U.S. DEPARTMENT OF ENERGY | Office of Science

DOE/SC-ARM-24-005

Summary of October 2023 ARM User Executive Committee Meeting

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March 2024

ARM

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How to cite this document:

Delamere, J, M Jensen, J Mather, O Ajoku, S Burrows, C Flynn, and M Zawadowicz. 2024. Summary of October 2023 ARM User Executive Committee Meeting. U.S. Department of Energy, Atmospheric Radiation Measurement user facility, Richland, Washington. DOE/SC-ARM-24-005.

Work supported by the U.S. Department of Energy,
Office of Science, Office of Biological and Environmental Research

Executive Summary

The User Executive Committee (UEC) provides objective, timely feedback to the leadership of the Atmospheric Radiation Measurement (ARM) user facility with respect to the user experience. The UEC held a hybrid meeting at the ARM Southern Great Plains Observatory in October 2023. Four goals were identified for this meeting: (1) to take an in-depth look at the ARM user facility, (2) to provide actionable items to ARM within the context of the UEC subgroups, (3) to develop new user engagement strategies, and (4) to see an ARM facility in operation, providing valuable context for future UEC discussions. The outcomes of the successful meeting are highlighted in this report. The UEC is grateful to ARM for facilitating this in-person meeting and to our gracious hosts at SGP.

Acknowledgments

The UEC thanks ARM for sponsoring this hybrid workshop. ARM's Technical Administrator Kimberly Stewart skillfully managed travel logistics and the virtual component of the meeting. Southern Great Plains (SGP) Site Manager Mike Ritsche, SGP Operations Manager John Schatz, and SGP Site Administrative Assistant Doris McAbee handled onsite logistics, providing a welcoming environment with lots of Oklahoma hospitality!

Jennifer Delamere also thanks the ARM Communications Team (led by Rolanda Jundt) for assisting with the preparation of this report. Stacy Tooyoka carefully edited the report. Katie Dorsey kept the UEC Chair and her accompanying blog posts somewhat on schedule.

Acronyms and Abbreviations

AAF	ARM Aerial Facility
AGU	American Geophysical Union
AMF	ARM Mobile Facility
AMS	American Meteorological Society
ARM	Atmospheric Radiation Measurement
ASR	Atmospheric System Research
CRC	Climate Resilience Centers
DOE	U.S. Department of Energy
DEI	diversity, equity, and inclusion
DQO	Data Quality Office
E3SM	Energy Exascale Earth System Model
ESMD	Earth System Model Development
FAIR	Funding for Accelerated and Inclusive Research
FOA	Funding Opportunity Announcement
KML	Keyhole Markup Language
LASSO	LES ARM Symbiotic Simulation and Observation
LES	large-eddy simulation
NERSC	National Energy Research Scientific Computing Center
PI	principal investigators
QME	Quality Measurement Experiment
RENEW	Reaching a New Energy Sciences Workforce
RGMA	Regional and Global Modeling Analysis
RRM-SCREAM	Regional-Refined Simple Cloud Resolving E3SM Atmosphere Model
SGP	Southern Great Plains
UEC	User Executive Committee
VAP	value-added product
WDTS	Workforce Development for Teachers and Students

Contents

1.0 Introduction

The Atmospheric Radiation Measurement (ARM) User Executive Committee (UEC) met on October 24–25, 2023, at the Southern Great Plains (SGP) site with remote access for those who could not travel. ARM user facility staff also participated. The UEC had four goals for this 1.5-day meeting. First and foremost was to provide an in-depth look at the ARM user facility, more than can be accomplished with quarterly, two-hour virtual meetings. Second, to provide actionable items to ARM within the context of the UEC subgroups: (1) Enhancing Communication with the Modeling and Energy Exascale Earth System Model (E3SM) Communities, (2) Enhancing Communication with the Satellite Community, (3) Measurement Uncertainty and Communicating Calibrations, and (4) Undergraduate Engagement with a Focus on Diversity. A third component was to discuss user engagement strategies with the ARM community, both new and old. The meeting also gave UEC members the opportunity to see the largest ARM facility in operation, including a tour and meeting site staff, as many UEC members never had the opportunity to see a site through their funded projects.

