

Instrument Overview

ARM Climate Research Facility
19th Annual ARM Science Team Meeting

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U.S. DEPARTMENT OF
ENERGY

Office of Science

Presentation Outline

- Program Science Goals and Approach
- Research Sites
- Instrument Strategy
- Instrumentation
- Instrument Team
- Instrument Documentation
- Conclusion

ARM Science Goals

Clouds and Radiative Feedback

- Improve the scientific understanding of the fundamental physics related to interactions between clouds and the radiative feedback processes in the atmosphere.

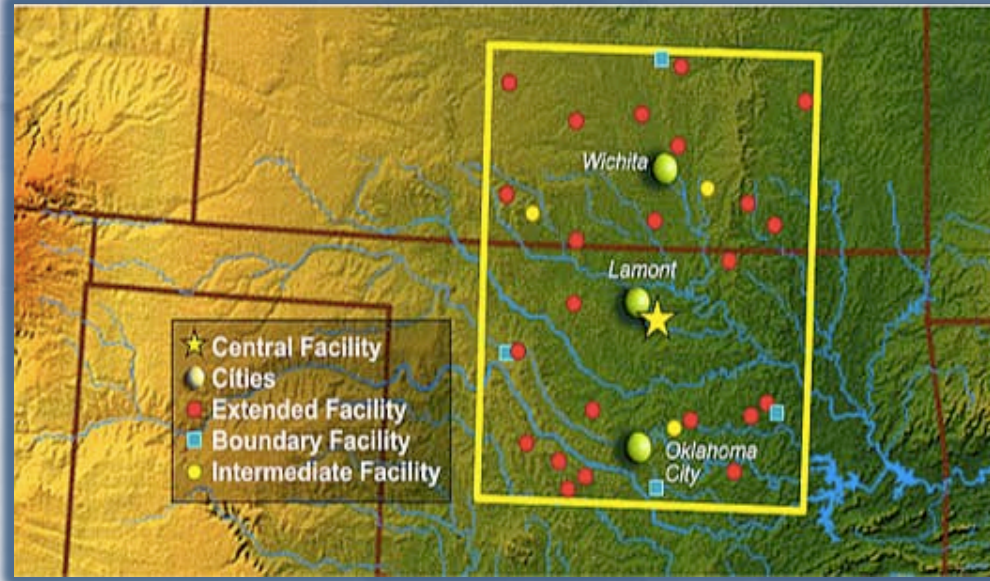
Continuous Field Measurements

- To provide data products that promote the advancement of climate models.

ACRF Approach

- Produce high quality measurement products
- Relate observed radiative energy fluxes to temperature, water vapor, clouds, and surface properties
- Acquire observations over a wide range of climatic conditions
- And, over climatically meaningful (decadal) time scales
- Provide data freely to the science community

Research Sites



Established 1992

Southern Great Plains

Research Sites



Manus 1996



Nauru 1998



Darwin 2003

Established

Tropical Western Pacific

Research Sites



Barrow 1997



Atkasuk 1999

Established

North Slope of Alaska

Research Sites



Pt. Reyes, CA - 2005



Niamey, Niger - 2006



Black Forest, Germany- 2007



Shouxian, China - 2008



Azores- 2009



Azores- 2010

Established 2005

ARM Mobile Facility-1

Research Sites



AMF2 for Marine Environments



Storm Peak, Colorado – 2010 - 2011



Target Deployment 2010

ARM Mobile Facility-2

Research Sites



Annual

Established 2007

ARM Aerial Facility

Research Sites



Pagosa Springs, CO – Integration Site



Cerro Toco, Chile ~17,000 ft.

