



# ARM

CLIMATE RESEARCH FACILITY

## **ARM Orientation for New and Current Principal Investigators**

**Jim Mather, Jimmy Voyles, and  
Raymond McCord**

**Third ASR Science Team Meeting  
Crystal City, VA  
March 12, 2012**



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

# Outline

## Part 1: ARM Facility Overview

- ARM and ASR, Goals and Mission
- ARM Climate Research Facility Overview
- Facility Changes: Recovery Act and New Sites
- Field Campaigns
- Data Products and Processes

## Part 2: Interacting with the ARM Facility

- Finding, Ordering and Using ARM Data
- Submitting Research Highlights
- Submitting Field Campaign Requests
- Keeping up with ARM News and Information
- More Information and Feedback

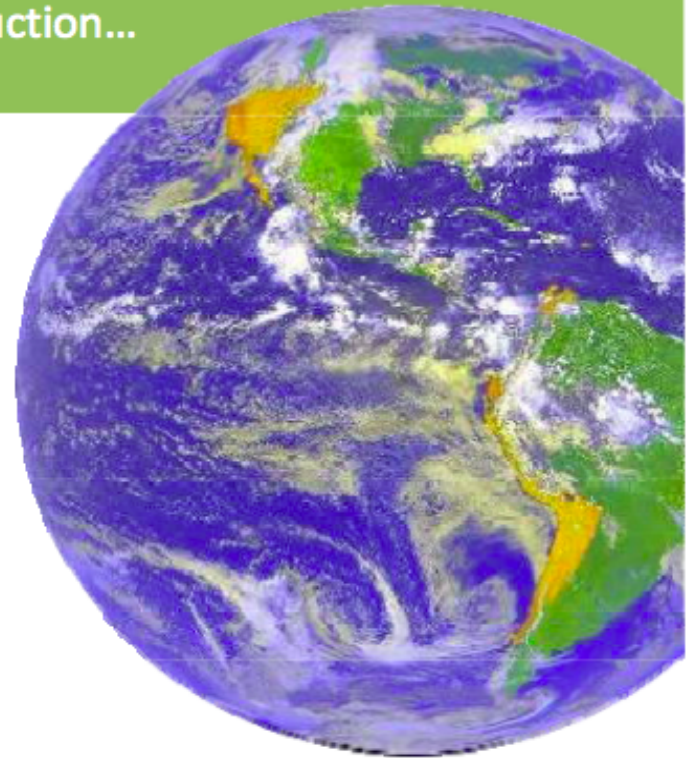
# Strategic Planning

## The Energy-Environment-Climate Nexus

Greenhouse gases are emitted during energy production...  
and climate change will impact energy production

**Building on our CESD mission:**

**To advance a robust predictive understanding  
of Earth's climate and environmental systems  
and to inform the development of  
sustainable solution to the Nation's energy  
and environmental challenges.**



# Climate & Environmental Sciences Division Strategic Goals

1. Synthesize new process knowledge and innovative computational methods advancing next generation, integrated models of the human-earth system.
2. Develop, test and simulate process-level understanding of atmospheric systems and of terrestrial ecosystems extending from bedrock to the top of the vegetative canopy.
3. Advance fundamental understanding of coupled biogeochemical processes in complex subsurface environments to enable systems-level prediction and control.
4. Enhance the unique capabilities and impacts of the ARM and EMSL scientific user facilities and other BER community resources to advance the frontiers of climate and environmental science.
5. Identify and address science gaps that limit translation of CESD fundamental science into solutions for DOE's most pressing energy and environmental challenges.

# ARM and ASR

We continue to hear a lot of confusion from many corners about the relationship between ARM and ASR.

ARM is an observational scientific user facility with the mission described on the previous slide (<http://www.arm.gov>).

ASR is a separate, parallel DOE program that is research-based. Members of the ASR science team constitute an important part of the ARM user community though ultimately ARM serves the larger climate research community (<http://asr.science.energy.gov>).

So – for example – one should refer to ARM sites or ARM data but research done with ARM data would often be done as part of an ASR science project.

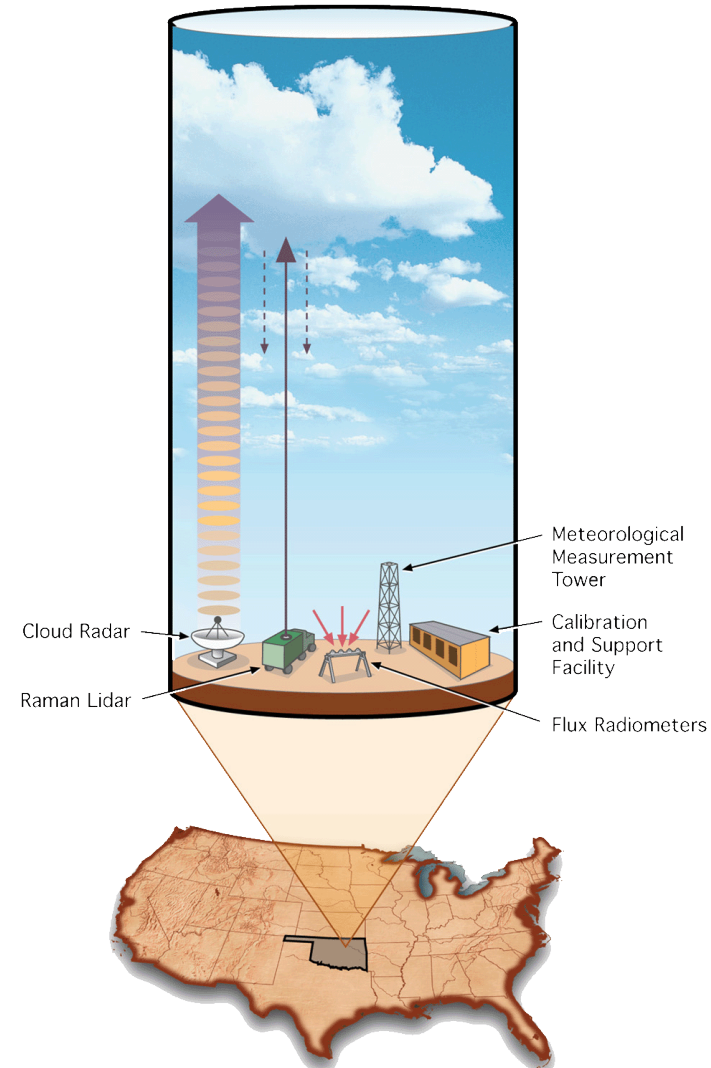
# ARM Mission and Vision Statements

## Mission

The ARM Climate Research Facility, a DOE scientific user facility, provides the climate research community with strategically located in situ and remote sensing observatories designed to improve the understanding and representation, in climate and earth system models, of clouds and aerosols as well as their interactions and coupling with the Earth's surface.

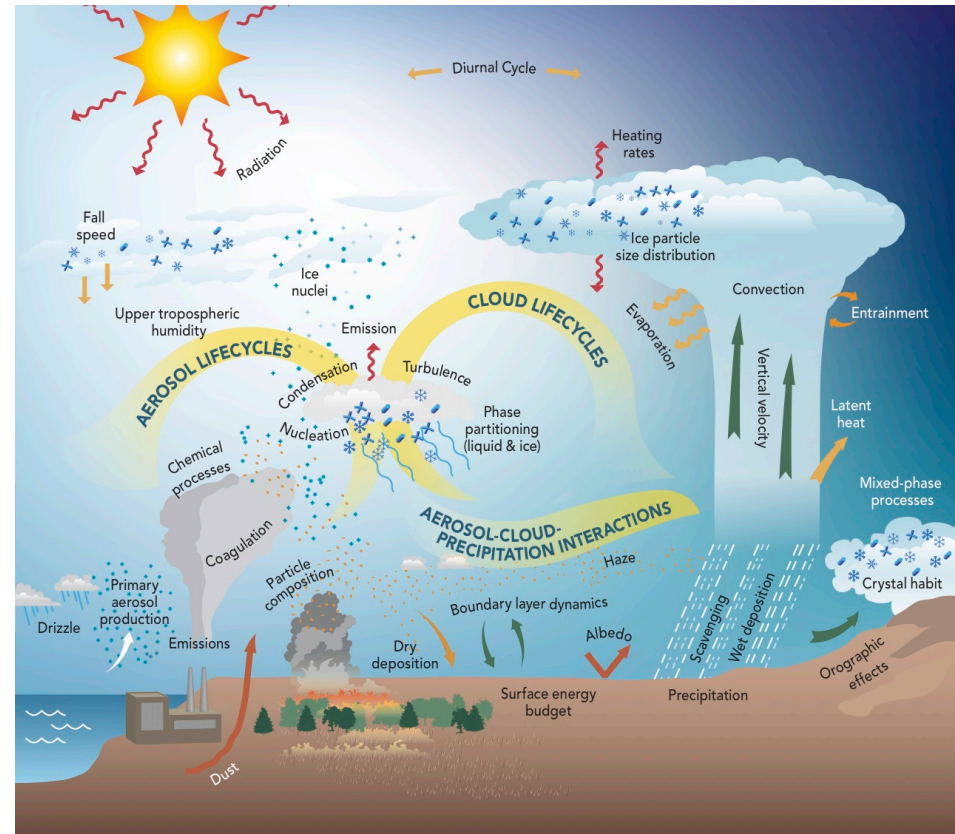
## Vision

To provide a detailed and accurate description of the earth atmosphere in diverse climate regimes to resolve the uncertainties in climate and earth system models toward the development of sustainable solutions for the Nation's energy and environmental challenges.



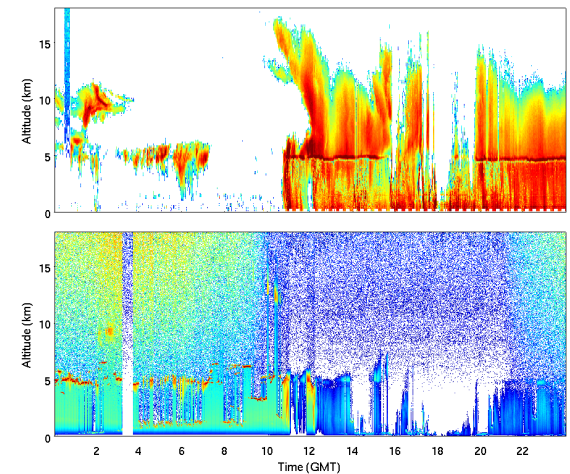
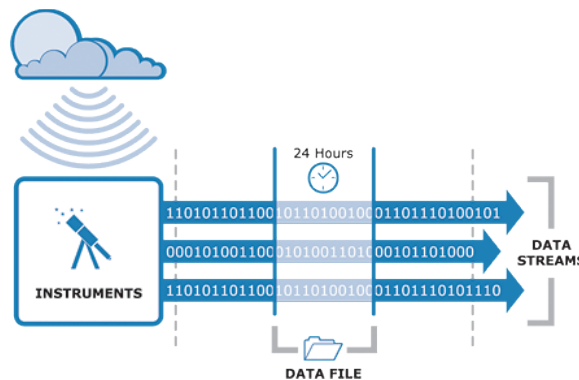
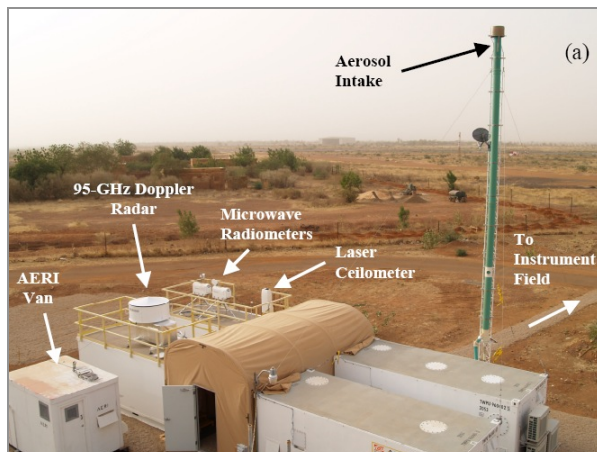
# Atmospheric System Research (ASR) Mission Statement

The goal of ASR, in partnership with the ARM Facility, is to quantify the *interactions among aerosols, clouds, precipitation, radiation, dynamics, and thermodynamics* to improve fundamental **process-level understanding**, with the ultimate goal to reduce the uncertainty in global and regional climate simulations and projections.