Figure 1. Southern Great Plains (SGP) Site Manager Mike Ritsche leads in-person User Executive Committee (UEC) Workshop attendees on a walking tour of the SGP site. Photo credit: Adam Theisen, Argonne National Laboratory.

2.0 ARM Overview

ARM Technical Director Jim Mather and DOE ARM Program Manager Sally McFarlane each presented historical overviews of the ARM user facilities and the Atmospheric System Research (ASR) program. Specifically, ARM Infrastructure Management Board members (Jim Mather, Mike Ritsche, Adam Thiesen, Giri Prakash, Jennifer Comstock, and Nicki Hickmon) provided an overview of ARM capabilities, current activities, organization, services, processes, and history. Many of these details (e.g.,

high-level organization, association of individuals with ARM roles, and a description of capabilities) are available on the ARM website: https://www.arm.gov.

Sally McFarlane reviewed ARM within the context of the larger DOE Office of Science Program. Her slides are available here.

Reviewing ARM's extensive history with the UEC resulted in many questions and discussions. *An outcome of this section of the meeting was the identification that additional information exchange between ARM and both the UEC and the broader user community would be valuable.*

Questions and topics for exploration were posed by UEC members during this portion of the meeting. ARM may want to consider addressing these questions in the future:

- What types of activity are suitable for ARM's high-performance computing facility?
- Are there better ways to connect ARM mentors to the ASR program's new principal investigators (PIs)?
- Is ARM over- or undersubscribed for field campaigns? Will future ARM calls for proposals have specific guidelines?
- How many liaisons are there to the scientific community from the ARM translator group?
- How does ARM measure the success of ARM-hosted community workshops?
- How is ARM used by other DOE Office of Science Programs (i.e., beyond ASR)?
- Would it be possible for ARM to sponsor an early career scientist at one of its observatories?

3.0 UEC Subgroup Discussions

UEC members also participate in subgroups that aim to help broaden community outreach. Each subgroup has four to six members. The subgroup topics originated with the 2021-2022 UEC and will remain in place for the 2023-2024 UEC. At the UEC workshop, sub-group chairs provided updates on their group's activities and led discussions toward possible next steps.

3.1 Undergraduate Engagement with a Focus on Diversity Subgroup

Chair: Osinachi Ajoku

The UEC subgroup on Undergraduate Engagement with a Focus on Diversity is charged with assessing opportunities for undergraduate students, especially from underrepresented groups, to engage with the ARM facility and related research groups. Recent and ongoing efforts by DOE towards addressing these questions were acknowledged, including programs funded by the DOE Workforce Development for Teachers and Students (WDTS), and the new DOE Reaching a New Energy Sciences Workforce (RENEW), Funding for Accelerated and Inclusive Research (FAIR), and Climate Resilience Centers (CRC) programs. In addition, a successful action from the UEC subgroup was bringing invited speakers to the 2022 and 2023 ARM user facility and ASR Science Team meetings focused on diversity, equity, and inclusion (DEI) topics. Next, the group identified new activities that ARM could undertake to engage undergraduate students further, including:

- Development of a listserv to solicit engagement from the undergraduate community**
- Develop a methodology to measure undergraduate knowledge of DOE programs**
- Recruitment and outreach during the annual meetings of the American Geophysical Union (AGU), the American Meteorological Society (AMS), and the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)
- Create (or resurrect) an "Ask a Scientist" program
- Consider funding a modest amount of undergraduate-only research opportunities that piggyback onto currently funded ASR projects.

** Indicates priorities for CY 2024.

In addition to undergraduate engagement, discussions extended to more general DEI issues, particularly those associated with inclusion and fostering a respectful environment during fieldwork. Many of these issues were highlighted during the invited presentation by Emily Fischer (Colorado State University) at the 2022 ARM-ASR meeting. Recommendations (some of which are now being implemented by the ARM user facility) include:

- Offer and require individual and collective bystander training prior to ARM field deployments
- Develop a clearly documented procedure to report incidents occurring during field campaigns, meetings, and workshops.

