

# Proposed ARM Sampling Strategy

Aerosol Measurement Science Group (AMSG)

Discussion of goals and options

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Discussion of goals and options

**FEEDBACK : SLACK Channel**

# US Department of Energy Climate Science

- **ASR** – aerosol **processes** (i.e., process-level evolution)
  - e.g., changes in chemistry, mixing state, size distributions, CCN and IN activity, etc.
- **ARM** – aerosol **properties** (i.e., long-term observations)
  - User Facilities in support of **ASR** science
    - AMF (AOS) – super-sites, aerosol properties
    - AAF – airborne, aerosol properties and processes
- How can ARM long-term measurements be optimized to better support ASR process studies?”
  - What aerosol and atmospheric properties are necessary to evaluate aerosol processes?
  - What sampling strategies best enable the study of aerosol processes?

# Current ARM Sampling Strategies

- Core measurements operating all the time (Super sites)
  - Annual Facility Call Campaigns (> \$300k)
  - Small Campaigns (< \$300k)
- } Principal Investigator (PI)  
science driven
- Should ARM consider new sampling strategies?
    - **AMSG** concept under consideration
    - ARM structured to improve measurement and data quality
    - Encourage Guest measurements/instrumentation

# Goals for new ARM Sampling Strategy

- Improve understanding of aerosol processes at ARM facilities
- Increase involvement from ASR funded scientists and new external scientific communities
- Improve ARM measurement and data quality
- Provide ARM instrument mentors with structured down-time for maintenance and calibrations
- Test new measurement technologies (e.g., SBIR)
- Increase ARM data *use and confidence*

# Proposed ARM Sampling Strategy

- **Structured Intensive Observational Periods (IOPs)**
  - Located at long-term and medium-term super-site locations
    - not including Small Campaigns associated with Annual Facility Call Campaigns
  - Science topic driven
  - Increase spatial (i.e., vertical) and temporal (i.e., 4D) measurements at ARM super-sites
  - More readily include AAF facilities including tethered balloons and UAV
  - Direct participation and focus from ARM mentors
  - Principal Investigator (PI) proposals accepted/encouraged for participation in IOPs
  - Concentrate complex measurement techniques during IOPs rather than as core long-term measurements
  - Seasonally aware

# IOP Aerosol Sampling Plan

## Core Measurements

| S  | M  | T  | W  | T  | F  | S  |
|----|----|----|----|----|----|----|
|    |    |    | 1  | 2  | 3  | 4  |
| 5  |    |    |    | 9  | 10 | 11 |
| 12 | 13 | 14 |    |    |    | 18 |
| 19 | 20 | 21 | 22 | 23 |    |    |
| 26 | 27 | 28 | 29 | 30 |    |    |

Continuous 24/7 – Year Round

**Core Measurements:**  
**Focus on long-term trends (IPCC)**  
e.g., Aerosol Concentration,  
Full Aerosol Size Distribution,  
Aerosol Optical Properties,  
CCNC, ACSM, etc.

With a focus on  
aerosol *in situ*  
initially

## Intensive Observational Periods

Times selected (with input from modelers and AMSG) to strategically sample different sources and environmental phenomenon. Mentors required to have instruments calibrated and at optimum allowable performance. Vertical profiling is targeted.

**ARM measurements focused on atmospheric processes:**  
e.g., fRH, HTDMA, Scanning  
CCNC, etc.

## Guest Instruments or Mini IOPs

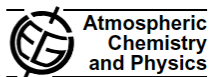
Annual or Bi-Annual  
Mechanism for outside PIs to propose to small field campaign that will allow instrumentation to complement existing

**PI measurements focused on Process Questions, Closure Studies & Instrument Comparison**  
e.g., CIMS, CFDC, etc.

# Core Measurements

- Strongly support core measurements, specifically for the long-term
  - Core measurements within proposed sampling strategy are still to be defined
- SGP – Long Term Site
  - Acts a backbone for long-term trend studies
  - Increase awareness of data within international communities (e.g., EBAS database for upcoming trend studies for IPCC)

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## Aerosol decadal trends – Part 1: In-situ optical measurements at GAW and IMPROVE stations

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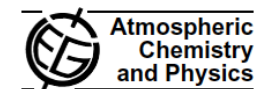
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## Multidecadal trend analysis of in situ aerosol radiative properties around the world

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## Aerosol decadal trends – Part 2: In-situ aerosol particle number concentrations at GAW and ACTRIS stations

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# Proposed Intensive Observational Periods

- Seasonal IOP's at super-sites to ensure long term coverage of measurements
- ARM structured themes, time periods, and locations
  - Based on input from ASR (i.e., aerosol processes goals), Modelers, Mentors
  - Optimized for efficient use of ARM mentors and infrastructure
  - Open proposal calls for ASR and external PI's
- Augment Core Measurements
  - Include complex ARM and GUEST measurements
  - Selection of times/locations driven by science
    - Ideally – alternating through seasons over several years
    - Practically – may be only several weeks each year, or depend upon the site

# Thoughts on proposed sampling strategy

- Will this proposed structure meet the needs to ASR community?
  - Goal: Driven by science and PI input, but ARM selected times and locations
- How to chose relevant scientific topics of a given IOP?
- Will this structure meet the needs of modelers (high-quality data only for a few weeks each season)?
  - ARM needs from modelers: what parameters can modelers simulate and what are they interested in simulating?
  - Having lots of data is not the same thing as having the desired data
  - Interests/needs will be different depending on which modelling community (global climate and cloud processes operate on different time and space scales).
- Will this increase ARM measurement quality and decrease the labor burden on instrument mentors?
  - Both are goals of the proposed sampling strategy