# The ARM Climate Research Facility
# New Capabilities and the Expected Impacts on Climate Science and Modeling

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## 1. The ARM Climate Research Facility

DOE Office of Science National Scientific User Facility

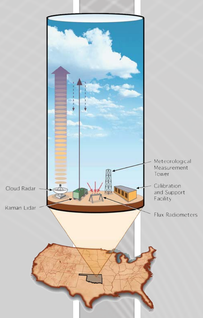
High quality, research data products for atmospheric and climate sciences

National and international research sites including mobile and aerial facilities

Primary focus on measurements needed to advance the understanding of clouds and radiative feedbacks

To use this understanding to improve the performance of climate models

Learn more by visiting our Webpage:
http://www.arm.gov




## 2. Recovery Act Enhancements

$60M in capital investments for instrumentation and research infrastructure

Over 120 individual procurement actions and 50 datastreams

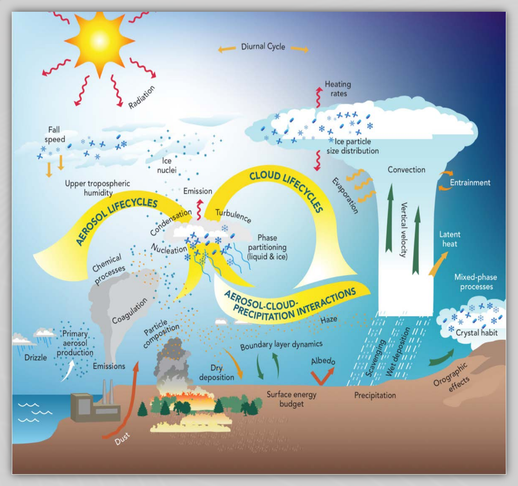
Accelerated procurement and implementation plan

Provide 3-dimensional measurements of cloud scale dynamics, microphysics, and precipitation

Provide enhanced measurements of atmospheric aerosol composition and chemistry

Enhance ARM measurement base to bridge new knowledge into, and improve, the predictive performance of climate models

A list of instruments being purchased is available here:
http://www.arm.gov/about/recovery-act




Depiction from the Atmospheric System Research Science Plan

## 3. Principal Measurement Groups And Supporting Infrastructure

Scanning Precipitation Radars

Reference Rain Network

Scanning Dual-Frequency Cloud Radars

Lidars for Clouds and Aerosols

Multi-frequency Microwave Radiometers

Infrared and Solar Spectroradiometers

Expanded Surface Flux Network

Atmospheric Aerosols and Chemistry

Atmospheric State

Research Site Infrastructure, Computing, and Networking

## 4.1 Accelerated Evolution Into 3-Dimensional Measurements of Cloud Life cycle

Volume Represented Cloud Properties, Precipitation, Water Vapor, Dynamics

## 4.2 Synergistic Aerial Measurements of Aerosols and Cloud Composition

In situ Cloud Particle and Aerosol Composition, Concentration, Size Distribution, and Chemistry

## 4.3 Enhanced Ground-Based Aerosol and Atmospheric Chemistry

Aerosol Properties, Composition, Hygroscopic Growth, Absorption, Concentration, Size Distribution, and Chemistry

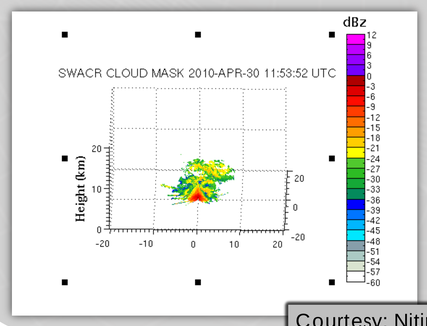
**Mobile Aerosols**
**Mobile Chemistry**
**Mobile Facility 2**
**Darwin**