Radiative Heating in Unexplored Bands Campaign

RHUBC II - 2009

An “Off Site Campaign”

Field Campaigns

- Annual Process
- Instrument and Field Campaign Coordinator is Moderator
- Science Board Provides review
- DOE Program Management makes award



The screenshot shows the ARM website's 'Field Campaigns' page. At the top, there is a navigation menu with links for 'ABOUT ARM', 'ABOUT ACRF', 'SCIENCE', 'SITES', 'INSTRUMENTS', 'MEASUREMENTS', 'DATA', 'PUBLICATIONS', 'EDUCATION', and 'FORMS'. Below this is a secondary menu with 'User Information', 'Field Campaigns', 'Capabilities & Products', 'Organization', 'Operations Updates', 'Facility Statistics', and 'Contacts'. The main content area features a 'Field Campaigns' heading, a text box with information about proposal deadlines, a photograph of a field site with a tall tower, and a sidebar with links for 'Apply for a Field Campaign', 'Search Campaigns', and 'Browse Campaigns'.

Field Campaigns

Proposals for smaller campaigns this fiscal year, and forward, are still being considered. We are no longer accepting preproposals for use of the AMF and AVP services in FY 2010; invited full proposals are due May 15. Preproposals for routine use of small aircraft in FY 2008-2010 at the Southern Great Plains (SGP) field site are no longer being accepted; invited full proposals are due April 1.

ARM Climate Research Facility users regularly conduct field campaigns to augment routine data acquisitions and to test and validate new instruments. Any field campaign which is proposed, planned, and implemented at one or more research sites is referred to as an intensive operational period (IOP). IOPs are held using the fixed and mobile sites; Southern Great Plains, North Slope of Alaska, Tropical Western Pacific, ARM Mobile Facility (AMF), and Aerial Vehicles Program (AVP). The AVP provides aerial measurement platforms that can be used to support experiments at the fixed sites, in conjunction with the mobile facility, or in support of other research activities independent of the ACRF. While the ACRF does not provide direct funding for other research, small amounts of funding may be provided to allow the facility to assist with logistics, the development of datastreams and archiving, and other infrastructure activities associated with using the facility.

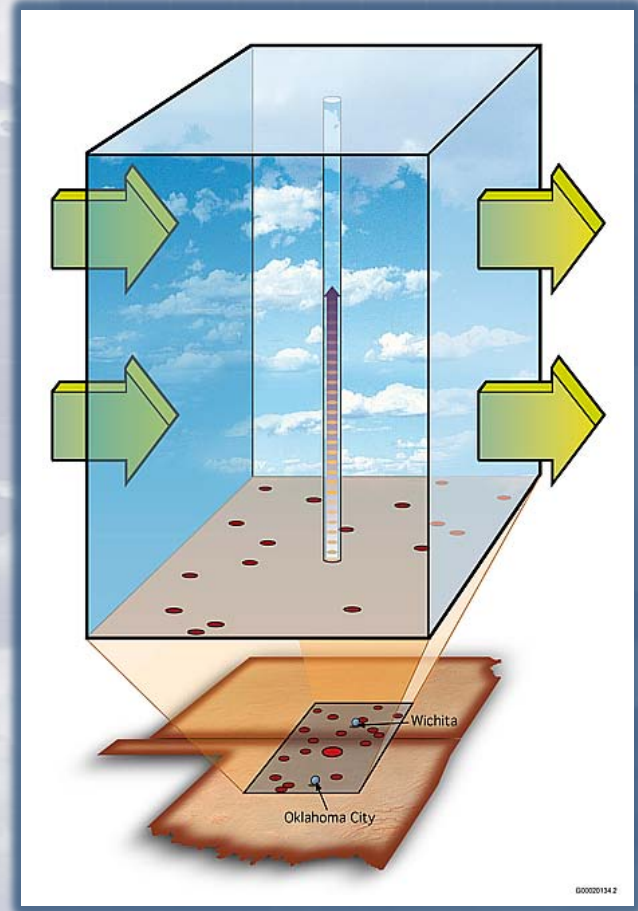
Field Campaigns Home

- Apply for a Field Campaign
 - Preproposal Submission Form
 - Instrument Support Request (ISR) Form
- Search Campaigns
 - Search Form
- Browse Campaigns
 - Current Campaigns
 - Upcoming Campaigns
 - Past Campaigns
 - View All Campaigns
- Other Field Campaign Information
 - Processes and Guidelines

