



Improving the Understanding and Accessibility of ARM's Aerosol Data



Topics

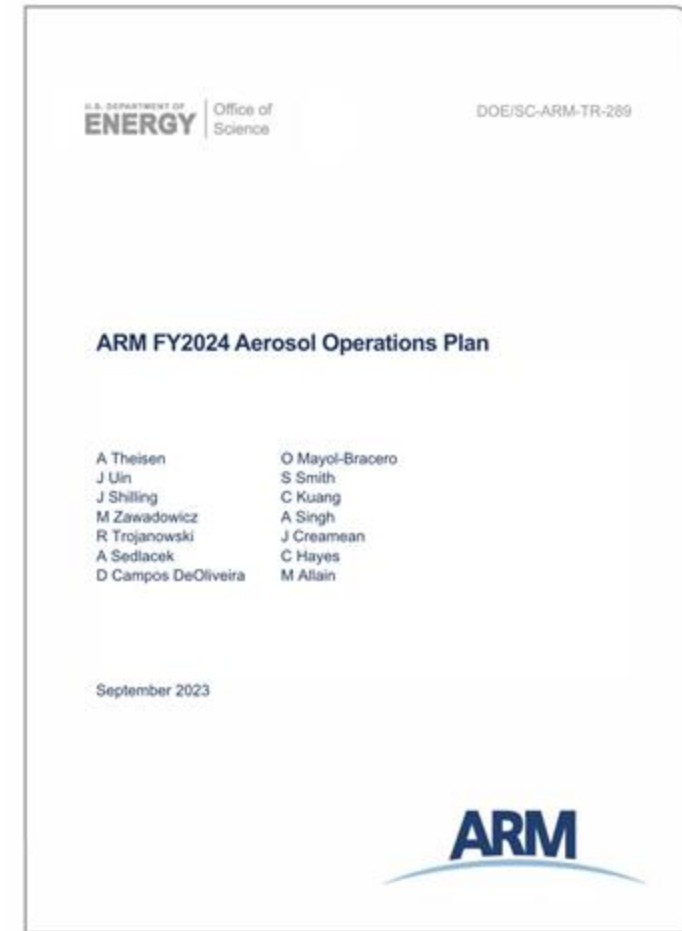


- Recent and Planned Reports
- Calibration Information
- Handbooks/VAP Technical Reports
- Data Quality
- Reprocessing

Current Resources: Recent and Planned Reports

- Aerosol Operations Plan
 - Mechanism to communicate our priorities and plans to the scientific community
 - Documents timelines for calibration trips and periods identified for IOPs

Site	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024	Jun 2024	Jul 2024	Aug 2024	Sep 2024	Oct 2024	Nov 2024	Dec 2024
AMF1 (EPC)	■					■										■
AMF2 (CAPE-K)*						■									■	
AMF3 (BNF)			■				■				■					■
ENA			■												■	
SGP				■			X	■	■	X	■			■		
NSA								■								
Calibration Trip	■															
X - Every effort will be made to ensure all instruments are operating at a high quality																
Ideal periods for IOPs	■															



Current Resources: Recent and Planned Reports

- ARM AOS Overview Paper
 - <https://journals.ametsoc.org/view/journals/atot/36/12/jtech-d-19-0077.1.xml>
- UHSAS Artefacts Technical Report (Coming Soon)