3.2 Enhancing Communication with the Satellite Community Subgroup

Chair: Connor Flynn

The UEC subgroup with a focus on Enhancing Communication with the Satellite Community is charged with assessing current and future collaborative opportunities with the satellite community and how ARM communicates its satellite products to the community. The discussions during this subgroup session focused on raising the visibility of satellite products already available through ARM Data Discovery, developing tools for easier use of satellite data and collocation with ARM measurements, and more formalized outreach to major satellite programs. The recommendations from this discussion were separated into short-, medium- and long-term recommendations.

Short-term recommendations:

- Raise the visibility of satellite-derived products in ARM Data Discovery
  - Add a satellite icon under "Search by Category" on the main landing page (https://adc.arm.gov/discovery/#/)
  - Add "satellite" as a choice under Categories in the search tool (https://adc.arm.gov/discovery/#/results)
- Updates and additions to the "Satellite Data" page under Capabilities (https://www.arm.gov/capabilities/science-data-products/satellite-data)

  - Encourage "enhanced JupyterHub access" for satellite research as it reduces barriers concerning processing power and data storage
  - Links to ARM-relevant satellite science teams on the Satellite Data page
  - KML files identifying ground-based ARM facilities to facilitate ordering ARM-collocated data from other satellite data archives. Links to these files should be available from the Satellite Data page.
- Formalized outreach to specific satellite science teams. (If necessary, provide travel support to ensure ARM representation.)

Medium-term recommendations:

- Updates and additions to "Satellite Data" page under Capabilities
  - Develop Jupyter Notebook tutorials for ARM-hosted satellite data
  - Provide KML files for user-specified domains around ground-based facilities of the KML files
  - Provide KML files for mobile ARM measurements (e.g., AMF2, AAF, sondes)
  - Maintain a current table of ARM-relevant satellite science team meetings and webinars.

Long-term recommendation:

- Develop a data product with increased emphasis on ARM active remote sensors and comparison with collocated satellite products.

3.3 Measurement Uncertainty and Communicating Calibrations Subgroup

Chair: Maria Zawadowicz

The UEC subgroup on Measurement Uncertainty and Communicating Calibrations is charged with assessing ARM's measurement calibration framework and uncertainty estimates, both for the community of users familiar with ARM data and those who are new to them. Topics and solutions that emerged from the discussion are listed below:

- There is information about recent instrument calibrations in the new ARM database, uncertainty information in the handbooks, and data quality information provided through the ARM Data Quality Office (DQO). Because those pieces are all in different places, a data user (particularly someone new to the program) may be overwhelmed looking for information. A proposed solution would be to collate this information better and send it to the users along with data order confirmation.
- Convene a Data Uncertainty Committee, which would prioritize datastreams that need more rigorous estimates of uncertainty and update Doug Sisterson's report (2017) entitled "A Unified Approach for Reporting ARM Measurement Uncertainties Technical Report: Updated in 2016." This charge is not within the purview of the DQO, which focuses on operational data quality, not long-term characterization of inherent instrument biases.
- Using value-added products (VAPs) to assess data quality was discussed. Members of the UEC and ARM infrastructure described that early in the program, ARM-sponsored routine Quality

Measurement Experiments (QMEs) – formalized closure exercises to compare datastreams and identify biases and uncertainties. There are ways to achieve this by exploring redundancies in instruments that measure similar properties (e.g., overlapping size ranges on aerosol size distribution measurements) or using reanalysis or satellite data to compare to ARM data. The new machine learning project underway at the DQO is a great example of a data quality VAP.

- Storing uncertainty information with ARM data can be contentious and variable by instrument. Identifying examples with consensus could be useful.

3.4 Enhancing Communication with the Modeling and Energy Exascale Earth System Model (E3SM) Communities Subgroup

Chair: Susannah Burrows

The UEC subgroup focusing on Enhancing Communication with the Modeling and Energy Exascale Earth System Model (E3SM) Communities is tasked with recommending to ARM how the user facility can effectively work with modeling centers. This subgroup has met frequently for the past year. Susannah Burrows was the initial subgroup chair for 2021-2022 and has continued in her role for the UEC 2023-2024 board. Thus, this subgroup has continued to work with recommendations made from earlier subgroup work.

