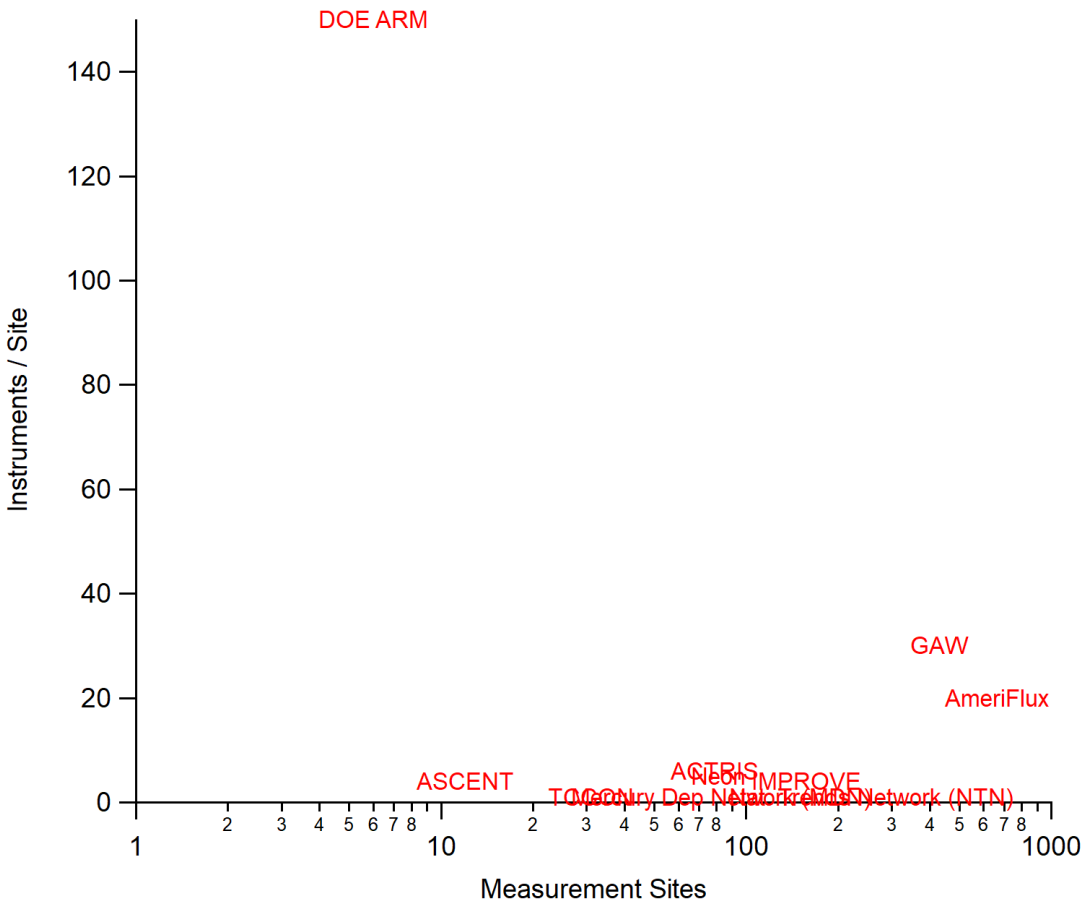
DOE ARM
Engage with Strategic Partners

Leads: Gannet Hallar and Tim Onasch

Breakout Session Introduction

- The DOE ARM program was established following several international studies based on the conclusion that cloud–radiative feedback is the single most important effect determining the magnitude of possible climatic responses to human activity
- ARM's current focus is on providing infrastructure for climate-relevant observations, analysis, and modeling
- ARM has created a unique network of supersites developed to inform models scaled from atmospheric column, to geographical region, to global
- Looking ahead, we believe that ARM can greatly benefit by actively ***engaging with strategic partners***