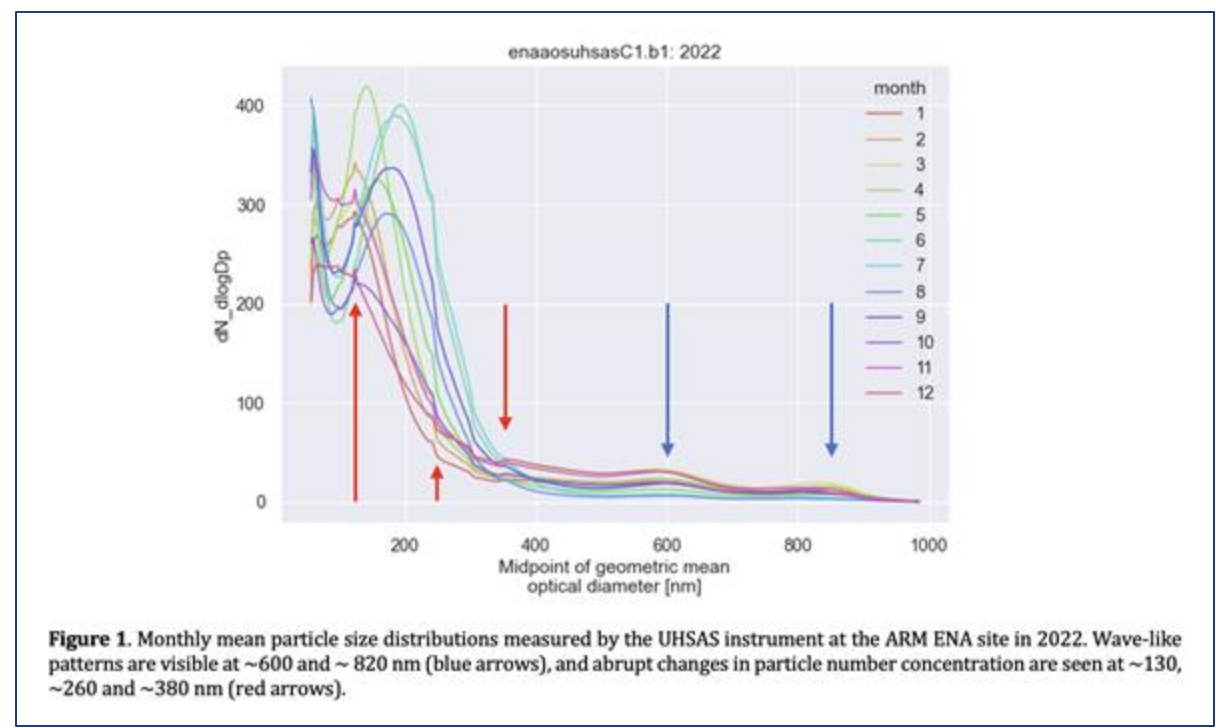


Figure 1. Monthly mean particle size distributions measured by the UHSAS instrument at the ARM ENA site in 2022. Wave-like patterns are visible at ~600 and ~820 nm (blue arrows), and abrupt changes in particle number concentration are seen at ~130, ~260 and ~380 nm (red arrows).

Current Resources: Recent and Planned Reports

- Instrument Webpage
 - Has a lot of additional information connected
 - Handbooks
 - Aerosol Operations Plan
 - Reference Papers
 - History/Future
 - Etc...

CAPABILITIES > INSTRUMENTS
AOS

[HANDBOOK](#) [CITE DATA](#) [BROWSE DATA](#)

Aerosol Observing System

AOS > AEROSOL OBSERVING SYSTEM

INSTRUMENT TYPE(S) > BASELINE • EXTERNAL • GUEST

The aerosol observing system (AOS) is the primary platform for in situ aerosol measurements at Earth's surface. Each AOS has a different complement of instruments, which are selected to ensure the best measurements at each deployment site.

The AOS measures aerosol optical properties to better understand how particles interact with solar radiation and influence the Earth's radiation balance. These measurements are useful for calculating parameters used in radiative forcing calculations, such as the aerosol single scattering albedo, asymmetry parameter, mass scattering efficiency, and hygroscopic growth. Measurements made with the AOS form a long-term record at the ARM fixed sites. Shorter measurement records are available from mobile deployments in a wide variety of geographical regions. These measurements are valuable for:

- identifying long-term changes in aerosol properties
- identifying atmospheric processes controlling aerosol life cycle and their influence on clouds
- providing experimental data for developing and testing atmospheric climate models.

