ARM Data Quality: What You Need to Know

ARM Data Quality Office
2016 ARM/ASR PI Meeting
May 2, 2016
Agenda

- Who to contact with problems
- DQ Office Overview
- How to access DQ information
  - Handbooks
  - Embedded QC Flags
  - DQRs
- Live demo of DQ Office plotting tools
- ARM Infrastructure Discussion/Help Session
Any questions or notifications about the level of quality of ARM data can be sent to problems@arm.gov. No problem is too small.
DQ Office

Randy Peppler
DQ Office Manager since 2000

Ken Kehoe - May 2004

Justin Monroe - February 2008

Sean Moore - 1998

Adam Theisen - May 2010

Josh King - 2014
DQ Office

- Work to minimize the amount of unacceptable data collected
- Team of DQ Analysts that review data from most ARM instruments
  - Review an average of 175 years worth of data each year
- Process data every hour to produce
  - ~6500 Plots and movies/day
  - >300 QC summary metrics files/day
How to Access DQ Information

- Instrument Handbooks
- Embedded QC Flags (qc_ fields in netCDF file)
  - Automatically generated during data file creation
  - Not displayed or used for data filtering in ARM Data Discovery!
- Data Quality Reports (DQR)
  - Manually entered after data file creation
  - Displayed in ARM Data Discovery, and data marked as “incorrect” by DQRs are filtered by default

What methods do you use?
Handbooks

Instrument: Surface Meteorological Instrumentation (MET)

Instrument Categories
Surface Meteorology

General Overview
The ARM Surface Meteorology Systems (MET) uses mainly conventional in situ sensors to obtain 1-minute statistics of surface wind speed, wind direction, air temperature, relative humidity, barometric pressure, and rain rate. Additional sensors may be added to or removed from the base set of sensors depending upon the deployment location, climate regime, or programmatic needs. In addition, sensor types may change depending upon the climate regime of the deployment. These changes/additions are noted in the Deployment Locations and History section of the instrument handbook.

Output Datastreams
met: ARM-standard Meteorological Instrumentation at Surface

Primary Measurements
The following measurements are those considered scientifically relevant.

- Atmospheric moisture
- Atmospheric pressure
- Atmospheric temperature
- Horizontal wind
- Precipitation
- Visibility

Locations
Embedded QC Flags

- Automatically generated during data file creation
- Not displayed or used for data filtering in ARM Data Discovery!
  - It is up to the data user to review these and filter data as warranted

- Why Bitpacked?
  - Stored in a single variable vs. the need for multiple accompanying variables
  - Tests are stored independently including the results of multiple tests

- Example
**Data Quality Report (DQR)**

- **Official mechanism to report problems or general information to the end-users**

<table>
<thead>
<tr>
<th>DQRID</th>
<th>D120928.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start Date</strong></td>
<td><strong>Start Time</strong></td>
</tr>
<tr>
<td>09/08/2012</td>
<td>2052</td>
</tr>
</tbody>
</table>

**Subject:** SGF/MET/E13 - Low logger voltage

**DataStreams:** sgpmeE13.b1

**Description:** Low logger voltage was reported. Low voltage may result in data spikes or dropouts.

**Suggestions:**

**Measurements:** sgpmeE13.b1:
- PWD 1 minute mean visibility (pwd_mean_vis_1min)
- PWD 10 minute mean visibility (pwd_mean_vis_10min)
- PWD cumulative liquid precipitation (pwd_cumul_rain)

[more]
Data Quality Report (DQR)

DATA

DQ Office

Plots, Metrics, & Other Tools

Internal to ARM

DQ Analyst
DQ Personnel

Data Quality Assessment Reports (DQA)

Problem?

Data Quality Problem Report (DQPR)

DQ Office

Mentors

Site Ops

DMF

Site Scientist

Reprocessing Advisory Board

RID

Data User

Reprocessing Needed

Reprocessing Notification

Site Ops

Mentors
Data Quality Report (DQR)

- Do you read DQRs?
- Did you know that they are categorized as: (ARM Data Discovery)
  - Incorrect (Data Unreliable; Filtered out by Default)
  - Suspect (Data Questionable)
  - Missing (Data Missing)
  - Does not affect quality (Data Note)

Overwhelmed yet?
This does not have to be a manual process!
DQ Plotting

- Where does one go to find data plots and movies?
  - Archive - Thumbnail Viewer, NCVweb
  - DQ Office - Plotbrowser, NCVweb, DQ Explorer, DQ Zoom
    - Different from the Archive as we are focused on finding problems.
    - More comparison plots, diagnostics, movies, etc…
    - Don’t see what you want? e-mail us.

[dq.arm.gov]
Please go to dq.arm.gov and click the survey link at the top of the page to give feedback on the ARM DQ process.
Everything you see/hear us talk about at this meeting including anything on our poster is available from our meeting summary site.
Questions?