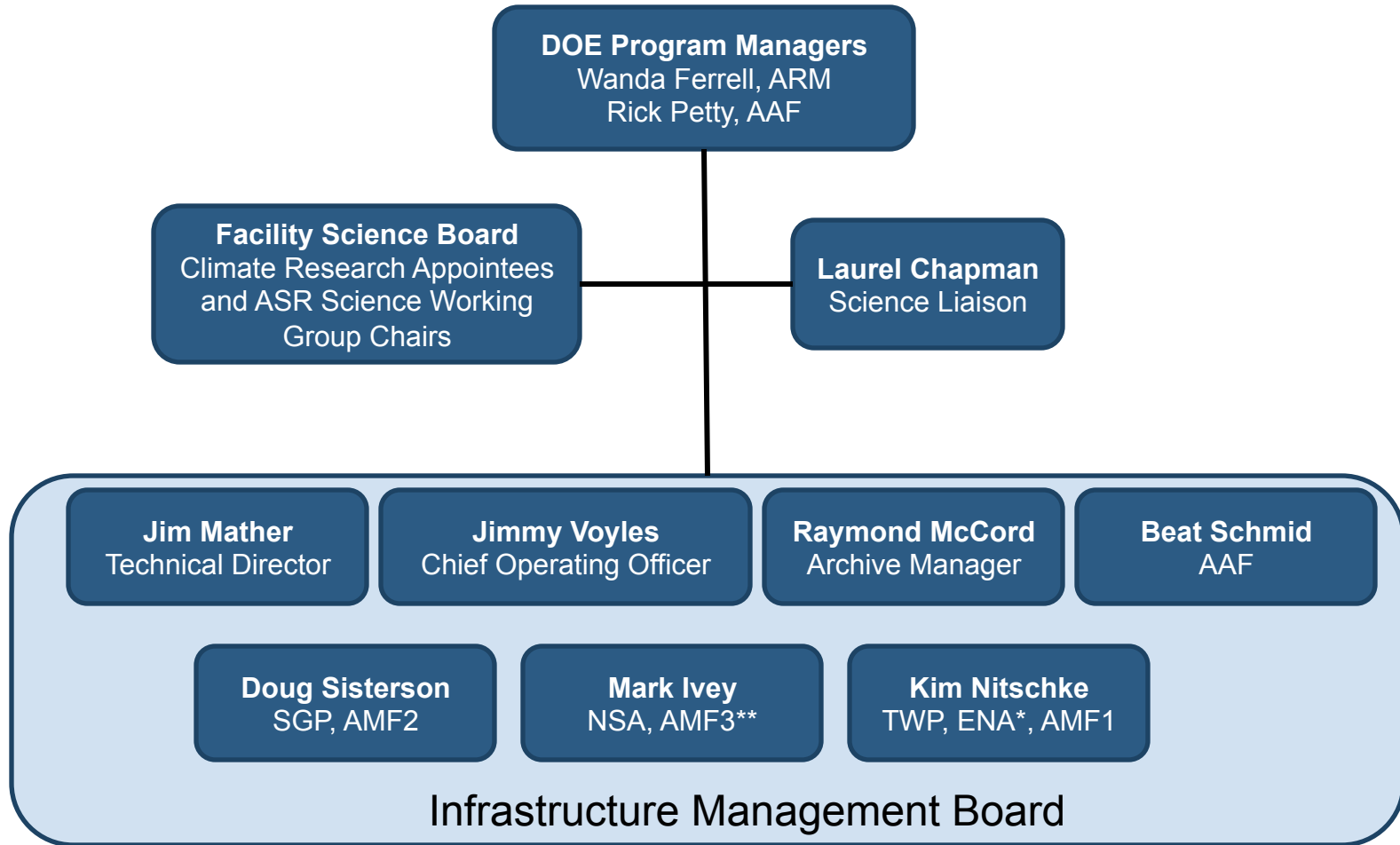
# Facility Components

- Research sites – permanent, mobile, and aerial
- Instruments and measurements
- Data processing, data quality, Data Archive
- Field campaigns – ground-based and airborne





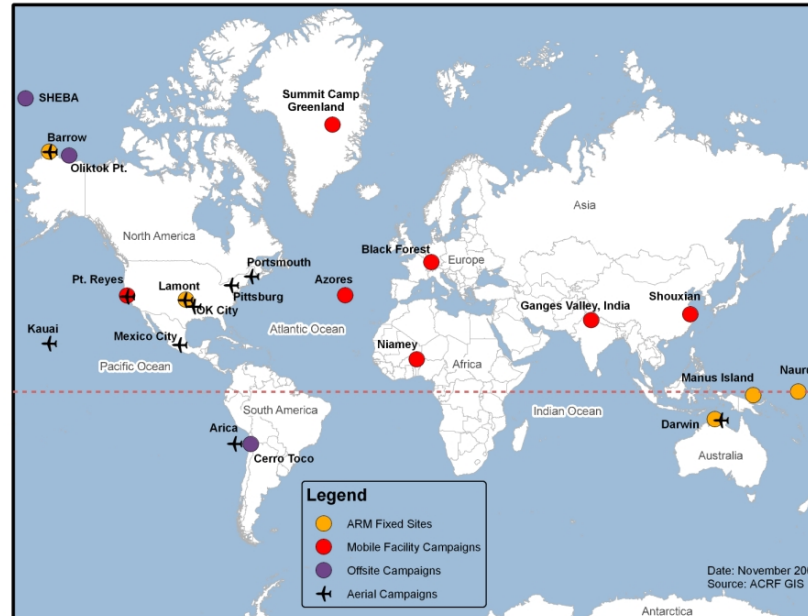
# ARM Climate Research Facility Management



\* ENA = Eastern North Atlantic, the new permanent site in the Azores

\*\* AMF3 = Third Mobile Facility with an initial extended duration deployment to Oliktok Point, AK

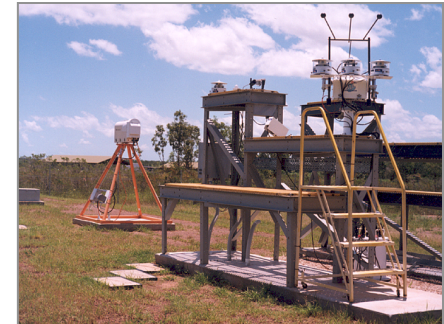
# Research Sites



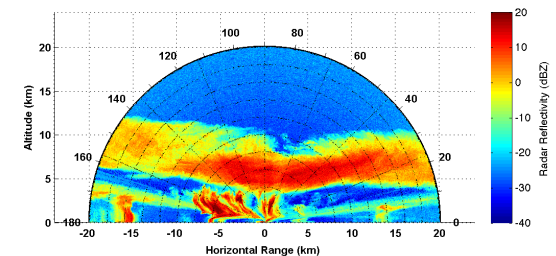
- Southern Great Plains (1993)
- North Slope of Alaska: Barrow (1998) and Atqasuk (1999)
- Tropical Western Pacific: Manus (1996), Nauru (1998), and Darwin (2002)
- First ARM Mobile Facility (2005); Second ARM Mobile Facility (2010)
- ARM Aerial Facility (2007)

# Measurements and Instruments

- Cloud profiles: millimeter radar and lidar
- T/RH/Wind profiles: radiosondes
- Column water: microwave radiometer
- Column aerosol: solar spectral radiometer
- In situ aerosol optical and cloud nucleation properties
- Surface radiation budget
- Surface meteorology
  
- 3D Clouds: Scanning ARM Cloud Radar



Additional measurements at some sites include 3D precipitation from cm-wavelength radar, vertical velocity from Doppler lidar, and water vapor profiles from Raman lidar



# Recovery Act Status

- All instruments installed with the exception of the AMF1 radars and the Darwin AOS
- MAOS deployed at BNL during summer of 2011 and is currently at LANL for PACE campaign and training.
- Working through set of known radar issues (come to Tuesday evening session for details)
- Data from many instruments are available at the archive
- Aircraft instruments flown as part of CARES and CalWater
- The Recovery Act project, begun in the spring of 2009 will formally finish at the end of this month.

<http://www.arm.gov/about/recovery-act>

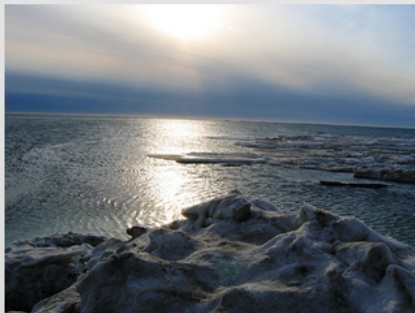


# Two New ARM Sites in 2013



## Azores

The **Azores** are an island group in the **Eastern North Atlantic (ENA)** ocean in a region characterized by marine stratocumulus. Marine stratocumulus have a strong influence on climate yet are poorly represented in global climate models.



## Oliktok Point








The **Oliktok Point** site is located approximately 300 km Southeast of the existing ARM site in Barrow and provides an opportunity to link coastal conditions from the standard ARM measurement suite with near-coast conditions using an **Unmanned Aerial System (UAS)**.

Breakout Session  
on Tuesday at 1pm.

Breakout Session  
on Wednesday at  
7:30 pm.