- Key Gap: Integration of measurements and process modeling is not as thorough for aerosol-cloud-turbulence interactions as for other areas (e.g., clouds and convection). Case libraries with an emphasis on aerosols might be needed if there is community interest.
- Key Opportunity: Use the emerging E3SM storm-resolving model capabilities (both global and doubly periodic) as a new approach to bridge the scale gap. Regional-Refined Simple Cloud-Resolving E3SM Atmosphere Model (RRM-SCREAM) simulations that zoom into ARM fixed sites and mobile field campaign sites would be particularly useful in providing day-to-day hindcasts in comparison with ARM observations, especially those with scanning capabilities. RRM-SCREAM facilitates simulations with kilometer-scale resolution in the refined domains and coarser resolution outside, thus offering huge gains in computational efficiency while still maintaining representation of interactions across local, regional, and global scales.
- Tutorials offered by model developers, focused on specific processes, is another means to bring communities together.
  - Example: The E3SM Tutorial Workshop is scheduled for May 7th-10th, 2024, at the National Energy Research Scientific Computing Center (NERSC) at Lawrence Berkeley National Laboratory in Berkeley, California. This workshop is aimed primarily at graduate students and other new model users.

The current Earth System Model Development (ESMD), and Regional and Global Modeling Analysis (RGMA) Funding Opportunity Announcement (DE-FOA-0003228) will fund university-led projects that focus on aerosol-cloud interactions and on bridging gaps in scales and that are encouraged to use ARM data or other DOE-funded measurements and diagnostics.

4.0 User Engagement

Since COVID, the UEC has been challenged to gain meaningful feedback from the ARM community via formal surveys or at the annual Joint ARM User Facility and ASR PI Meeting breakout sessions. Thus, the last few hours of the SGP workshop were spent on the topic of user engagement for both the UEC and ARM. We reflected on how to introduce the UEC to the community and build user relationships. We asked ourselves how ARM can provide a more personal introduction of the user facility to new data users and PIs beyond just using ARM.gov. We questioned ourselves about the UEC's role in obtaining feedback about ARM. What is the difference between the Ask Us and Ask a UEC Member links on the ARM website? We on the UEC know the answer—we can talk with you beyond providing information on a data format or the data archive. We can provide one-on-one dialogue on the user facility and the relationship between ARM and ASR, and, importantly, we can convey feedback to ARM management, which can effect change.

Figure 2. The UEC and ARM staff met in the conference room at the SGP Central Facility. Some members attended virtually. In total, 25 people joined the workshop. Photo credit: Jen Delamere, University of Alaska Fairbanks.

Below are topics discussed with actionable items that emerged.

- For newly funded ARM large proposals, the UEC can personally contact the new PIs with an email from a UEC member (not the general UEC email), copied to the UEC chair. ARM is a complex facility. This email would introduce the UEC and offer to assist the PI if they are challenged navigating a particular aspect of ARM.
- Use a stepped approach to communicate details about ARM to the community. Levels of information and engagement could be tuned to the nature of engagement of users (e.g., ordering data, accessing computing resources, conducting a small-scale field campaign, and conducting a mobile facility campaign) to enhance users' experiences while engaging with the facility.

- Joint ARM User Facility and ASR PI Meeting: Could have an infrastructure "block" of time, not just a UEC breakout session or just a "new PI" meeting. This would not be at the expense of the plenary session updates. We could take advantage of the ARM Data booth to have UEC members available during meeting breaks. Perhaps we have some small topics for discussion during this booth time that could be advertised?

5.0 Strategies for New UEC Member Welcome and Engagement

An important topic of discussion during the final portions of the meeting was how to best inform and engage UEC membership, particularly during the annual transition when new members are welcomed to the committee. The overview of the ARM user facility that kicked off the meeting was valuable, especially for UEC members who were relatively new users of ARM data, and provided important context to help inform the UEC's role in supporting ARM. Several action items were defined to fully engage UEC members for their full period of service.

- Shortly following the bi-annual UEC meeting that includes outgoing, incoming, and continuing members, offer the ARM overview presentation to facilitate early and full engagement of new UEC members. The main topics for this overview could be garnered from a pre-meeting survey of the new and continuing UEC membership.
- Develop an annual calendar that includes full UEC meetings and target periods for subgroup meetings and milestone reporting. A calendar for CY2024 has been started.