<http://www.arm.gov/acrf/fc.stm>

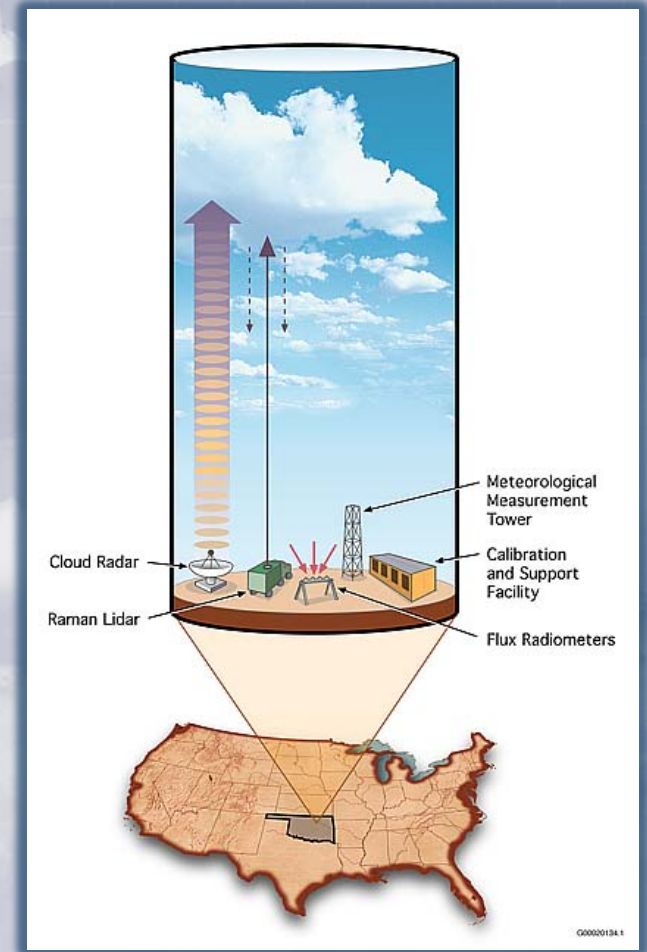
Measurement Approach

- Patterned after a single column model
- Detailed characterization of vertical column
- Spatial variations at the surface
- Transport of mass, momentum, and energy into and out of the domain



Instrument Approach

- Active Sensing
- Passive Sensing
- Maintenance and Calibration
- Research Site Operations
- Instrument Mentors



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Instrumentation

- Deployment is driven by the science needs
- Configured to provide reliable, timely, high quality, and documented observations
- The resulting data products are available from the ARM Archive
- Instrument management is a cooperative effort (Instrument Team, Operations, Engineering, and Data Quality Office)

Instrumentation ₂

- Annual process in our science working groups to refine approach
- Instruments are Grouped by Categories

Instrument Categories

- Aerosols
- Airborne Observations
- Atmospheric Carbon
- Atmospheric Profiling
- Cloud Properties
- Radiometric
- Surface Meteorology
- Surface/Subsurface Properties



New Instrumentation for FY2009



Next Generation
3-Channel
Microwave Radiometer



W-band (95 Ghz)
Upgrade for Scanning
Capability



Surface Albedo
Measurements
AMF1

Instrument Team

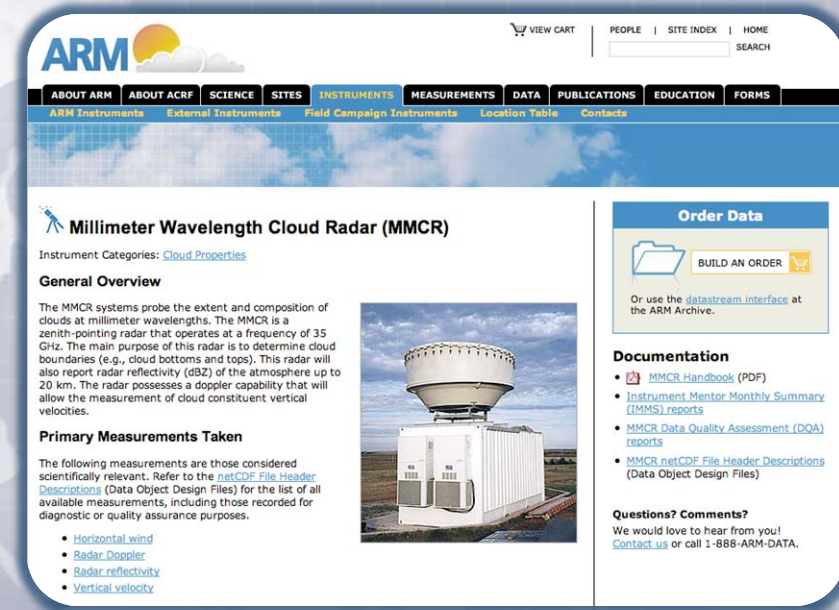
- All of our Instruments have a Mentor
- Technical point of contact
- New Instrument specifications
- Calibration protocol
- Engineering, deployment, operations and maintenance
- Data quality review