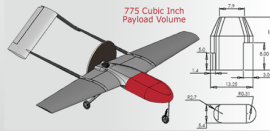
- Sites scheduled to come on line by end of FY13
- The facility at Oliktok Point is a mobile facility deployed for an extended term
- Instruments at these sites match those found at other sites including many of the enhancements added through the Recovery Act and plans to add UAS at Oliktok

# Instrumentation for the New ARM Sites


 <p><b>Atmospheric and Boundary State</b></p> <ul style="list-style-type: none"> <li>• MET, PWD, TSI</li> <li>• <u>Sondes</u>, ECOR, 915 RWP (NSA), 1290 RWP (ENA)</li> </ul>	 <p><b>Oliktok</b> Unmanned Aerospace Vehicles</p>
 <p><b>Lidars</b></p> <ul style="list-style-type: none"> <li>• HSRL, MPL, Doppler</li> </ul>	
 <p><b>Cloud and Precipitation Radars</b></p> <ul style="list-style-type: none"> <li>• Scanning Cloud, Scanning Precipitation</li> <li>• Ka Zenith Pointing</li> </ul>	
 <p><b>Precipitation</b></p> <ul style="list-style-type: none"> <li>• Parsivel, Video Disdrometer, Weighing Bucket, TPS</li> </ul>	
 <p><b>Radiometry</b></p> <ul style="list-style-type: none"> <li>• Solar Broadband (Up/Down), IRT</li> <li>• MFRSR, MFR, AERI or ER-AERI, MWR3C</li> </ul>	
 <p><b>Aerosol Observation System</b></p> <ul style="list-style-type: none"> <li>• Scattering, Absorption, Size Distribution</li> <li>• Trace Gases</li> </ul>	
<p><b>Azores Research Site</b> Kim Nitschke - Site Operations Manager Los Alamos National Laboratory</p>	
<p><b>Oliktok Point Research Site</b> Mark Ivey - Site Operations Manager Sandia National Laboratory</p>	



**Fundamentally New Arctic Measurements**



Unmanned Aerospace Vehicles for Coordinated Multi-Sensor Measurements



Tethered Sonde and In-Situ Measurement Package

- Multiple UAVs' and Associated Infrastructure
- **Instrument Suite Under Discussion Options Include;**
  - ✓ Condensation Particle Counter
  - ✓ Optical Particle Counter
  - ✓ Aethalometer
  - ✓ Radiometry and Atmospheric State
  - ✓ Cloud Condensation Nuclei Counter
  - ✓ Stabilization Platform

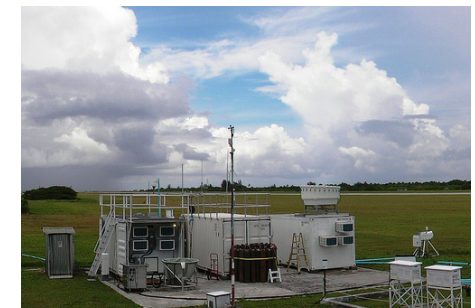
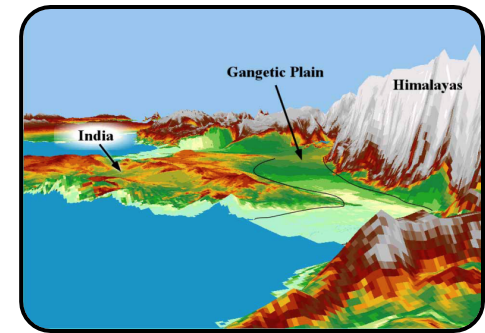
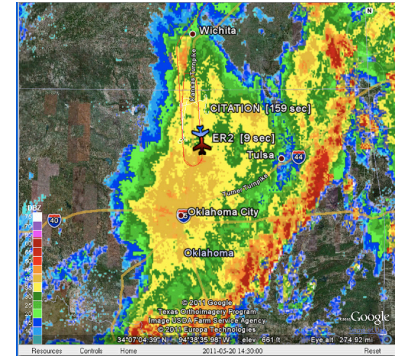
Issues under discussion include characteristics of Azores precipitation radar (X- or C-band) and characteristics of the UAS and associated payload.

# Recent and On-Going Field Campaigns

**Midlatitude Continental Convective Clouds Experiment (MC3E):** April 22 – June 6, 2011 at the SGP ARM site. MC3E was joint with NASA and focused on deep convection and precipitation.

**Ganges Valley Aerosol Experiment (GVAX):** June 2011 – March 2012 Deployment of the AMF1 to Nainital India with an emphasis on aerosols and their impact on clouds and precipitation.

**ARM MJO Investigation Experiment (AMIE):** October 2011 – March 2012 featuring the AMF2 in the Maldives and enhanced operations at Manus. Focus on tropical convection in collaboration with the NSF DYNAMO campaign.



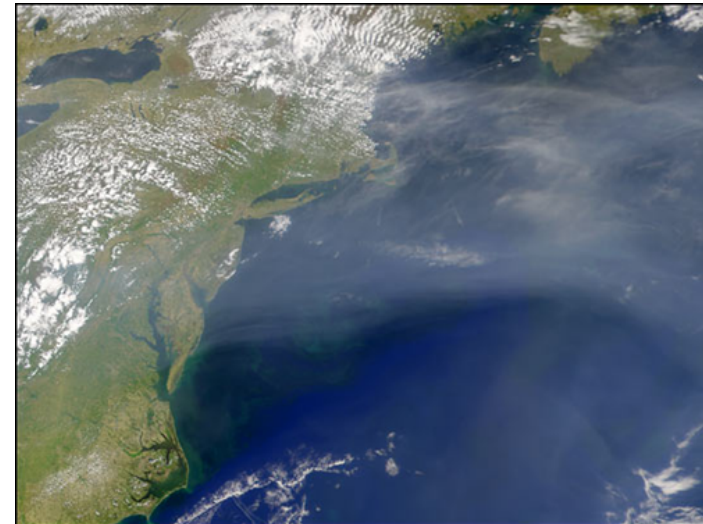
# Two-Column Aerosol Project (TCAP)

TCAP is designed to study aerosol properties and their interaction with clouds.

The experiment will be based on Cape Cod and will include observations over the adjacent ocean.

TCAP will span the period July 2012 – June 2013 and will include an extensive set of observation systems:

- AMF1
- AAF G1 Aircraft
- Mobile Aerosol Observing System





# Marine ARM GPCI Investigation Campaign (MAGIC)

MAGIC will be the first marine AMF deployment. The AMF2 will be deployed on a cargo vessel shuttling between Long Beach and Honolulu from October 2012 – September 2013.

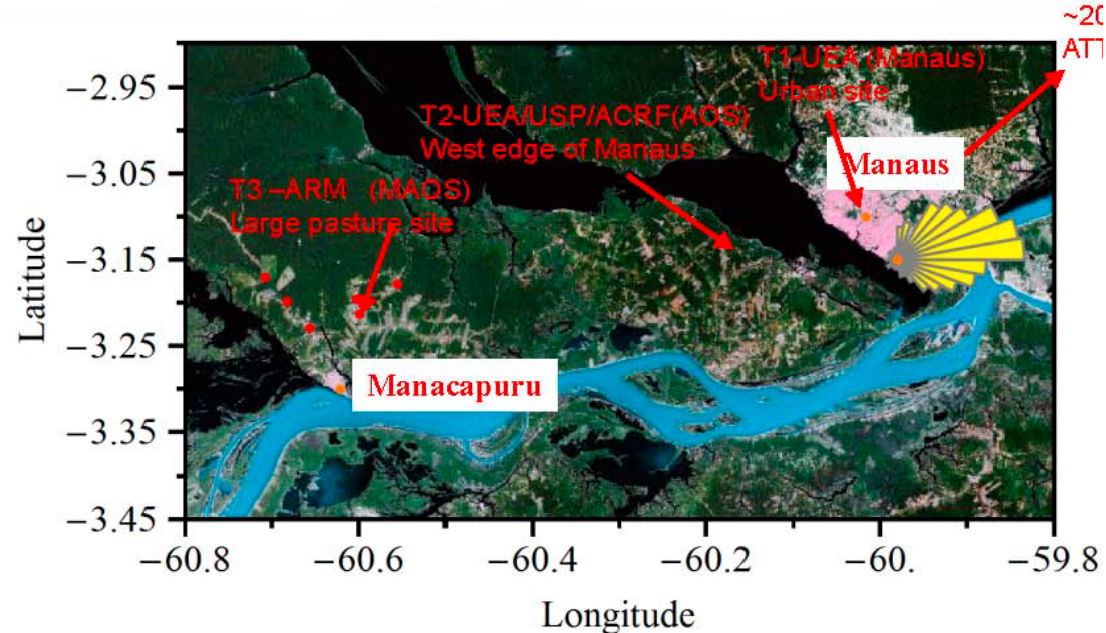
The AMF2 will approximately follow the GPCI transect – a transect that spans the transition from cumulus to stratocumulus and is used for model comparisons.



The round-trip from Long Beach to Honolulu and back takes approximately 2 weeks. So the AMF2 will make the trip approximately 25 times carrying instruments to study clouds, aerosols, radiation, and standard meteorological parameters.

# Green Ocean Amazon 2014 (GOAmazon2014)

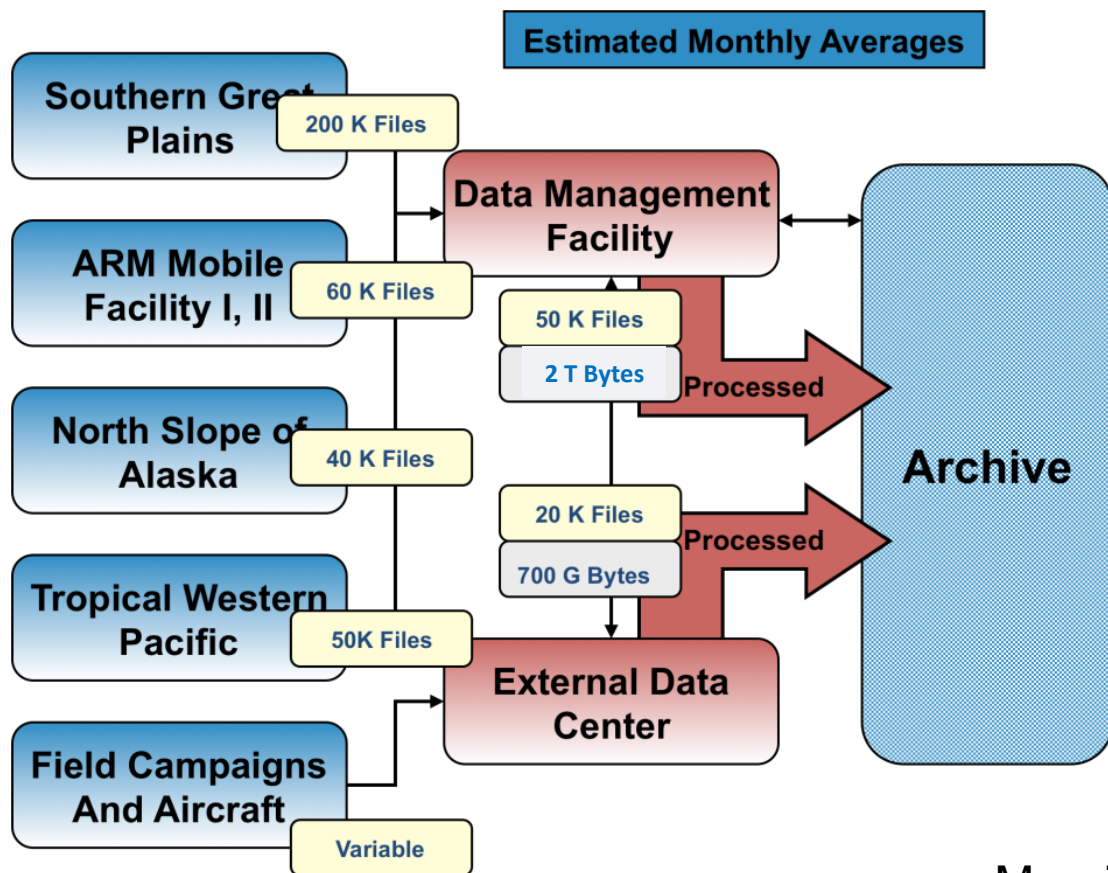
GOAmazon2014 will see many of the same instruments deployed for TCAP – again including the AMF1, the G1 and the MAOS – but now in the Amazon rain forest near the inland city of Manaus.



GOAmazon will further bring together scientists studying diverse disciplines including aerosol chemistry, tropical convection, surface biological processes and modeling of these diverse systems.

GOAmazon2014 is scheduled to span the full calendar year 2014.