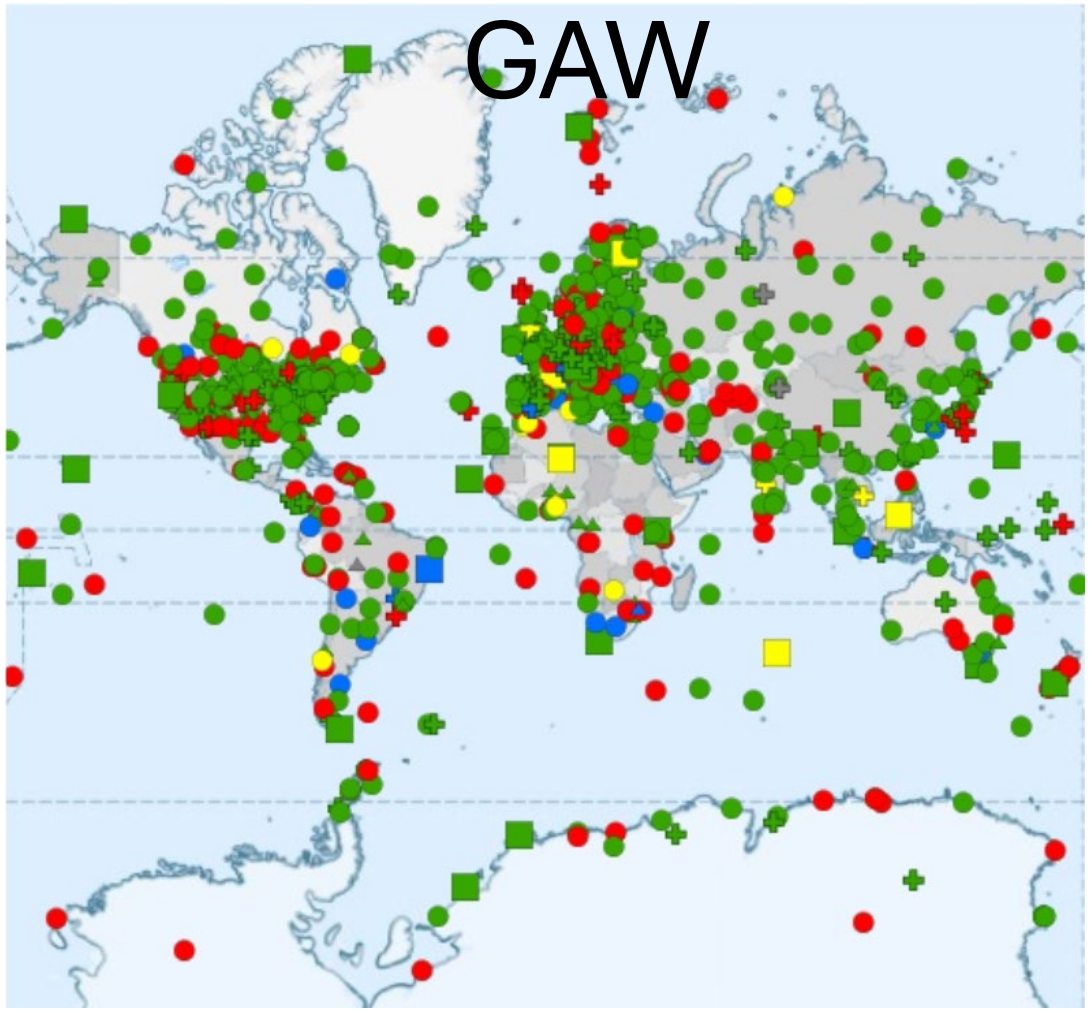
DOE ARM is unique as a network



- DOE ARM supports several different measurement “sites” (including fixed and mobile, airborne, and shipborne)
- DOE ARM stands out in the sheer number of instruments per site, but also in the limited number of sites

NOTE: Not meant to be exhaustive, nor especially accurate for any given network, but the trend is readily apparent