[VIEW AOS CORE CONFIGURATION](#) [LEARN AOS HISTORY](#) [DISCOVER AOS FUTURE](#)

RELATED DATA ANNOUNCEMENTS

[Black Carbon Data Product Available for Use](#)
24 January 2024

[Boon of New Aerosol and Trace Gas Data for ARM Users](#)
16 February 2021

REFERENCES

Theisen et al. [ARM FY2024 Aerosol Operations Plan](#). 2023. 10.2172/2008425. [View Citation](#)

Uin et al. [Southern Great Plains \(SGP\) Aerosol Observing System \(AOS\) Instrument Handbook](#). 2021. 10.2172/1756406. [View Citation](#)

Current Resources: Recent and Planned Reports

- Internal Reports
 - Testing a new field-deployable calibration system for AOS aerosol instruments
 - Characterization of the AOS Aerosol Inlet Stack for Transmission Losses for $D_p > 1 \mu\text{m}$
 - Intercomparison of TSI APS with GRIMM OPC
 - Absorption, Scattering, and Extinction Closure
 - LASIC Nephelometer Data Quality (Attached to DQR D240603.6)
 - TRACER/EPCAPE Hygroscopicity Closure
- Challenge: When to publish as a tech report vs keeping internal?

New Calibration System

- Calibration plans and reports tailored to each instrument
- Reports will be accessible in a similar manner as DQRs
 - Data discovery
 - Data downloads
 - API
 - Calibration Search Tool
- Timeline
 - Calibration record entry added in early July
 - Dissemination - TBD

The screenshot shows a web interface for 'Calibration Plan Details'. At the top, it says 'Fields marked with * are required.' The form includes the following fields and values:

- Calibration Plan Name:** ACSM Flow Calibration (with a green checkmark)
- Plan ID:** 84
- Version:** 132
- Instrument Class:** acsm - Aerosol Chemical (dropdown)
- Collection Type:** ACSM (dropdown)
- Product Type:** (empty dropdown)
- Asset Type:** (empty dropdown)
- Calibration Type:** Calibration (dropdown)
- Calibration Equipment:** (empty dropdown)
- Interval:** (empty field with a green checkmark) and 'As Needed' (dropdown)
- Performed By:** Mentor (dropdown with a green checkmark)
- Notification:** Mentor (dropdown with a green checkmark)
- Reminder:** (empty field with a green checkmark) and 'As Needed' (dropdown)

Below the form is a rich text editor for the procedure. The text reads: 'To perform a flow calibration on an ACSM, follow the steps below.' followed by a numbered list of 6 steps: 1. Close inlet valve and turn Detector and filament off. 2. Carefully remove the critical orifice and replace it with a needle valve. 3. Open inlet valve while checking the inlet pressure. 4. Open IGOR to collect data. 5. Set inlet pressure range to at least 5 points. 6. While slightly opening the needle valve, focus on reaching the first point of your inlet pressure set range (mb). Once the inlet pressure first point is reached, calculate the inlet flow by using the gibrator (ccm).



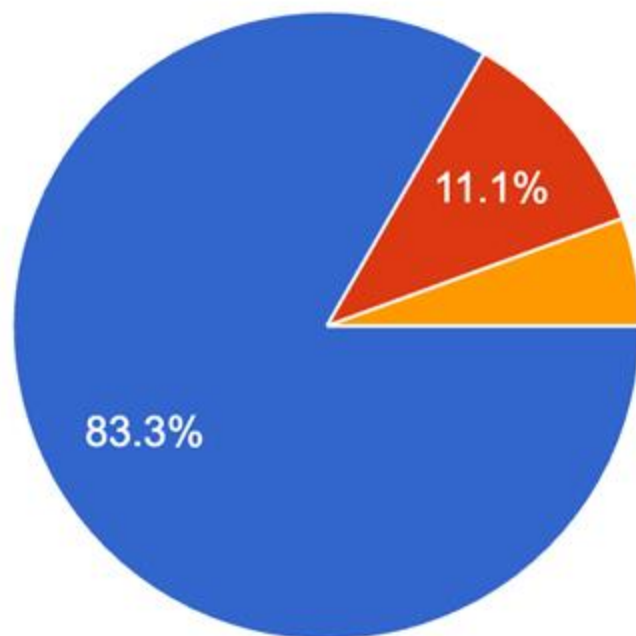
ARM Data Quality Survey Q&A

Question 1



How often do you work with ARM data?