# Overview: Data Products

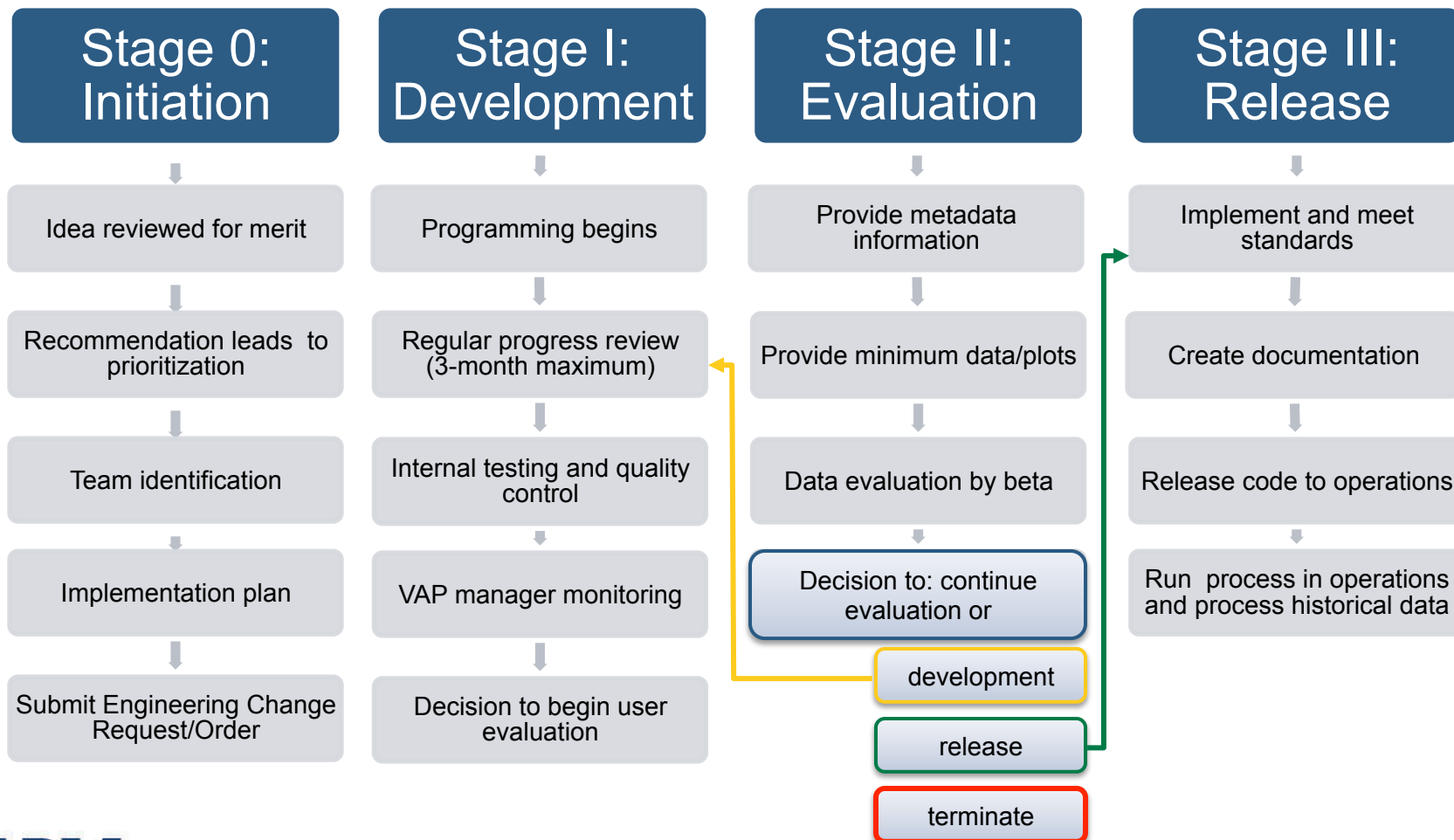


Most instrument data are processed to a standard NetCDF format before being delivered to the Archive.

When necessary, higher-order Value-Added Products (VAPs) are developed. VAPs serve a variety of purposes including:

- Merging data from multiple instruments
- Providing derived parameters
- Adding QC/QA information

# Value Added Product Stages



# Key Contacts for New Datastreams

## Working Group Chairs

- Cloud lifecycle: Matthew Shupe, Anthony Del Genio
- Aerosol lifecycle: Allison McComiskey, Jian Wang
- CAPI: Dave Turner, Steve Ghan

## Translators

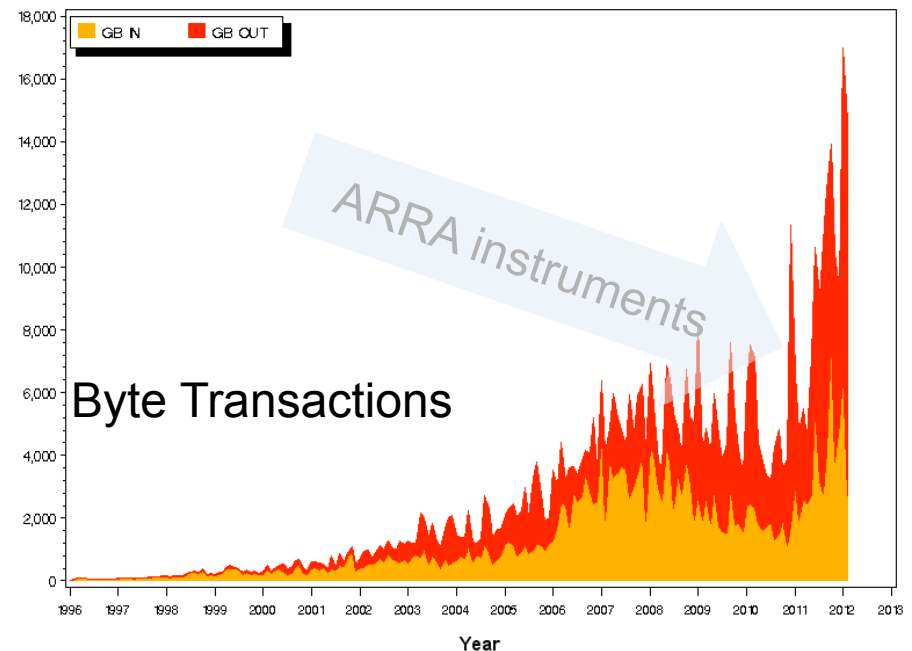
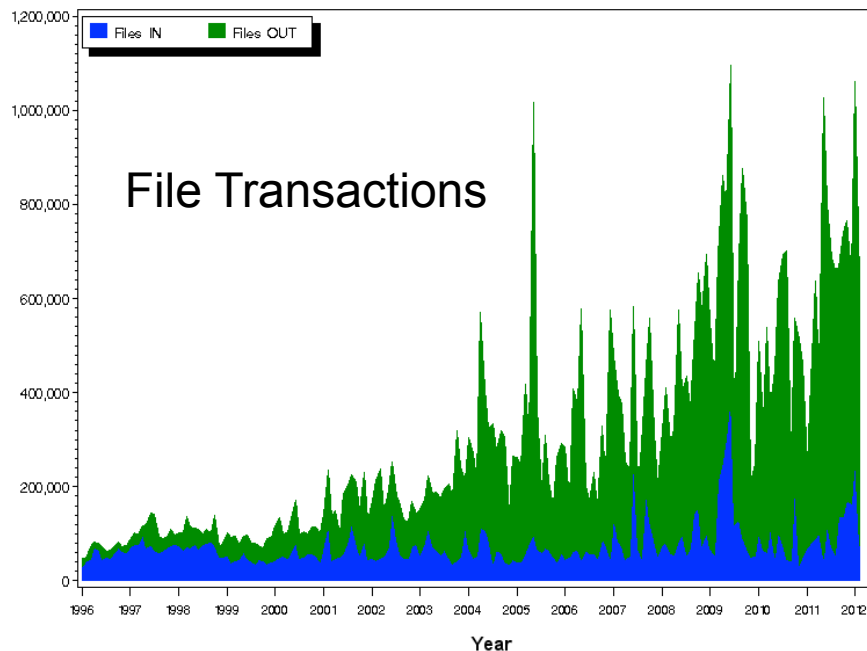
- Observation: Mike Jensen, Connor Flynn, Sally McFarlane
- Modeling: Shaocheng Xie, Jerome Fast

Program Contacts: <http://www.arm.gov/about/contacts>

People Database: <http://www.arm.gov/people>

# Data Archive

- The Data Archive collects and delivers about 10-15 terabytes of data per month (400K -1,000K transactions!)
- Nearly 7000 registered users from over 15 U.S. agencies, 475 universities, and 71 countries



# Outline

## Part 1: ARM Facility Overview

- ARM and ASR, Goals and Mission
- ARM Climate Research Facility Overview
- Facility Changes: Recovery Act and New Sites
- Field Campaigns
- Data Products and Processes

## Part 2: Interacting with the ARM Facility

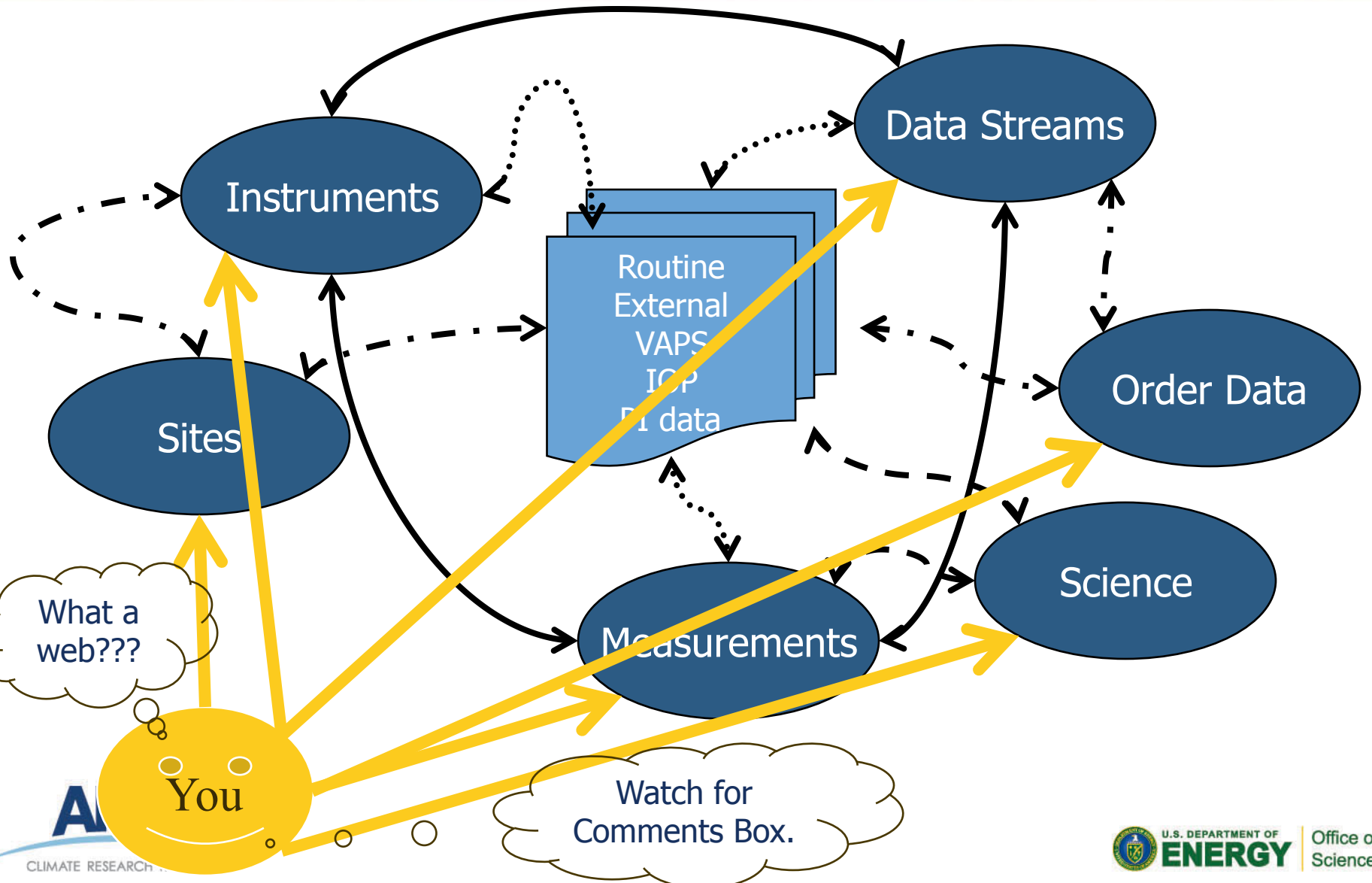
- Finding, Ordering and Using ARM Data
- Submitting Research Highlights
- Submitting Field Campaign Requests
- Keeping up with ARM News and Information
- More Information and Feedback

# How do I ...

- Find a datastream
- Order a datastream
- Read a NetCDF file
- Cite ARM data products
- Visualize very large data products
- Review data quality information and measurement recommendations



# Navigating ARM Web “space”



# How Do I Find a Datastream for a Specific Measurement?

Each measurement page lists the datastreams that include that measurement. Click the datastream name for more information or click Build an Order.