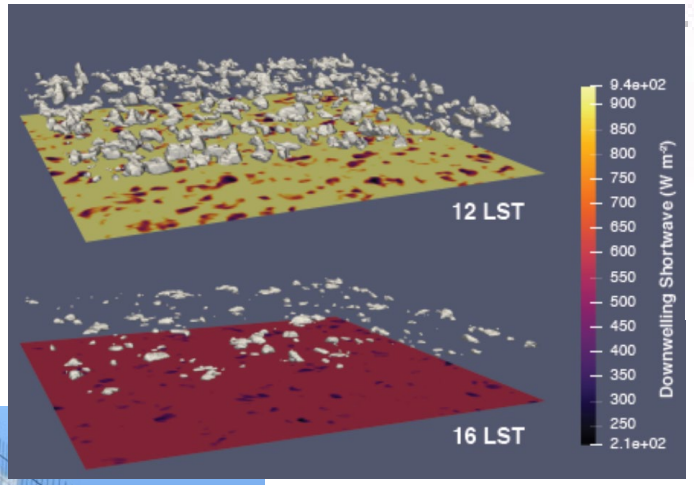
ARM is a unique network

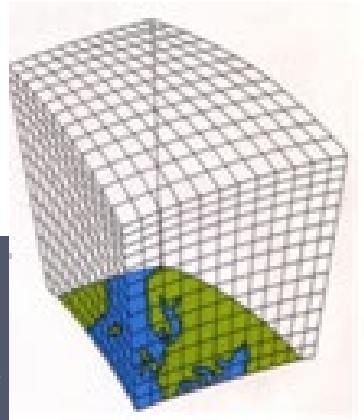


- ARM operates Fixed and Mobile Sites

ARM is unique as a super site

- Southern Great Plains (SGP) observatory consists of in situ and remote-sensing instrument clusters arrayed across approximately 9,000 square miles (23,310 square kilometers) in north-central Oklahoma and southern Kansas