18 responses



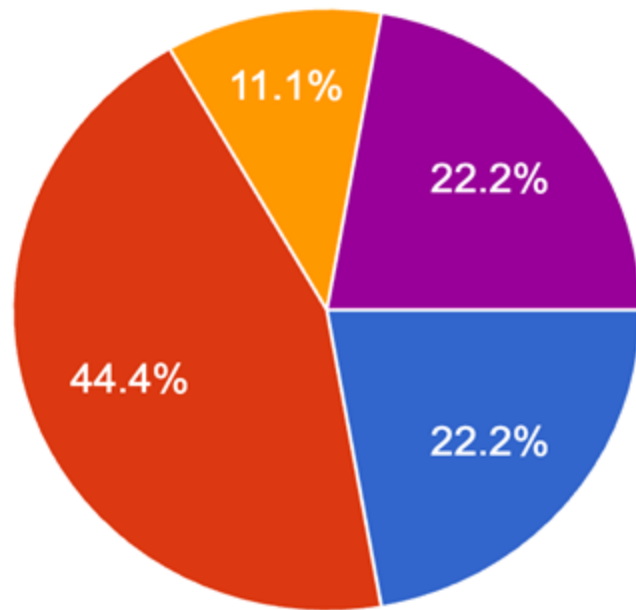
- 1 - frequently, at least every few months
- 2 - a few times a year
- 3 - rarely/I've only used ARM data a few times
- 4 - never

Question 2



Please indicate your view of the effectiveness of the following data quality communication mechanisms: Data Quality Reports (DQRs)

18 responses



- 1 - very effective
- 2 - somewhat effective
- 3 - somewhat ineffective
- 4 - very ineffective
- N/A - I have had no experience with the mechanism

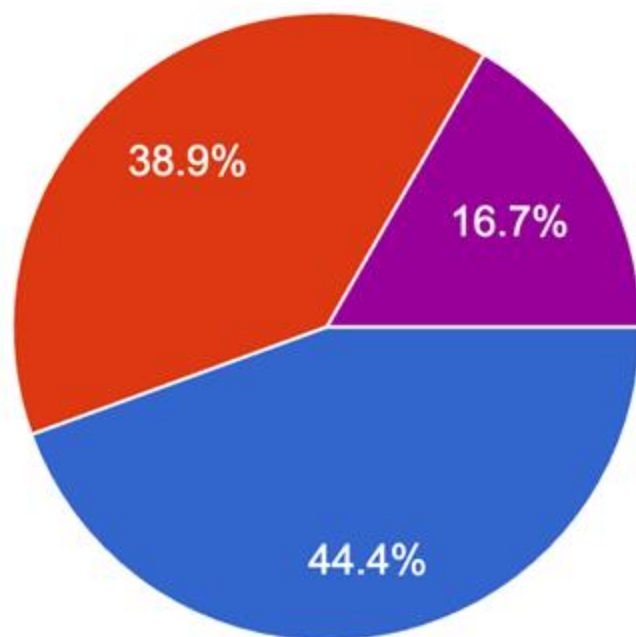
- Creating new DQR
- DQR Dashboard

Question 3



Data Quality Flags embedded in data files (embedded QC)