**ARM**  
CLIMATE RESEARCH FACILITY

CART | Home | People | Site Index | Search arm.gov

U.S. DEPARTMENT OF ENERGY | Office of Science

About | Science | Campaigns | Sites | Instruments | **Measurements** | Data | News | Publications | Education

ARM.gov » Measurements » Cloud fraction

### Measurement : Cloud fraction

Fraction of sky covered by clouds, observed directly or derived from SW irradiance.

**Categories**  
Cloud Properties

**Instruments**

The above measurement is considered scientifically relevant for the following instruments. Refer to the datastream (netcdf) file headers of each instrument for a list of all available measurements, including those recorded for diagnostic or quality assurance purposes.

- ARM Instruments
  - MPL : Micropulse Lidar
  - SKYRAD : Sky Radiometers on Stand for Downwelling Radiation
  - TLCV : Time-Lapsed Cloud Video
  - TSI : Total Sky Imager
  - WSI : Whole Sky Imager
- External Instruments
  - ETA : Eta Model Runs
  - ECMWFDIAG : European Centre for Medium Range Weather Forecasts Diagnostic Analyses
  - ECMWF : European Centre for Medium Range Weather Forecasts Model Data
  - GOES : Geostationary Operational Environmental Satellites
  - MOLTS : Model Output Location Time Series
  - NCEPGFS : National Centers for Environment Prediction Global Forecast System
  - NWSSURF : National Weather Service Surface Meteorology Data
- Field Campaign Instruments
  - AERI-CF : AERI Cloud Fraction
  - CIR : Cloud Infrared Radiometer
  - CMBE-CLDRAD : Cloud Modeling Best Estimate- Cloud and Radiation
  - VARANAL : Constrained Variational Analysis
  - ETA : Eta Model Runs
  - ECMWFDIAG : European Centre for Medium Range Weather Forecasts Diagnostic Analyses

**Order Data**

BUILD AN ORDER

**Comments?**

We would love to hear from you!  
Send us a note below or call us at 1-888-ARM-DATA.

Email Address

Comments

SEND

# How Do I Find a Datastream for a Specific Instrument?

Each instrument page lists the datastreams associated with that instrument.

You can click on a datastream name for more information, or click “Build an Order” to begin ordering data.

**ARM**  
CLIMATE RESEARCH FACILITY

CART | Home | People | Site Index | Search arm.gov

U.S. DEPARTMENT OF ENERGY | Office of Science

About | Science | Campaigns | Sites | Instruments | Measurements | Data | News | Publications | Education

ARM.gov >> Instruments >> tsi

## Instrument : Total Sky Imager (TSI)

**Instrument Categories**  
[Cloud Properties](#)

**General Overview**  
The total sky imager (TSI) provides time series of hemispheric sky images during daylight hours and retrievals of fractional sky cover for periods when the solar elevation is greater than 10 degrees. To view current sky cover retrievals at the ARM sites, see the [TSI most recent sky images](#).

**Output Datastreams**

- >> [tsicldmask](#) : Total Sky Imager (TSI): cloud decision images, PNG format
- >> [tsimovie](#) : Total Sky Imager (TSI): daily movie generated from 30-sec sky image
- >> [tsiskyclover](#) : Total Sky Imager (TSI): fractional sky coverage
- >> [tsiskyimage](#) : Total Sky Imager (TSI): sky image (JPEG)

**Primary Measurements**  
The following measurements are those considered scientifically relevant.

- >> [Cloud fraction](#)

**Locations**

- North Slope Alaska ([NSA](#))
- Southern Great Plains ([SGP](#))
- Tropical Western Pacific ([TWP](#))
- ARM Mobile Facility ([FKB](#))
- ARM Mobile Facility ([GAN](#))
- ARM Mobile Facility ([GRW](#))
- ARM Mobile Facility ([HFE](#))
- ARM Mobile Facility ([NIM](#))
- ARM Mobile Facility ([PGH](#))
- ARM Mobile Facility ([PYE](#))
- ARM Mobile Facility ([SBS](#))

**Documentation**

- >> [TSI : Handbook](#)
- >> [TSI : Instrument Mentor Monthly Summary \(IMMS\) reports](#)
- >> [TSI : Data Quality Assessment \(DQA\) reports](#)

**Order Data**

[BUILD AN ORDER](#)

**Comments?**

We would love to hear from you! Send us a note below or call us at 1-888-ARM-DATA.

Email Address:

Comments:

[SEND](#)

Picture of the Total Sky Imager (TSI)

# How Do I Find a Datastream by Name?

The Datastreams A-Z page lists all datastreams in alphabetical order by full name.

To access this page, select **Datastreams** under the **Data** tab on the ARM website.

ARM CLIMATE RESEARCH FACILITY

CART | Home | People | Site Index | Search arm.gov

U.S. DEPARTMENT OF ENERGY Office of Science

About Science Campaigns Sites Instruments Measurements Data News Publications Education

ARM.gov >> Data >> Datastreams

### Datastreams A-Z

ARM Datastreams External Datastreams

Datastream	Full Name	Start	End
AERIO1CH1	Atmospheric Emitted Radiance Interferometer (AERI) 01: ch. 1 data	1995.07.22	2012.03.05
AERIO1CH2	Atmospheric Emitted Radiance Interferometer (AERI) 01: ch. 2 data	1995.07.22	2012.03.05
AERIO1SUMMARY	Atmospheric Emitted Radiance Interferometer (AERI) 01: summary data	1995.07.22	2012.03.03
AERICH1	Atmospheric Emitted Radiance Interferometer (AERI): channel 1 data	1994.01.10	2012.03.05
AERICH2	Atmospheric Emitted Radiance Interferometer (AERI): channel 2 data	1994.01.10	2012.03.05
AERIENGINEER	Atmospheric Emitted Radiance Interferometer (AERI): engineering data	1998.02.22	2012.03.05
AERISUMMARY	Atmospheric Emitted Radiance Interferometer (AERI): summary data	1994.01.10	2012.03.05
AOS	Aerosol Observing System (AOS): aerosol data, 1-min	1995.11.03	2011.08.30
AOSCCN	Aerosol Observing System (AOS): cloud condensation nuclei data	2005.03.04	2011.08.30
AOSCCN100	Aerosol Observing System (AOS): cloud condensation nuclei data	2010.10.08	2012.03.05
AOSCLAP3W	AOS: 3 wavelength CLAP	2011.03.01	2012.03.05
AOSCPC	AOS: condensation particle counter	2010.10.14	2012.03.05
AOSMET	AOS: aerosol-based meteorology data	2010.10.03	2011.05.02
AOSNEPHDRY	AOS: ambient nephelometer measurements	2010.10.04	2012.03.05
AOSNEPHWET	AOS: humidified nephelometer measurements	2010.10.04	2012.03.05
AOSOZONE	AOS: O3 measurements	2010.10.04	2011.04.25
AOSPASS3W	AOS: 3 wavelength Photoacoustic Soot Spectrometer	2009.02.19	2012.02.23
AOSPSAP3W	AOS: 3 wavelength particle soot absorption photometer	2010.10.11	2012.03.05
BLC	Belfort Laser Ceilometer (BLC): 30-s avgs of cloud base heights at up to 3 levels	1994.08.11	2000.05.23
BLCPROF	Belfort Laser Ceilometer (BLC): profiles	1996.11.01	2000.05.23
BRS	Broadband Radiometer Station (BRS): broadband shortwave and longwave radiation	2001.03.05	2012.02.20
BRS60S	Broadband Radiometer Station (BRS): 60-second broadband shortwave and longwave radiation	2001.03.05	2003.04.17
BSRN	Baseline Solar Radiation Network (BSRN): solar irradiances	1993.07.01	2001.01.22
CARBONFLASKS	Flask Sampler for Carbon/Isotopes/Trace gasses	2012.02.09	2012.02.09
CMH	Chilled Mirror Dew Point Hygrometer	2001.03.31	2003.10.25
CO	Carbon Monoxide Mixing Ratio System	2005.06.01	2011.12.31

Measurement Categories

Select below to highlight datastreams in specified measurement categories.

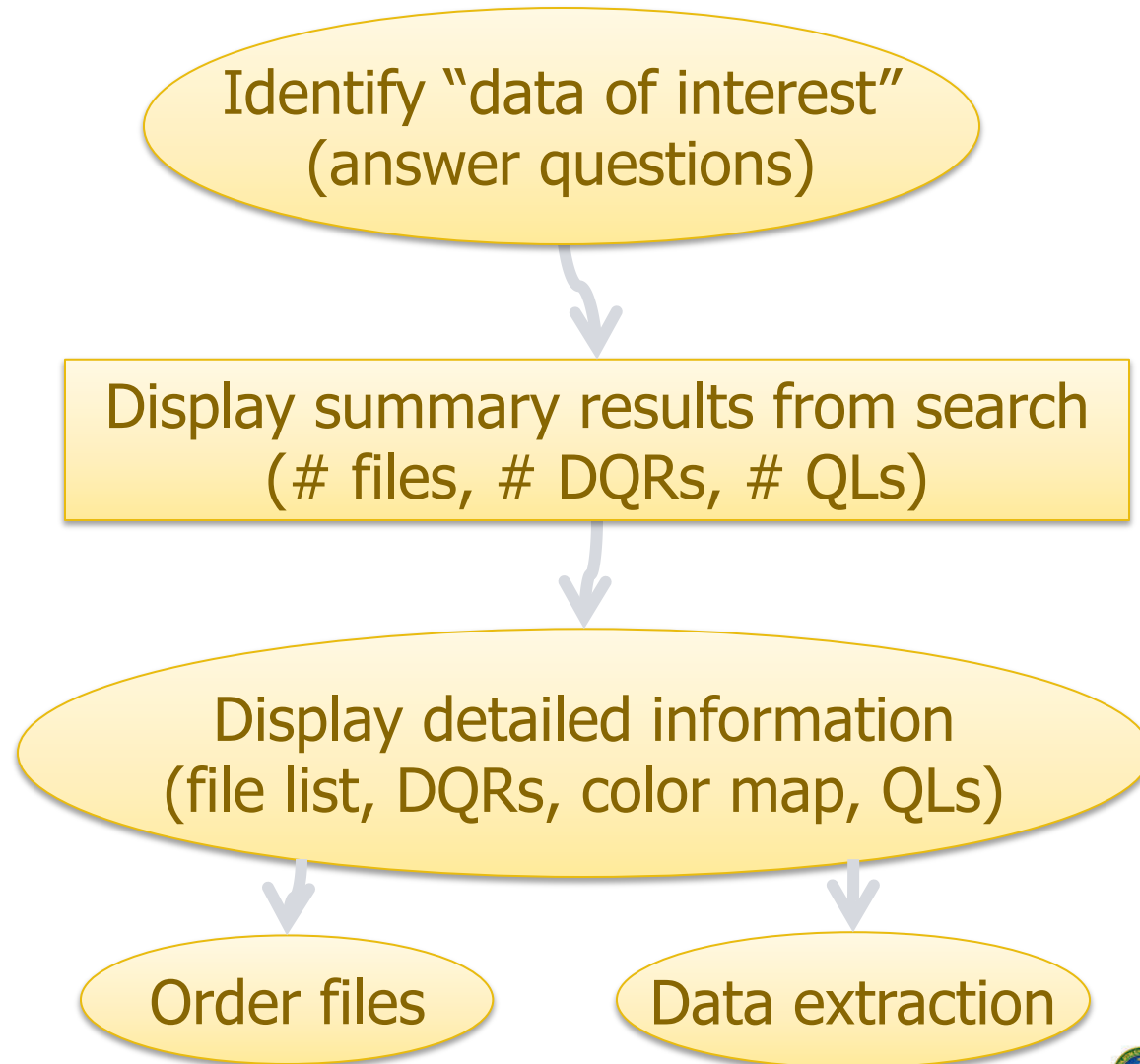
- Aerosols
- Atmospheric Carbon
- Atmospheric State
- Cloud Properties
- Radiometric
- Surface Properties

