota Project include the AMRC explicitly in future…
      * Work toward a better interface with larger data centers
        * While having the regional AMRC datacenter to support the community
      * Aim for a longer term solution that will be financially viable and will work within the USAP as well as external users.
    * Long term: National Data Center
      * Build the relationships via the RCN funding.
      * Could be NCAR or NCDC…

Paths Forward: My Suggestion

* A Multi-prong Path:
  * No one path works
  * A Combination:
    * ~~Short term : AIL support~~ This appears to have failed for now…
    * Mid term: Cyberinfrastructure/RCN
      * Having the U. Minnesota Project include the AMRC explicitly in future…
      * Work toward a better interface with larger data centers
        * While having the regional AMRC datacenter to support the community
      * Aim for a longer term solution that will be financially viable and will work within the USAP as well as external users.
    * Long term: National Data Center
      * Build the relationships via the RCN funding.
      * Could be NCAR or NCDC…

* Didn't make it for April 2014 NSF proposal call…
* Will try this in April 2015??

Unrelated, but noteworthy…

* Matthew Lazzara will be full time faculty at Madison Area Technical College starting in August 2014
* He will keep an appointment at University of Wisconsin-Madison and will continue to PI projects there in progress (e.g. AWS program, etc.)
* In essence, job flipping from
  * 10 Years as Adjunct Faculty at the College
  * 23 Years at UW-Madison

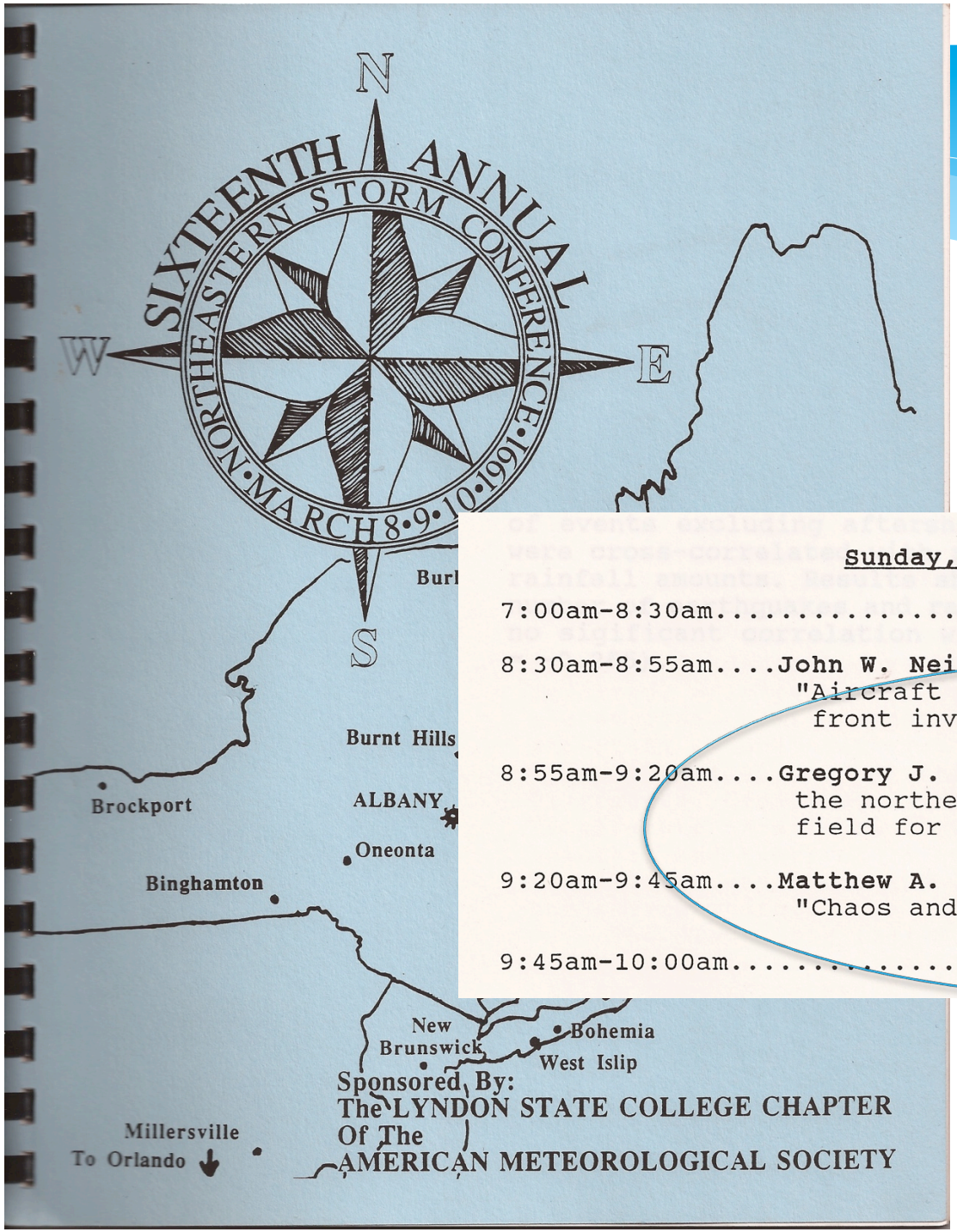
Discussion

Research, Operations, etc. move on…

Nature knows best… nature bats last and wins

Thank you!

Thank you to the
National Science Foundation
Division of Polar Programs
Geoscience Directorate



Sunday, March 11th

7:00am-8:30am.....Breakfast.....

8:30am-8:55am....**John W. Neilson**, SUNY-Albany; "Aircraft observations of waves along a coastal front inversion"....

8:55am-9:20am....**Gregory J. Hakim**, SUNY-Albany; "An analysis of the northern hemisphere 1000-500hPa thickness field for January and July: 1958-1984"....

9:20am-9:45am....**Matthew A. Lazzara**, Lyndon St. College; "Chaos and atmospheric predictability"....

9:45am-10:00am.....Break.....