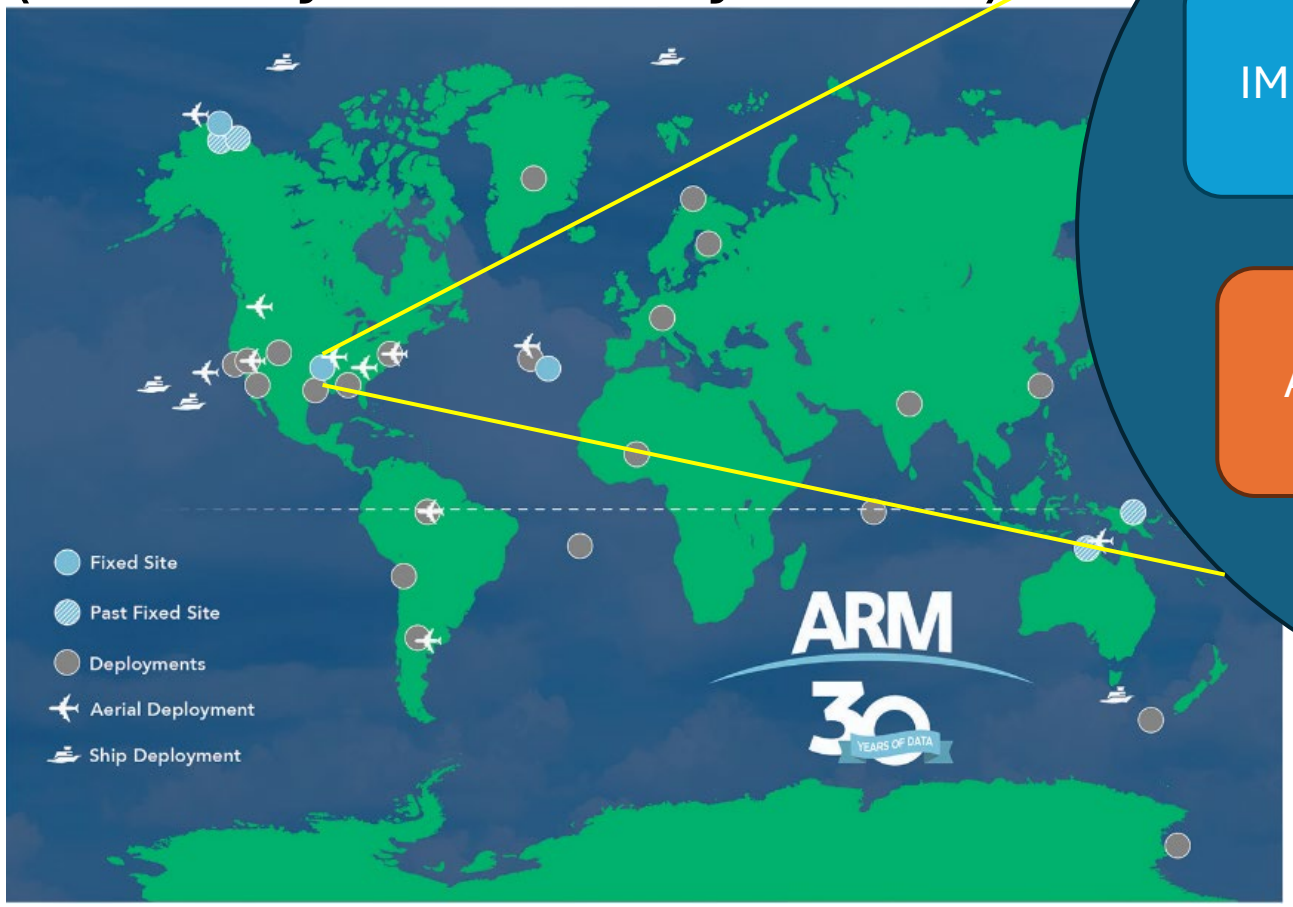
GCM

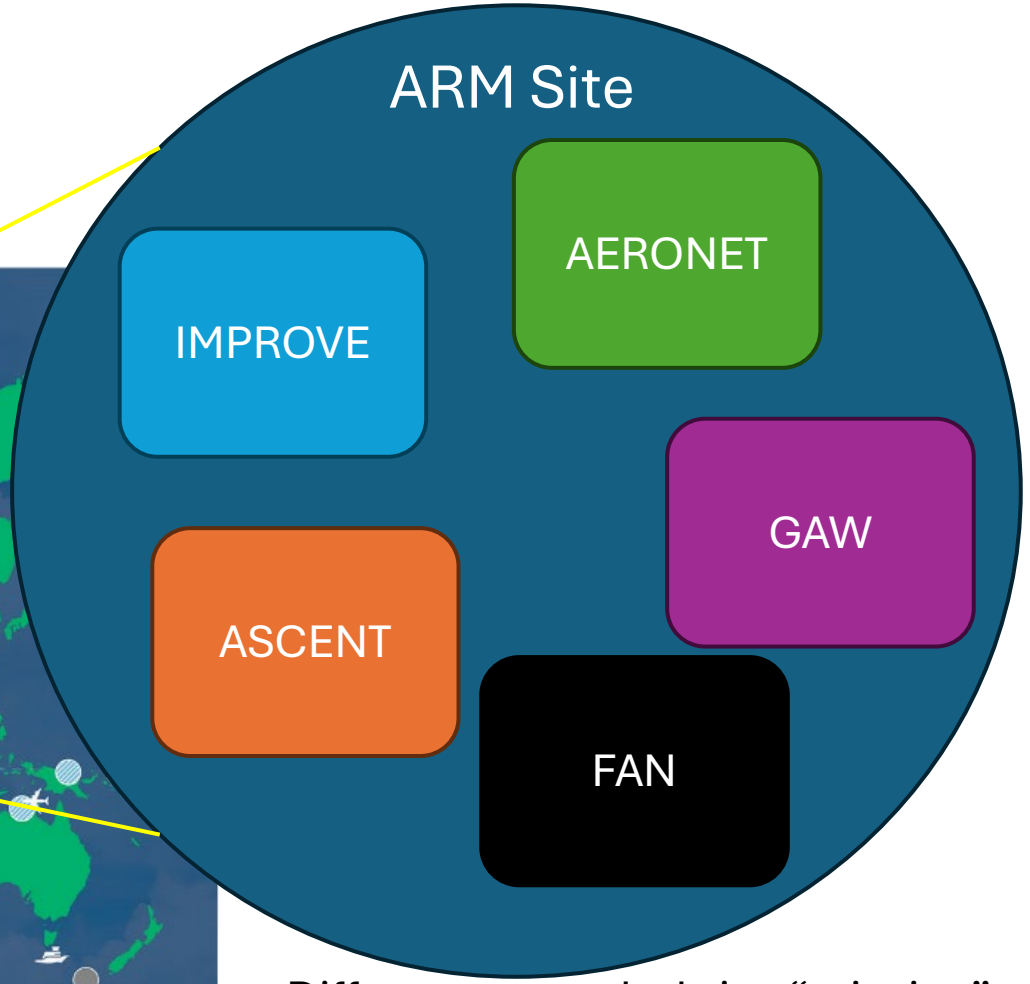
- LASSO uses large-eddy simulation (LES) modeling combined with observations to enable researchers to more easily use ARM's suite of observations
- Goal of bridging the gap between observations and scales within large forecast and climate models

Potential Benefits from Strategic Partners

- ***Higher profile for ARM, including leadership roles and new metrics for success***
- Access to higher number and variability of measurement sites
- Access to more aerosol and trace gas measurements – including hosting other network sites at ARM observatories to augment current/missing measurements (e.g., IMPROVE at SGP for aerosol chemical composition)
- Coordinate data collection protocols with other entities
- More accessible data for scientists (i.e., analytic) and models (i.e., predictive)
- Larger community of scientists (including modelers) using ARM infrastructure and data
- Greater coordination across entities during large-scale Intensive Observational Periods (IOPs) and campaigns