Select All | Invert Selection

# Comparison of Interface Options

Data Browser	Routine ARM data	<i>"I know what I want. Do you have it?"</i> Searching with predefined selection criteria.
Thumbnail Browser	Most routine ARM data	<i>"I will know what I want when I see it."</i> Searching with a combination of predefined selection criteria and visual review of data plots
NCVWeb	Routine ARM Data	<i>"I want to see my own data plot."</i> Interactive data plotting tool with visualizing, extracting, statistics generation capabilities.
"IOP" Data Browser	IOP, PI, Showcase and beta data	<i>"I need to look in the odd parts bin."</i> Direct access to IOP data. Navigate /year/site/iop directory tree. Also use narrow Google search.
Data Cart	Routine ARM data and some IOP data	<i>"I need to read about what you have, then I will decide."</i> Discover areas of interest by browsing the ARM web documentation and collect items of interest.

# Typical Logic behind Data Access Tools



# Who are you?

# Who wants to know?

- Archive users must register.
- Notification helps you with data access.
- ARM infrastructure is a “National User Facility”
  - provides access to extra budget!!
  - OMB requests User Facilities to report user statistics for several “demographic categories”
- Some personal information is required\*
  - \*personal information is not reported individually and is accessible only to Archive staff after entry

# How do I Order Data?

Use one of several Archive User Interfaces to find and order data.

OR

Use "Build an Order" function on several types of ARM web pages.

[www.archive.arm.gov](http://www.archive.arm.gov)

The screenshot shows the ARM website interface. At the top, there is a navigation bar with links for 'About', 'Science', 'Campaigns', 'Sites', 'Instruments', 'Measurements', 'Data', 'News', 'Publications', and 'Education'. Below this, a search bar and social media icons are visible. The main content area displays a 'Measurement: Aerosol extinction' page. A yellow arrow points from the text 'Use "Build an Order" function on several types of ARM web pages.' to a 'BUILD AN ORDER' button with a shopping cart icon. Below the button is a 'Comments?' section with a text input field and a submit button. The footer includes the ARM logo and the U.S. Department of Energy logo.

The screenshot shows the ARM Data Archive website. The header features the ARM logo and navigation links for 'About', 'Science', 'Campaigns', 'Sites', 'Instruments', 'Measurements', 'Data', 'News', 'Publications', and 'Education'. A search bar is located in the top right corner. The main content area is titled 'ARM Data Archive' and contains several sections: 'Get routine ARM data' with sub-sections for 'Data Browser' and 'Thumbnail Browser'; 'Plot previously ordered data' with a sub-section for 'NCVWeb'; and 'Get special data' with sub-sections for 'IOP Data', 'PI Data', 'Evaluation Data', and 'Showcase Data'. A yellow arrow points from the text 'Use one of several Archive User Interfaces to find and order data.' to the 'Data Browser' section. On the right side, there are sections for 'Showcase Data' and 'Featured Data'.



# How do I Order Data?

ARM CLIMATE RESEARCH FACILITY

CART | Home | People | Site Index Search arm.gov

U.S. DEPARTMENT OF ENERGY Office of Science

Science Campaigns Sites Instruments Measurements Data News Publications

Measurements >> Aerosol extinction

Measurement : Aerosol extinction

of radiant energy from an incident beam by the process of aerosol absorption and/or scattering.

Order Data

**BUILD AN ORDER**

Comments?

We would love to hear from you. Send us a note below.

1-888-ARM-DATA

Use "Build an Order" function on several types of ARM web pages OR one of several Archive User Interfaces to find and order data.

ARM CLIMATE RESEARCH FACILITY

CART | Home | People | Site Index Search arm.gov

U.S. DEPARTMENT OF ENERGY Office of Science

About Science Campaigns Sites Instruments Measurements Data News Publications Education

## ARM Data Archive

Data collected through the routine operations and scientific field experiments of the ARM Climate Research Facility are stored at and distributed through the Archive. These data are available free of charge to the public and can be accessed through any of the interfaces below. Upon selection of an interface, a new window will ask you to sign in, or, if not already registered with the Archive, to complete the free and easy registration process.

### Get routine ARM data

**Data Browser** [ ? ]

Select datastreams, view quality information about the data and order data files with the Data Browser. The "Novice Interface" guides new users through the process, while the "Datastream Interface" is designed for users experienced with ARM data.

**Thumbnail Browser** [ ? ]

View prepared plots of data to quickly find data of interest to you. The thumbnail browser uses location, measurement type and date range selections to retrieve data plot thumbnails that the user can browse. You can also download high-resolution images of the data plots, or download the data files.

### Plot previously ordered data

**NCVWeb** [ ? ]

NCVWeb is an interactive NetCDF data plotting tool users can use to plot the data they have ordered from the archive, or plot regular standing data orders, eliminating the need for separate visualization software. It has many powerful features such as producing detailed tables of NetCDF file contents, data extraction, generating statistics, and plotting one variable against another.

### Get special data

**IOP Data** **PI Data** **Evaluation Data** **Showcase Data** [ ? ]

Browse and download data generated from ARM Intensive Operation Periods or "IOPs". Data is

### Showcase Data

The following data products represent "best estimates" derived from several instruments and/or VAPs.

- >> Climate Modeling Best Estimate (CMBE)
- >> View CMBE plots and Extract Data using Statistical Browser

*We are interested in your feedback for these products; please contact us.*

### Featured Data

02.22.2012  
Help Us Help You; ARM Data Survey Available Now

01.31.2012  
Five Years of Radiatively Important Parameters Best Estimate (RIPBE) Data Now Available

01.31.2012  
It's Official Now—Cloud Microphysical Properties Value-Added Product Changes Status

<http://www.archive.arm.gov/>

# How Do I Read NetCDF Data?

NetCDF is an open source, self-describing, scientific data format. There are many tools available to read NetCDF. See a partial list on the ARM web data tab: [www.arm.gov/data/tools](http://www.arm.gov/data/tools). Further details are available at the Unidata NetCDF website.

## Supported languages include:

C, C++, Fortran,  
Matlab, IDL,  
Python, Java, R, ...

If you have questions – Ask! There is a lot of experience around the program.

unidata  
providing data services, tools and cyberinfrastructure leadership

Login | Register

Data Software Downloads Support Community Projects News Events About Us

Home / NetCDF

NetCDF  
NetCDF FAQ  
Documentation & Training  
Help & Support

Unidata Quick Links

- The Unidata Community
- Display & Analysis
- Data Access & Management
- Available Data

### NetCDF (Network Common Data Form)

NetCDF is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.

See the [netCDF package overview](#)

#### NetCDF News & Announcements

##### NUJAN NetCDF Writer Library 1.4.1

November 30, 2011

The UCAR Research Applications Laboratory (RAL) has released Nujan version 1.4.1. Nujan is a pure Java writer for HDF5 and NetCDF4 files. Nujan is 100% open source and is released under the MIT license. Nujan is intended to be useful in situations where portability and simplified development process are more important than access to the complete HDF5 feature set.

[Read more...](#)

##### Netcdf-Java library version 4.2.27

November 8, 2011

#### Other NetCDF Libraries

- NetCDF Java** implements the Common Data Model.
- The use of **LibCF** allows data files to conform to CF conventions.

#### NetCDF Musings

Blog posts from the NetCDF developers

- Better Organization of NetCDF Development with Jira**  
September 19, 2011
- Shaggy GRIB Stories**  
September 6, 2011
- Black hole BUFR blues**  
August 19, 2011

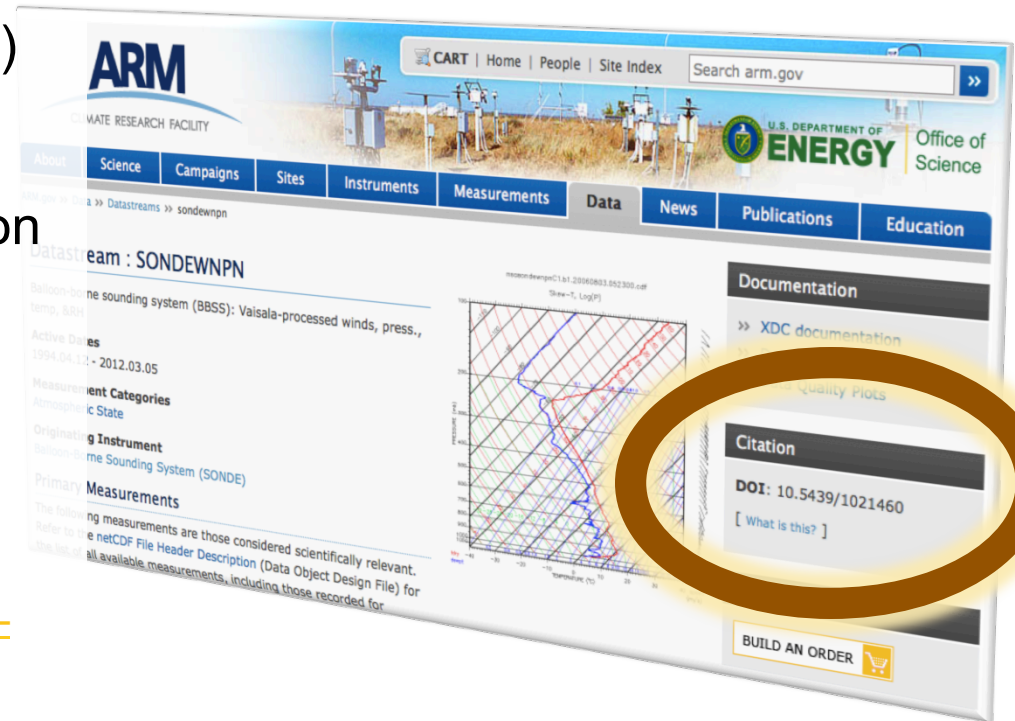
#### NetCDF Build Testing

View the **latest build** output of the latest netCDF snapshot distribution on a variety of platforms, with a variety of build environments.