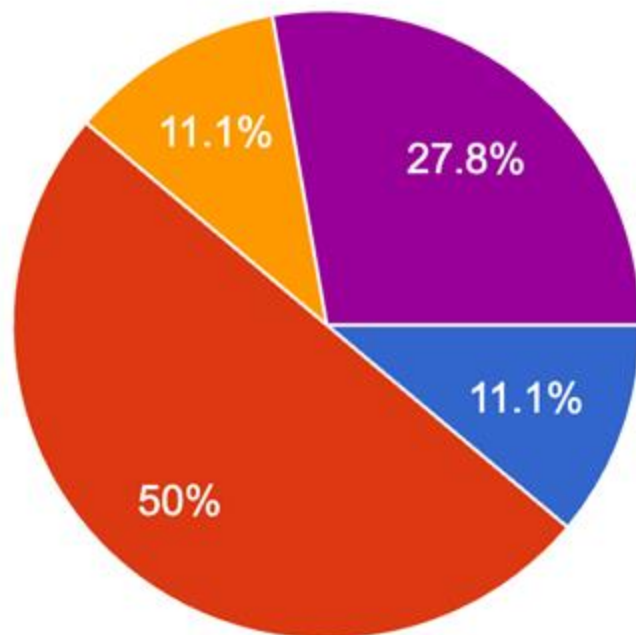
18 responses



- 1 - very effective
- 2 - somewhat effective
- 3 - somewhat ineffective
- 4 - very ineffective
- N/A - I have had no experience with the mechanism

Instrument Handbooks

18 responses



- 1 - very effective
- 2 - somewhat effective
- 3 - somewhat ineffective
- 4 - very ineffective
- N/A - I have had no experience with the mechanism

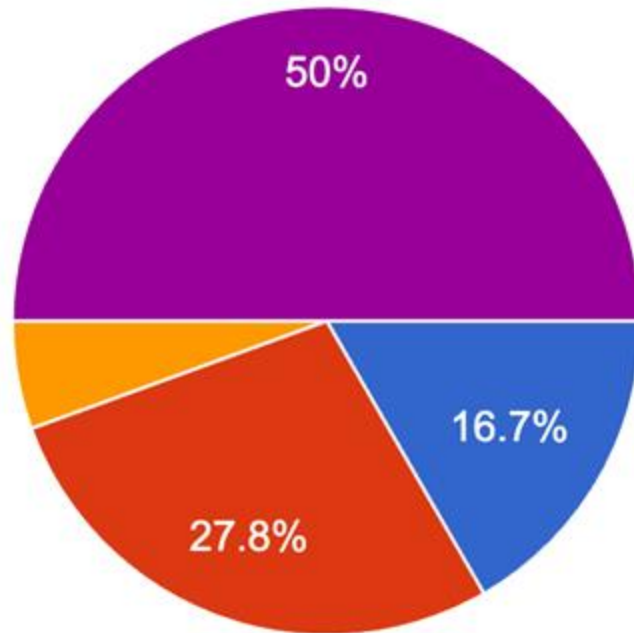
- Instrument Handbook example

Question 5



Data Quality (DQ) Office Tools (e.g. DQ-Explorer, DQ-Zoom)

18 responses



- 1 - very effective
- 2 - somewhat effective
- 3 - somewhat ineffective
- 4 - very ineffective
- N/A - I have had no experience with the mechanism

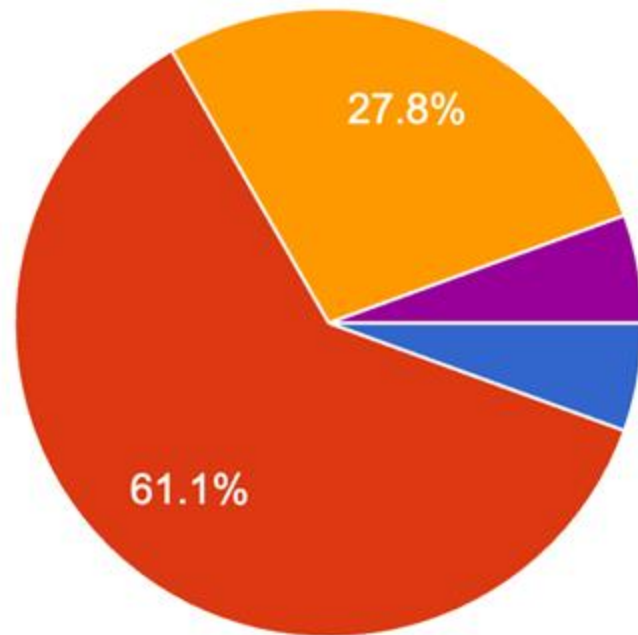
- DQ-Explorer
- DQ-Zoom
- DQ-Plotbrowser

Question 6



Overall, how satisfied are you with the communication of data quality information within ARM?