Figure 3. UEC workshop in-person attendees gathered around the new SGP sign. From left to right are Connor Flynn, Mike Ritsche, Adam Theisen, Jen Delamere, Jim Mather, Maria Zawadowicz, Yunyan Zhang, and Michael Jensen. Photo credit: John Schatz, SGP Operations Manager.

Appendix A

UEC Workshop
Southern Great Plains Site
October 23 - October 26, 2023

Note: All times are Central

October 23, 2023 (Monday)

- Travel to hotel in Enid, OK

October 24, 2023 (Tuesday)

- 08:15 - 09:00: Hotel to SGP site
  - Meet at Holiday Inn Express Hotel & Suites Enid (4702 W Owen K Garriott Road) for carpooling
- 09:00 - 09:30: Check-in at SGP
- 09:30 - 10:30: ARM topics (Jim Mather)
- 10:30 - 11:00: Meet SGP Staff, Coffee Break (Mike Ritsche)
- 11:00 - 12:00: ARM topics (Jim Mather)
- 12:00 - 12:30: Lunch (Open Discussion)
- 12:30 - 13:30: Subgroup - Modeling (Susannah Burrows)
- 13:30 - 14:30: Subgroup - Calibration (Maria Zawadowicz)
- 14:30 - 15:45: SGP Tour & Refreshments (General Overview) (Mike Ritsche)
- 15:45 - 16:45: Subgroup - Satellite (Connor Flynn)
- 16:45: Meeting adjourns
- 16:45 - 17:30: Travel back to hotel
- 18:30: Dinner at El Patio Mexican Grill & Cantina

October 25, 2023 (Wednesday) - Revised agenda due to weather delays

- 08:00 - 09:15: Travel to SGP
- 09:15 - 09:30: Check-in at SGP
- 09:30 - 10:00: ARM within DOE (Sally McFarlane)
- 10:00 - 11:00: Continue tour at SGP
- 11:00 - 11:30: Subgroup - DEI (Osi Ajoku) with morning coffee
- 11:30 - 12:00: Subgroup - Satellite (Connor)
  - cloudsat, calipso,
  - EarthCare and NASA AOS represent important developments for ARM to be involved in.

- 12:00 - 12:30: Lunch
- 12:30 - 13:00: Subgroup - Calibration (Maria)
- 13:00 - 13:30: UEC Community Engagement (Jen Delamere)
- 13:30 - 14:30: Triennial & Decadal Review (Jim Mather)
- 14:30 - 16:30: Short break & UEC Moving Forward (Jen Delamere, Mike Jensen)
- 16:30: Meeting adjourns
- Travel to airports/hotels

October 26, 2023 (Thursday)

- Travel Home

Appendix B

List of Attendees

Participant	Home Institution	UEC/ARM Affiliation	Hybrid Participation
Jennifer Delamere	UAF	UEC	In-Person
Mike Jensen	BNL	UEC	In-Person
Connor Flynn	Univ. of Oklahoma	UEC	In-Person
Maria Zawadowicz	BNL	UEC	In-Person
Yunyan Zhang	LLNL	UEC	In-Person
Jim Mather	PNNL	ARM	In-Person
Adam Theisen	ANL	ARM	In-Person
Mike Ritsche	ANL	ARM	In-Person
Sarah Brooks	Texas A&M	UEC	Virtual
Erika Roesler	Sandia	UEC	Virtual
Giri Prakash	ORNL	ARM	Virtual
Jennifer Comstock	PNNL	ARM	Virtual
Katie Dorsey	PNNL	ARM	Virtual
Ken Kehoe	Univ. of Oklahoma	ARM	Virtual
Kim Stewart	PNNL	ARM	Virtual
Kyle Dumas	ORNL	ARM	Virtual
Nicki Hickmon	ANL	ARM	Virtual
Osinachi Ajoku	Howard Univ.	UEC	Virtual
Rob Records	ORNL	ARM	Virtual
Scott Collis	ANL	UEC	Virtual
Susannah Burrows	PNNL	UEC	Virtual
Wade Darnell	ORNL	ARM	Virtual
Youtong Zheng	GFDL/Princeton Univ.	UEC	Virtual
Zhien Wang	CU Boulder	UEC	Virtual
Sally McFarlane	DOE	ARM	Virtual

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