[www.unidata.ucar.edu/software/netcdf](http://www.unidata.ucar.edu/software/netcdf)

# How Do I Cite Data? *(new: DOIs!)*

- Digital Object Identifiers (DOIs) now assigned for each type of data stream.
- References for future replication of data access should include:
  - site, date range, and date downloaded from Archive
- Additional guidance on DOI is found at
  - <http://www.arm.gov/data/docs/doi-guidance>



## Sample Citation:

Atmospheric Radiation Measurement (ARM) Climate Research Facility. 1994, updated daily. SONDEWNP. Oct. 2010–March 2011, 36° 36' 18.0" N, 97° 29' 6.0" W: Southern Great Plains Central Facility (C1). Compiled by R Coulter, J Prell, M Ritsche, and D Holdridge. Oak Ridge, Tennessee, USA: ARM Data Archive. Data set accessed 2011-04-13 at <http://dx.doi.org/10.5439/1021460>.

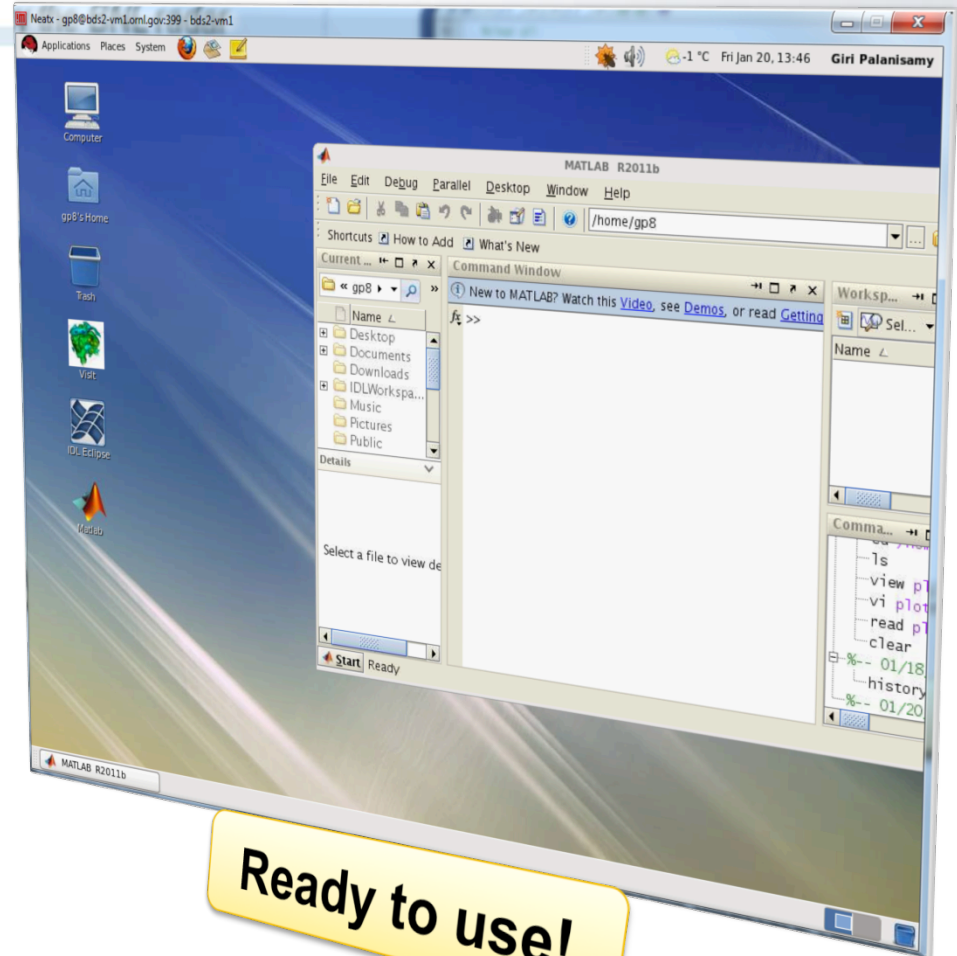
*Come see Giri's poster!*  
*Feedback wanted!*

# Visualize Very Large Data Products

- Interactive visualization cluster at ARM Archive
  - Designed for data analysis and visualization
  - NX client for remote access to Linux desktop
  - requires registration and limited authentication
  - ~15 TB of online radar data (and growing)
  - IDL, MATLAB, VisIt, Python/PERL modules (Others?)

[www.archive.arm.gov/cluster.pdf](http://www.archive.arm.gov/cluster.pdf)

- Other Archive Computing Clusters
  - Batch data processing system
  - ARM GPU system



Ready to use!

**ARM**

CLIMATE RESEARCH FACILITY

**Request Access:** Contact ARM Archive  
([armarchive@ornl.gov](mailto:armarchive@ornl.gov), 1-888-ARM-DATA)

36

# Data Quality Assessment

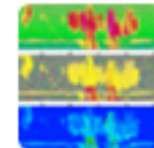
The assessment of data quality is managed by the ARM Data Quality Office

<http://dq.arm.gov/>

## Types of Quality Information

- Automated products
  - QC flags
    - inserted in data files during processing
  - Summaries of flags (data color)
- Manual products
  - Data Quality Reports (DQRs)
    - web accessible reports
    - delivered as HTML files with data requests AND delivered retrospectively when created
    - event driven and problem-based
  - Instrument Mentor Monthly Summary Reports
    - web accessible; linked to instrument web pages

## DQ Hands



- [QC Metrics and Plots](#)
- [Plot Browser](#)
- [DQ wiki](#)

## NCVweb



- [Interactive Data Plotting](#)

## DQ Reports



- [Search All Reports](#)
- [DQ Assessment Reports](#)
- [Report Findings](#)

# Recommended Measurements Discovery Tool

- Many redundant ARM measurements
  - ~5200 primary types
  - (e.g., 70+ air temp)
- Web application focused on recommended sources for core physical quantities
  - A short list (~40)
- Discovery tool identifies data products defined by:
  - Primary, secondary, tertiary sources
  - Measurement type
  - Measurement categories
  - Availability by location
- And displays links to:
  - Data product descriptions
  - Measurement descriptions



# Outline

## Part 1: ARM Facility Overview

- ARM and ASR, Goals and Mission
- ARM Climate Research Facility Overview
- Facility Changes: Recovery Act and New Sites
- Field Campaigns
- Data Products and Processes

## Part 2: Interacting with the ARM Facility

- Finding, Ordering and Using ARM Data
- Submitting Research Highlights
- Submitting Field Campaign Requests
- Keeping up with ARM News and Information
- More Information and Feedback

# How Do I Submit a Research Highlight?

Research Highlights are an efficient way to exchange results with your colleagues. They're used in annual reports and other high-level documents, as well as in program reviews and outreach materials.

<http://asr.science.energy.gov>



To access the Research Highlights Submittal Form:

1. On the ASR website, click **Science**.
2. Click **Research Highlights**.
3. Click **Submit a Highlight**.



# How Do I Submit a Research Highlight?

Select or submit up to two associated publications.



Select your area of research and ASR working group.



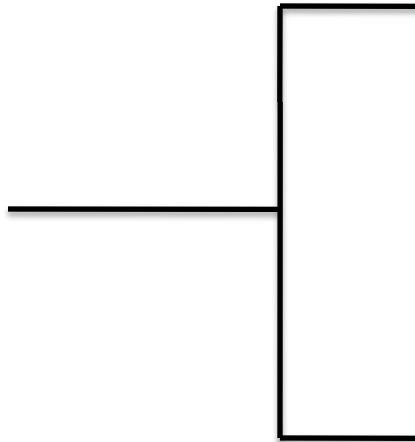
Enter the title and use the Look Up button to select up to two contacts.



Indicate if funded by ASR or ARM and if ARM data was used



Enter the Introduction, Main Discussion, and Conclusion.



You can enter up to two images with captions, but they are not required.



**Journal or Book Reference(s)** (if applicable): [Click](#)  
Your reference from the Publications Database. Limit two references. If you have not submit the references, please [Click](#) it now.

**Area of Research:**

**Working Group:**

(To select more than one, shift+enter.)

**Title of Highlight:**

(There is a 95 character limit.)

**Who is submitting this highlight?** [Click](#)  
(Limit two contacts; contributors will be visible in the journal reference.)

**Funding Source:** ASR Funded  ARM Funded  Both   
Neither

**Did you use ARM Data or Facility?:** Yes  No

Please limit the total of your introduction, main discussion, and conclusion to 5000 characters (this includes blank/white spaces). If you would like to include scientific characters or any other special characters, please use the [ISO 8859-1 standard](#) for HTML conversion or spell it out. For assistance with characters conversion, contact the [administrators](#).

**Introduction:**

**Main Discussion:**

**Conclusion:**

**Images:** (optional)  
Only images in JPEG, BMP, GIF, or PNG can be accepted up to 10 Mb. The image caption is limited to 500 characters.  
Read the ["Tips and Tricks"](#) before uploading multiple images to Research Highlights.

IMAGE1:   Image Caption:

IMAGE2:   Image Caption:

# How Do I Submit a Field Campaign Request?

- First, review the [guidelines](#) for submitting proposals.
- Next, [submit a preproposal](#); a short summary of the proposed campaign.
- Wait for a response from the Infrastructure Management Board (IMB) and/or [ARM Science Board](#).
- A full proposal or science plan may be requested.

The screenshot displays the ARM website's 'Propose a Campaign' form. The page header includes the ARM logo and navigation tabs for 'About', 'Science', 'Campaigns', 'Sites', 'Instruments', 'Measurements', 'Data', 'News', 'Publications', and 'Education'. The main content area is titled 'Submitting Proposals: Guidelines' and provides information on proposal submission, announcements, and the process overview. The form itself is titled 'Propose a Campaign: Preproposal Form' and includes sections for 'Campaign Information', 'Campaign Description', 'ARM Mobile Facilities', 'ARM Aerial Facility', and 'ARM Resources Requested'. The form contains various input fields, dropdown menus, and checkboxes for providing details about the proposed campaign, including dates, locations, and resource requirements.

# How Do I Stay Connected?

## ARM News Center

<http://www.arm.gov/news/>

## Facebook

<http://www.facebook.com/arm.gov>

## Twitter

<http://twitter.com/armnewsteam>

ARM Climate Research Facility website screenshot showing navigation menu, news articles, and social media links.

Twitter profile for @armnewsteam showing bio, follower counts, and recent tweets.

Facebook profile for ARM Climate Research Facility showing bio, follower counts, and recent posts.