18 responses



- 1 - very satisfied
- 2 - somewhat satisfied
- 3 - somewhat dissatisfied
- 4 - very dissatisfied
- N/A - I have no experience with ARM data quality communication

Question 7: What obstacles/challenges have you encountered when accessing ARM DQ info?



I hate having to merge DQR info with data files - i just want clean data files with suspect and invalid data already removed. it would make it SO much easier to work with the data. (also lower resolution data - (1min); 1sec data is painful for anything i do.)

The handbooks often contain incomplete information. Not all variables are well described.

There are certain data-sets where I am not sure if a "weird" looking feature is "real" or an instrument "artifact" and there is no clear guidance about how to either use, not-use, or selectively-use such data.

Not all info and problems included

As a modeler, sometimes I am not sure if the data is accurate or any inherent issue without a clear note

For some instruments (e.g., HSRL), there are no DQ information in the data files from ADC, or the DQ is not helpful (e.g., data does not look reasonable while DQ indicates good data)

I have found some data issues that were not previously known or reported. ARM addressed them, but it was not an efficient process.

Some of the data quality reports are more detailed than others depending on the instrument and site. I have seen instances where the data look suspicious but there is no mention of these time periods in the data quality report, which has led us to need to reach out to the instrument mentor for clarification.

The data quality flags can be a little difficult to interpret. Some bits are labeled as bad while others are labeled as intermediate and it's not always easy to understand whether the flagged data are useable or not.

The DQ information is scattered over multiple sources (DQRs, DQ flags) and it is not always obvious to the user which set they should use or that there even is more than one set of information. Secondly, potentially compromised data is not excluded by default when ordering data through Data Discovery. A user needs to opt OUT of this data which users often fail to do for one reason or another.

The main challenge is the direct communications with the mentors when some suspicious data is found, and the way it is re-processed

Question 8: Are there any specific features/functionality you would like to see to improve the communication of DQ info?



more efficient visualization tool to directly check the observation data

a 'clean' data file with all suspect and invalid data removed so consideration of DQRs is not necessary.

I'd request more responsiveness/prioritization when issues arise.

It would be good to get notified when a datastream that you have downloaded previously is updated at the database

Single source of DQ information that is clearly advertised during data ordering process. Also, during data ordering, exclude potentially compromised data by default or better yet, do not make it available without a special request.

Include raw data in next level files (processed files)

I think the data quality reports could include more information, especially when the data are flagged. I have seen several datasets where much or all of the data are flagged, but there are no explanations for the flagged data in the data quality reports. It would be helpful if the data quality reports mention whether the flagged data are still usable or not.

Question 9: Any thoughts to share concerning the communication of DQ info that has not already been covered?



access to handbooks (or handbook sections) for specific instruments rather than only one handbook for one type of CPC when there might be multiple CPC models used.

We found good set of aerosol measurement data but didn't find adequate for aerosol precursors. I strongly recommend DOE/ARM to add instruments measuring key aerosol precursors (SO₂, NH₃, key VOCs, etc.)

It may just be personal preference, but I tend to use this website more than the DQ links above to visualize data and metadata before downloading it during an ongoing campaign - <https://adc.arm.gov/afcd/#/>. Are there plans to link these campaign sites to the DQ information or to let users know that newer, higher quality data products might exist in ARM Data Discovery?

User Problem Reporting

- Please report any data quality issues to ARM as it will help improve the data for everyone
 - Opens up an incident report for ARM to track to resolution
- Any other questions, you can always use the “Ask Us” form and someone from ARM will respond