Instrument Team ₂


- Documentation for data consumers
- Consulting for data and instrument questions
- Represent Instruments within the science community

Instrument Documentation

- Instrument Website
www.arm.gov/instruments
- Measurements Taken
- Categories, Location Table, Data Ordering
- Contacts, Data Quality Assessment
- Monthly Reports
- Instrument Handbook and File Header Descriptions



The screenshot displays the ARM website interface for the Millimeter Wavelength Cloud Radar (MMCR). The page features a navigation bar with links for ABOUT ARM, ABOUT ACRF, SCIENCE, SITES, INSTRUMENTS, MEASUREMENTS, DATA, PUBLICATIONS, EDUCATION, and FORMS. Below the navigation bar, there are sub-links for ARM Instruments, External Instruments, Field Campaign Instruments, Location Table, and Contacts. The main content area is titled "Millimeter Wavelength Cloud Radar (MMCR)" and includes a "General Overview" section, a "Primary Measurements Taken" section, and a "Documentation" section. A "Data Ordering" sidebar is also visible on the right side of the page.

ARM  [VIEW CART](#) | [PEOPLE](#) | [SITE INDEX](#) | [HOME](#) | [SEARCH](#)

[ABOUT ARM](#) | [ABOUT ACRF](#) | [SCIENCE](#) | [SITES](#) | [INSTRUMENTS](#) | [MEASUREMENTS](#) | [DATA](#) | [PUBLICATIONS](#) | [EDUCATION](#) | [FORMS](#)

[ARM Instruments](#) | [External Instruments](#) | [Field Campaign Instruments](#) | [Location Table](#) | [Contacts](#)

Millimeter Wavelength Cloud Radar (MMCR)

Instrument Categories: [Cloud Properties](#)

General Overview

The MMCR systems probe the extent and composition of clouds at millimeter wavelengths. The MMCR is a zenith-pointing radar that operates at a frequency of 35 GHz. The main purpose of this radar is to determine cloud boundaries (e.g., cloud bottoms and tops). This radar will also report radar reflectivity (dBZ) of the atmosphere up to 20 km. The radar possesses a doppler capability that will allow the measurement of cloud constituent vertical velocities.

Primary Measurements Taken

The following measurements are those considered scientifically relevant. Refer to the [netCDF File Header Descriptions](#) (Data Object Design Files) for the list of all available measurements, including those recorded for diagnostic or quality assurance purposes.

- [Horizontal wind](#)
- [Radar Doppler](#)
- [Radar reflectivity](#)
- [Vertical velocity](#)

Order Data

[BUILD AN ORDER](#)

Or use the [datastream interface](#) at the ARM Archive.

Documentation

- [MMCR Handbook \(PDF\)](#)
- [Instrument Mentor Monthly Summary \(IMMS\) reports](#)
- [MMCR Data Quality Assessment \(DQA\) reports](#)
- [MMCR netCDF File Header Descriptions \(Data Object Design Files\)](#)

Questions? Comments?

We would love to hear from you!
[Contact us](#) or call 1-888-ARM-DATA.

Conclusion

- ARM Website www.arm.gov
- Instrument Mentors
www.arm.gov/instruments/mentors.php
- Data Quality dq.arm.gov
- Instrument and Field Campaign Coordinator
jimmy.voyles@arm.gov
- ARM People Directory www.arm.gov/people

Thank You