## 5. Expected impacts on Climate Science and Modeling

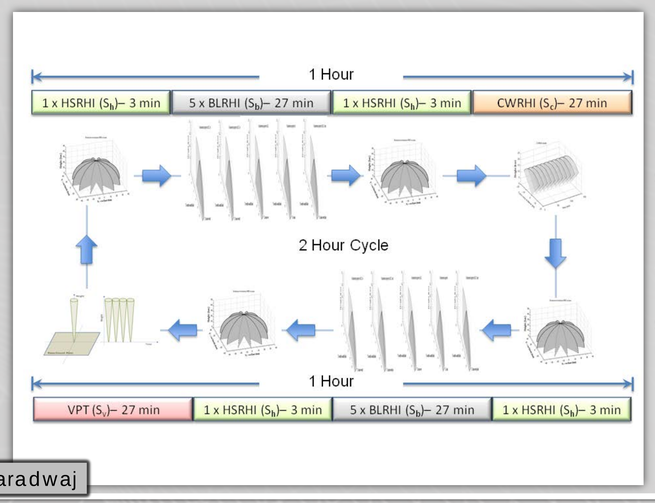
**Data for Observations, Evaluation and Analysis**

Enhanced 3-dimensional data sets

Integrated products from multiple measurements




Courtesy: Nitin Bharadwaj



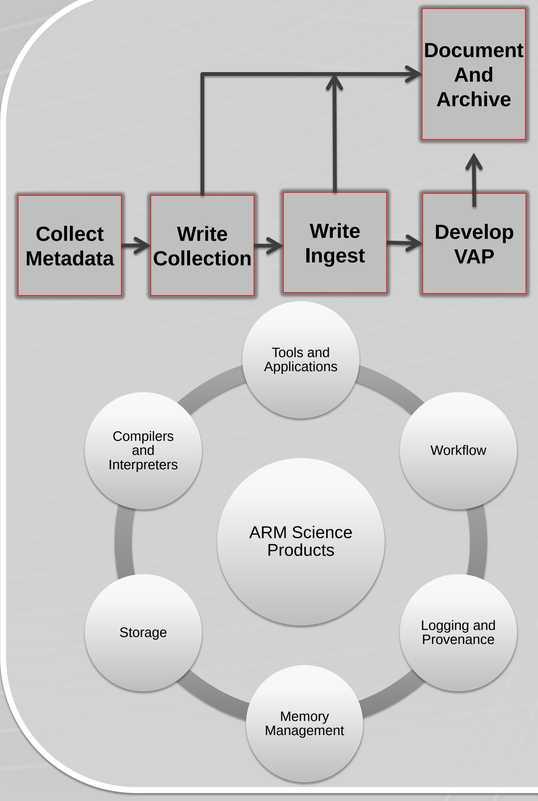

**Fundamental New Knowledge**

In the properties of, and interactions among, aerosols, clouds, precipitation and radiation.

Roles of atmospheric dynamics, thermodynamics, structure, radiation, surface properties, and chemical and microphysical processes in the life cycles of aerosols and clouds.

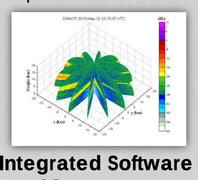
The processes of the aerosol-cloud-precipitation continuum that affect the radiative fluxes at the surface to the top of the atmosphere and the radiative and latent heating rate profiles.

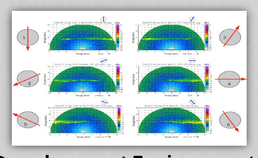
In the predictive performance of climate change models.




## 6. Datastream Availability and Processing Workflow Improvements

***Ingest*, Collection, and Delivery**
There are approximately 50 different instruments being introduced with a range of requirements.





**Integrated Software Development Environment Provides**
Improved user experience of scientists

Standardized retrieval, translation, and storage

Community approach to code development

Framework to analyze and process large data sets

Capability for external codes to be plugged into the ARM production pipeline

Environment hosted at ARM Archive

## 7. Project Status

100% of the project costs are committed

75% of the project is costed

95% of the baseline instruments have been received

SGP Radar Site Infrastructure Completion

AMF2 Aerosol Systems Online

TWP Darwin Raman Lidar deployed

New AERI systems deployed

Enhanced Aircraft Measurements Available

Instrument Delivery and Integration Underway

Site Infrastructure Enhancements Underway

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