How might this work?
ARM as host
(internally or externally funded)





- Different networks bring “missing” measurements to ARM
- IOP’s at ARM sites then automatically become IOP’s at other network sites…
- Modeling infrastructure at ARM sites then automatically become modeling infrastructure at other network sites…

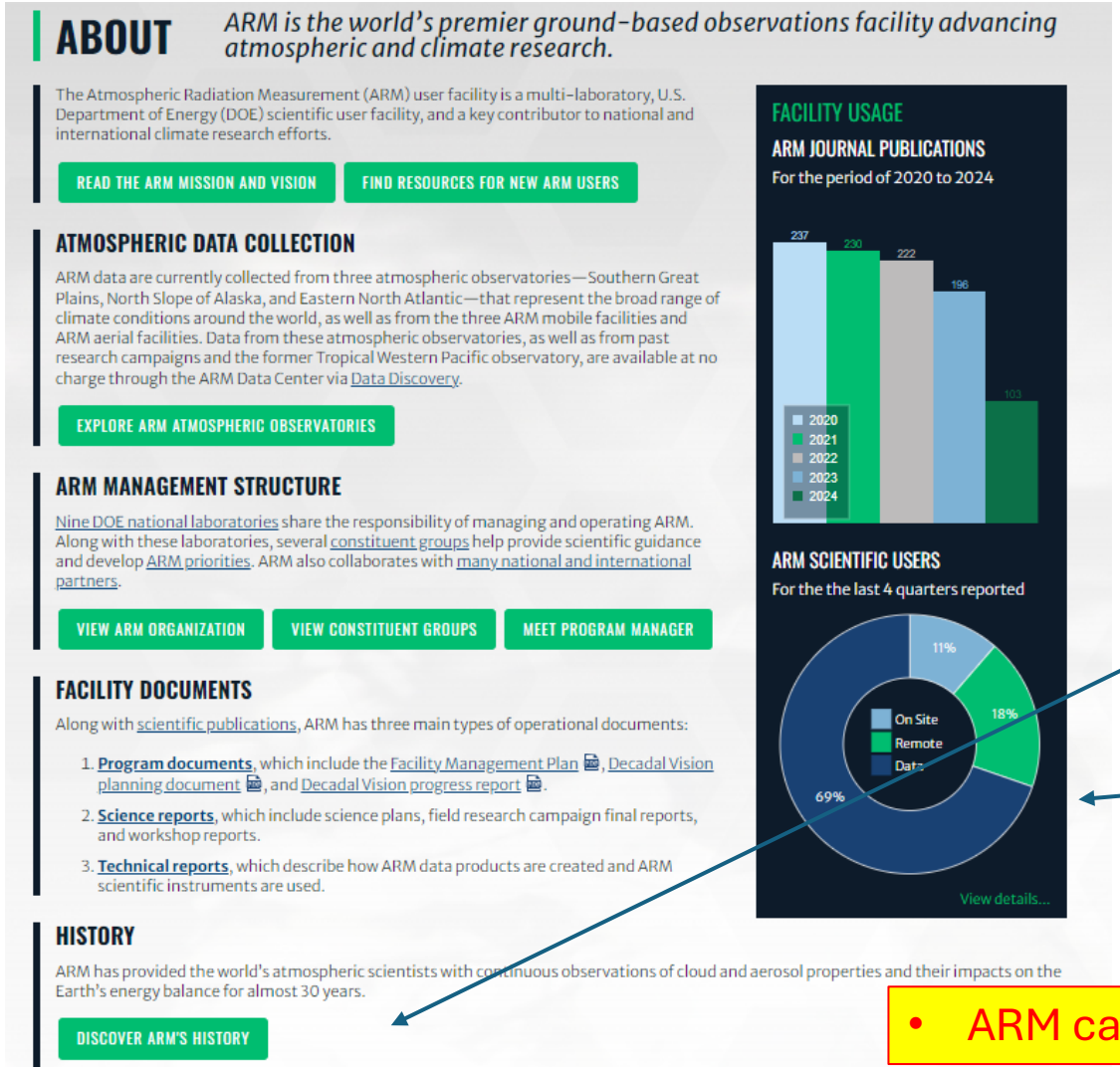
How might this work?
ARM as lead

Prof. Paolo Laj

DOE ARM leads United States "CARGO-ACT"-type coordination project with unfunded collaborations with Europe

- ARM helps fund, support, grow aerosol networks within the US and Globally

How might this work?
ARM as Advocate



ABOUT

ARM is the world's premier ground-based observations facility advancing atmospheric and climate research.