CONTACT ARM WITH YOUR DATA QUESTION ✕


✓ Finding ARM Data

Data Quality Issues

Other

! Email

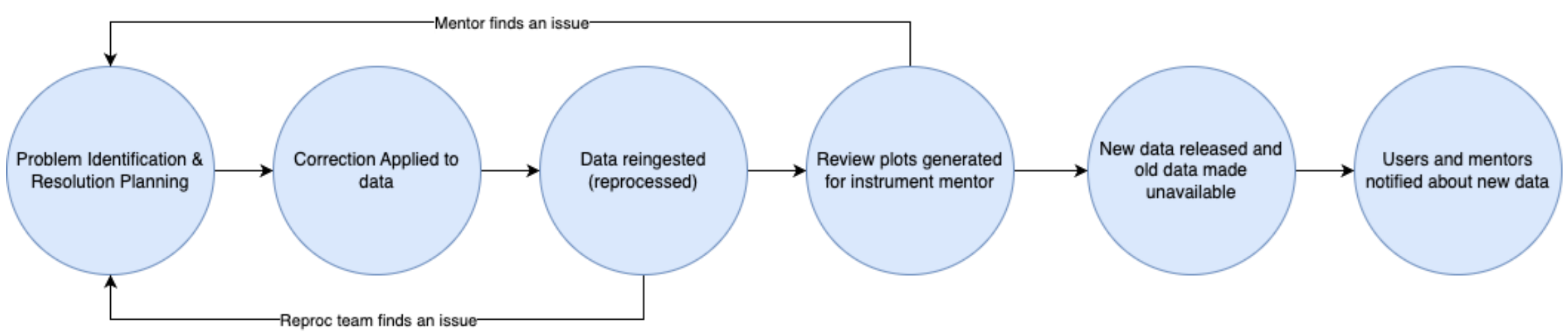
! Please describe your question here in detail.

I'm not a robot  reCAPTCHA
Privacy - Terms

SEND **CANCEL**

ADC Reprocessing High-level Overview

- **Identification & Planning**
 - Users, site workers, mentors, developers, Data Quality Office, ADC involved
 - Fixability is ascertained
- **Correction**
 - A fix might have to be applied to raw data (apply a formula, remove bad data, etc.)
- **Reprocess**
 - An update might have to be issued to ingest process. The data is run through the ingest



ADC Reprocessing High-level Overview

- **Review**

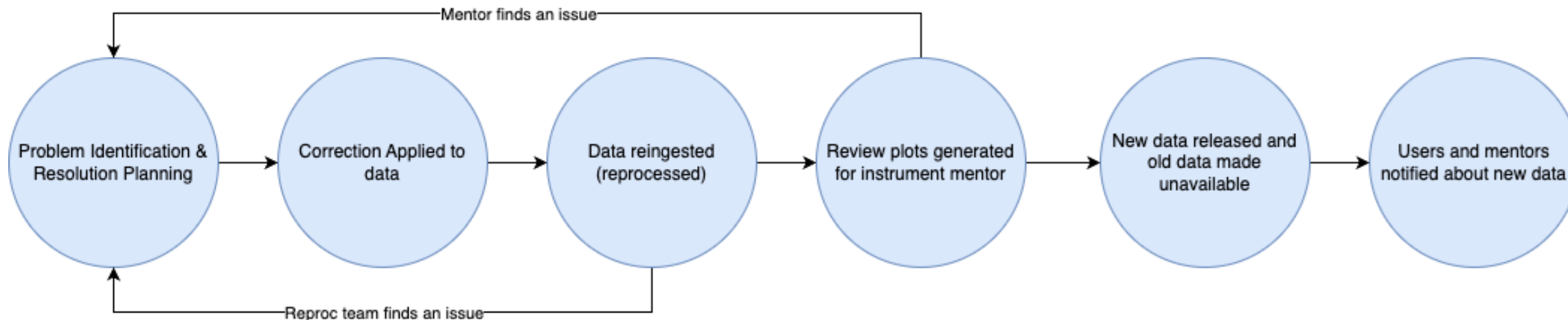
- Plots comparing old and new data created for mentor to review
- Can be cyclical, might find issue and must redo

- **Release**

- New data is released
- Old data made unavailable
- Nothing is ever actually deleted

- **Notify**

- Email notification
- Mentors, reproc team, and any user who's ordered the data in the last 5 years





Overview - Mentors

- Majority of ARM mentors are less than 50% on ARM

Discussion