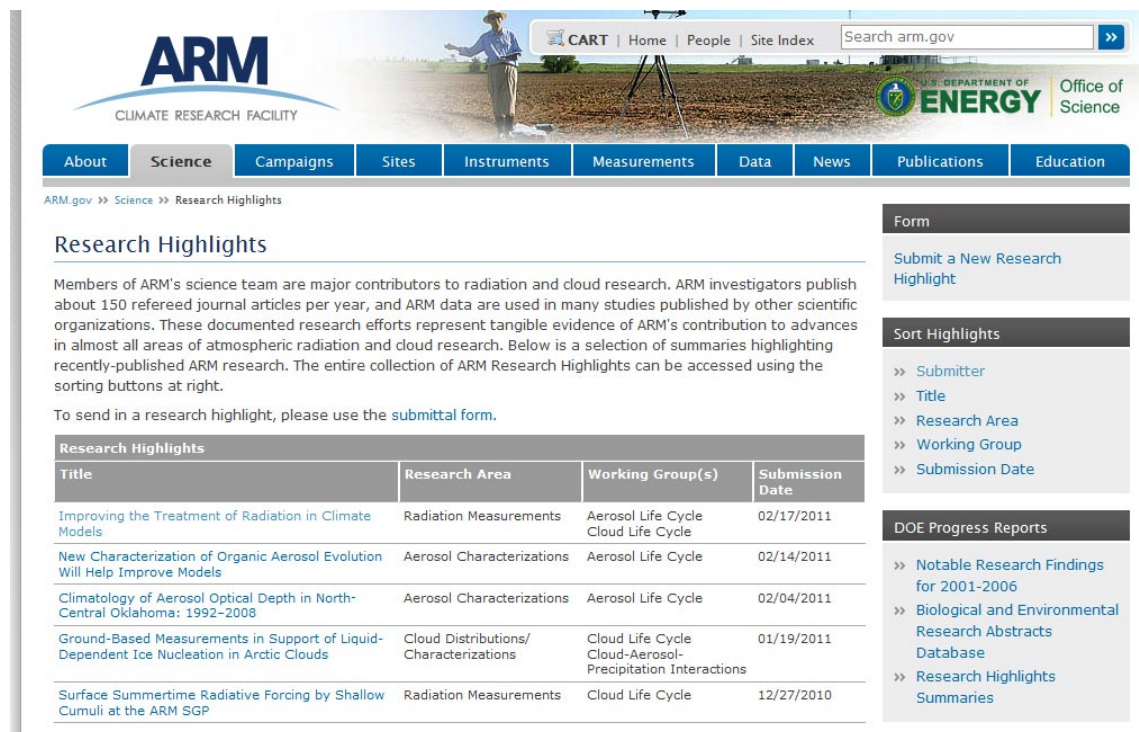
ARM Climate Research Facility Facebook page showing cover photo and a post from Dr. Robert Houze.



# How Do I Stay Connected?

## ■ Research Highlights

<http://www.arm.gov/news/research> or  
<http://www.arm.gov/science/highlights>



The screenshot shows the ARM Climate Research Facility website. The header includes the ARM logo, navigation links (CART, Home, People, Site Index), a search bar, and the U.S. Department of Energy Office of Science logo. The main navigation menu includes About, Science, Campaigns, Sites, Instruments, Measurements, Data, News, Publications, and Education. The page title is "Research Highlights".

Members of ARM's science team are major contributors to radiation and cloud research. ARM investigators publish about 150 refereed journal articles per year, and ARM data are used in many studies published by other scientific organizations. These documented research efforts represent tangible evidence of ARM's contribution to advances in almost all areas of atmospheric radiation and cloud research. Below is a selection of summaries highlighting recently-published ARM research. The entire collection of ARM Research Highlights can be accessed using the sorting buttons at right.

To send in a research highlight, please use the [submittal form](#).

Research Highlights			
Title	Research Area	Working Group(s)	Submission Date
Improving the Treatment of Radiation in Climate Models	Radiation Measurements	Aerosol Life Cycle Cloud Life Cycle	02/17/2011
New Characterization of Organic Aerosol Evolution Will Help Improve Models	Aerosol Characterizations	Aerosol Life Cycle	02/14/2011
Climatology of Aerosol Optical Depth in North-Central Oklahoma: 1992-2008	Aerosol Characterizations	Aerosol Life Cycle	02/04/2011
Ground-Based Measurements in Support of Liquid-Dependent Ice Nucleation in Arctic Clouds	Cloud Distributions/ Characterizations	Cloud Life Cycle Cloud-Aerosol- Precipitation Interactions	01/19/2011
Surface Summertime Radiative Forcing by Shallow Cumuli at the ARM SGP	Radiation Measurements	Cloud Life Cycle	12/27/2010

Form

[Submit a New Research Highlight](#)

Sort Highlights

- » [Submitter](#)
- » [Title](#)
- » [Research Area](#)
- » [Working Group](#)
- » [Submission Date](#)

DOE Progress Reports

- » [Notable Research Findings for 2001-2006](#)
- » [Biological and Environmental Research Abstracts Database](#)
- » [Research Highlights Summaries](#)

# How Do I Submit a Question?

<http://www.arm.gov/>

- Data/instrument issue
  - Use comment box on their web pages
- General questions
  - Go to Contacts page, linked off of every web page
- Needed measurement suggestions
  - Contact any SISC member or send it in through the web on the Contacts page

The image shows two screenshots of the ARM website. The top screenshot is the 'Instrument : X-band Scanning ARM Precipitation Radar (XSAPR)' page. It features a navigation menu with 'About', 'Science', 'Campaigns', 'Sites', 'Instruments', 'Measurements', 'Data', 'News', 'Publications', and 'Education'. The main content area includes a 'General Overview' section with a photograph of the radar dome, 'Output Datastreams' with links to various data products, and 'Primary Measurements' and 'Locations' sections. A 'Comments?' form is highlighted with a red box, containing fields for 'Email Address', 'Comments', and a 'SEND' button. The bottom screenshot shows the 'Contact(s)' page, listing contact information for Nitin Bharadwaj, Kevin Widener, and Scott Collins. A 'Send comments' button is highlighted with a red box, with an arrow pointing from the 'Comments?' form in the top screenshot to this button.

# For More Information on ARM

- Description of sites, instruments, data
- Upcoming campaigns
- Science highlights
- ARM News (subscribe to RSS feed)
- Wiki pages
- Provide Feedback
- Contacts

The screenshot shows the ARM Climate Research Facility website. At the top, there is a navigation bar with links for 'CART', 'Home', 'People', and 'Site Index', along with a search bar for 'arm.gov'. Below the navigation bar is a header image of a person standing next to a large instrument on a tripod in a field. The main content area is divided into several sections: 'Recovery Act' with a link to learn about ARM's efforts; a 'FEATURE' section dated 03.21.2011 titled 'Not Your Typical 3D Movie' featuring a 3D visualization of a radar scan; a 'News & Announcements' section with a list of recent news items; and a 'FEATURED DATA' section. On the right side, there are social media icons for Facebook, Twitter, YouTube, and RSS, and several sidebar sections including 'USING OUR FACILITIES', 'FIELD CAMPAIGNS' (listing GVAX, MC3E, and STORMVEX), and 'USER HIGHLIGHTS'.

Visit the ARM website:

<http://www.arm.gov>

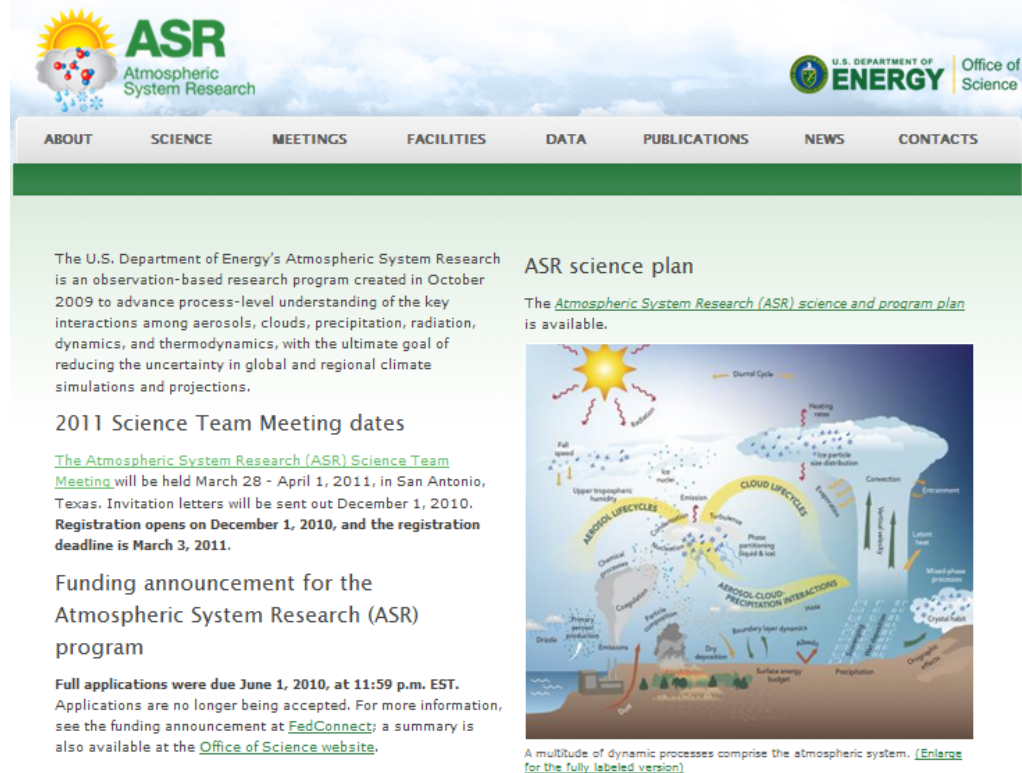
Or visit us on Facebook, Twitter, or YouTube

# For More Information on ASR

- Description of program goals
- Description of working groups
- Science highlights
- Meeting information
- Links to ARM resources
- Contacts

Visit the ASR website:

<http://asr.science.energy.gov/>



The screenshot shows the ASR website homepage. At the top left is the ASR logo (Atmospheric System Research) featuring a sun and a globe. To its right is the U.S. Department of Energy Office of Science logo. Below the logos is a navigation menu with links for ABOUT, SCIENCE, MEETINGS, FACILITIES, DATA, PUBLICATIONS, NEWS, and CONTACTS. The main content area includes a paragraph describing the ASR program, a section for the 2011 Science Team Meeting dates, and a funding announcement. On the right side, there is a section titled 'ASR science plan' with a link to the science and program plan. Below this is a detailed diagram of the atmospheric system showing various processes like aerosol cycles, cloud lifecycles, and aerosol-cloud-precipitation interactions.

The U.S. Department of Energy's Atmospheric System Research is an observation-based research program created in October 2009 to advance process-level understanding of the key interactions among aerosols, clouds, precipitation, radiation, dynamics, and thermodynamics, with the ultimate goal of reducing the uncertainty in global and regional climate simulations and projections.

2011 Science Team Meeting dates

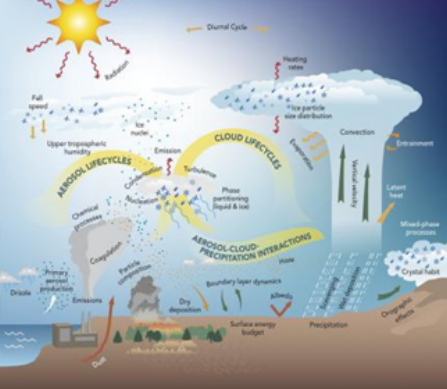
[The Atmospheric System Research \(ASR\) Science Team Meeting](#) will be held March 28 - April 1, 2011, in San Antonio, Texas. Invitation letters will be sent out December 1, 2010. **Registration opens on December 1, 2010, and the registration deadline is March 3, 2011.**

Funding announcement for the Atmospheric System Research (ASR) program

Full applications were due June 1, 2010, at 11:59 p.m. EST. Applications are no longer being accepted. For more information, see the funding announcement at [FedConnect](#); a summary is also available at the [Office of Science website](#).

ASR science plan

The [Atmospheric System Research \(ASR\) science and program plan](#) is available.



A multitude of dynamic processes comprise the atmospheric system. [\[Enlarge for the fully labeled version\]](#)

# ARM User Survey

## Does ARM Data Meet Your Research Needs?

- To help us understand how you, the ARM user community, interact with ARM data, we invite you to take our short survey. Your answers to this survey are very important, as they will guide improvements to the pathways for finding, ordering, and delivering ARM data and improving the communication of data quality information.

See email from February 22

Survey will remain open through March 23