The Atmospheric Radiation Measurement (ARM) user facility is a multi-laboratory, U.S. Department of Energy (DOE) scientific user facility, and a key contributor to national and international climate research efforts.

READ THE ARM MISSION AND VISION | FIND RESOURCES FOR NEW ARM USERS

ATMOSPHERIC DATA COLLECTION

ARM data are currently collected from three atmospheric observatories—Southern Great Plains, North Slope of Alaska, and Eastern North Atlantic—that represent the broad range of climate conditions around the world, as well as from the three ARM mobile facilities and ARM aerial facilities. Data from these atmospheric observatories, as well as from past research campaigns and the former Tropical Western Pacific observatory, are available at no charge through the ARM Data Center via Data Discovery.

EXPLORE ARM ATMOSPHERIC OBSERVATORIES

ARM MANAGEMENT STRUCTURE

Nine DOE national laboratories share the responsibility of managing and operating ARM. Along with these laboratories, several constituent groups help provide scientific guidance and develop ARM priorities. ARM also collaborates with many national and international partners.

VIEW ARM ORGANIZATION | VIEW CONSTITUENT GROUPS | MEET PROGRAM MANAGER

FACILITY DOCUMENTS

Along with scientific publications, ARM has three main types of operational documents:

1. **Program documents**, which include the Facility Management Plan, Decadal Vision planning document, and Decadal Vision progress report.
2. **Science reports**, which include science plans, field research campaign final reports, and workshop reports.
3. **Technical reports**, which describe how ARM data products are created and ARM scientific instruments are used.

HISTORY

ARM has provided the world's atmospheric scientists with continuous observations of cloud and aerosol properties and their impacts on the Earth's energy balance for almost 30 years.

DISCOVER ARM'S HISTORY

FACILITY USAGE

ARM JOURNAL PUBLICATIONS

For the period of 2020 to 2024

ARM SCIENTIFIC USERS

For the the last 4 quarters reported

View details...

- DOE ARM is "***the world's premier ground-based observations facility advancing atmospheric and climate research***"
- We believe that DOE ARM can be strengthened by ***engaging with strategic partners***
- Can we get "Partnerships" or "Partners" on ABOUT website?
- Can we provide metrics associated with Partners to help track ARM efficiency and effectiveness?

- ARM can highlight and promote partnerships

Session Brainstorming:

List of strategic opportunities:

Engage with Strategic Partners:

- Increase number of partnerships with external entities – reengage with FAN and ASCENT
- Start small → demonstrate with one partner → easy or important?
  - How to get agencies to talk together about campaigns
- Participate in European CARGO-ACT project
- Lead national project – similar to European CARGO-ACT project – to help coordinate networks
- Lead US CARGO-ACT effort
- What motivates outside partners?
  - "Selling" ARM to the broader community?
  - Engage [key modelers/users] First… which would grow users be peer-pressure "champions"
- Talk to "big data" firms? (follow AQ network path)
  - Precedence?
- Why did ACTRIS happen → follow the model
- Look at examples in other environmental science areas?
- Politically use the Chinese as a motivator? They have more/better networks?

Community Outreach:

- Highlight partnerships (e.g. on DOE ARM “about” website) – to our knowledge there is no place on the ARM websites that acknowledge existing external partners (outside of DOE)…
- DOE ARM aerosol related BAMS paper – description of the process…
- Use a “customer discovery” or “community engagement” model to find needs?
- More agencies at ASR/ARM PI meeting → breakout session focused on collaboration
- More SBIR Winners/Companies at DOE ARM/ASR PI meetings

Network Measurements:

- Continue to include DOE ARM ground-sites as sites in other networks (e.g., IMPROVE at SGP) to link and broaden scope and measurement capabilities
- IMPROVE at other ARM sites
- Link to UVB network of USDA @ Colorado State University (example: MFRSR Sensors → link networks)
- Continue to support BNL CAMS with international collaborations
- Augment existing DOE sites to comply with external networks
- Augment existing external networks with measurements most relevant to ARM, radiation
- Consider AERONET-model for low instrument numbers, high site density/converge
- Add ASCENT to DOE ARM sites after NSF ends? Excellent opportunity!
- Different networks bring "missing" measurements to ARM
- If ARM sites are in external networks, then IOP's at ARM sites then automatically become IOP's at other network sites…
- If ARM sites are in external networks, Modeling infrastructure at ARM sites then automatically become modeling infrastructure at other network sites…
- IOPs!!
- IOPS: Figure out how to bring more groups to ARM sites (i.e. BNF to bring in measurements ARM does not do) Requires long-term effort for coordination (years)
- Site selection studies
  - How do you make measurements at the surface carefully that truly relate to the column measurements?
  - Does ARM want to reach out to augment these sites?
- Elevated inlets? To get above surface

Data accessibility and sharing:

- Standardization of data files? Is this needed for ARM data to be used by other networks? If so, then ARM resources need to be carved out (not trivial), which means not doing something else (Advantage of more visibility vs. not doing something else)
- Reduce acronyms for inclusivity
- Joint Data Portal
  - NASA people use NASA data, DOE people use DOE data, change the culture
  - GASSP → aircraft collaboration… Is ARM data there? Anyone using it?
- Lean into versatility of ARM core data
  - Unique strength → many many measurements!
- Data Timeliness & Quality has been shown to improve with pressure from outside networks
- Data bundles
- "VAP or data level or bundle" to convert ARM data, commonly at rapid 1 Hz rates, into GAW format, typically averaged to 1 hour – leaving data in ARM database (i.e., control), but more readily available to external users
- Standardize Data format standard across agencies → MACIE effort, continue and invest, airborne instruments
  - Naming conventions
  - Interagency!
  - Net CDF
  - Leader/ or work within CARGO-ACT
- AAFmerge – Beat indicated that all aircraft data from each campaign are now available in one file (NetCDF)
- Data format porting – Nicole indicated that ARM can readily convert ARM data into other formats – just need to know which ones…

Session Brainstorming:

List of problematic roadblocks:

Engage with Strategic Partners:

- Funding requirement
- Inter-agency politics
- Incentives don't align → people at agencies don't benefit from other agency output
- Competing efforts at other agencies?
- $$$ - Even small coordination takes time. Need a point person [or team] (new hire) to be responsible for outreach / coordination with other networks → also on opportunity
  - Evaluate effectiveness of outreach → example AGU & AMS Booths + Townhalls
- Different research goals! (Example: Different agencies measuring CCN at different supersaturation)

Network Measurements

- Physical infrastructure challenges?
- Few sites

Data accessibility and sharing:

- Data quality - ARM would need to “set an example”
- Hard to “credit” data from lots of sources
- DAQ reports show quality when data is not good → weakens credibility
- VAPs have “distance” from actual measurements and uncertainty, need clear documentation
- Credit - If peer data is part of another does that diminish them? How to convince congress this is a good thing.

Extra Slides

Session Summary:

Prioritized list of actionable items:

1.

Final recommendations, comments and suggestions from breakout session (successes, failures):

Session Brainstorming:

- *List of strategic opportunities:*

1. Increase number of partnerships with external entities – reengage with FAN and ASCENT
2. Continue to include DOE ARM ground-sites as sites in other networks (e.g., IMPROVE at SGP) to link and broaden scope and measurement capabilities
3. Participate in European CARGO-ACT project
4. Lead national project – similar to European CARGO-ACT project – to help coordinate networks
5. Highlight partnerships (e.g. on DOE ARM "about" website) – to our knowledge there is no place on the ARM websites that acknowledge existing external partners (outside of DOE)…
6. "VAP or data level or bundle" to convert ARM data, commonly at rapid 1 Hz rates, into GAW format, typically averaged to 1 hour – leaving data in ARM database (i.e., control), but more readily available to external users
7. Continue to support BNL CAMS with international collaborations
8. DOE ARM aerosol related BAMS paper – description of the process…

Session Brainstorming:

- *List of problematic roadblocks:*

1. Funding (and politics)
2. Mission overlap with other government agencies or external entities
3. Data formats and ease of use differ from network to network
4. Lack of similar measurements (ARM – ASCENT different instruments)
5. Lack of fully established protocols for calibrations and uncertainty
6. Lack of metrics (outside of publications) to help guide ARM's direction and achievements
7. DOE lab funding as specific block tasks – breaks up data collection/QA/dissemination