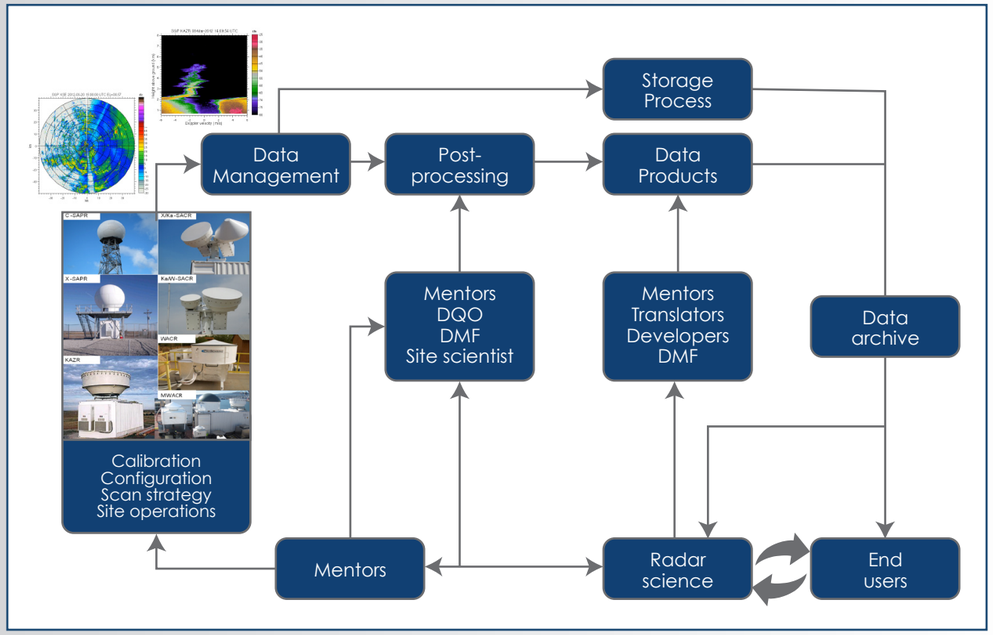
ARM Radar Data

Radar data is inherently complex. ARM radars are developed, operated, and overseen by engineers, scientists, data analysts, and technicians to ensure common goals of quality, characterization, calibration, data availability, and utility of radars.



Advanced Data Products and Tools

- **Active Remotely Sensed Cloud Locations (ARSCL)** – combines data from active remote sensors with radar observations to produce an objective determination of hydrometeor height distributions and retrieval of cloud properties.
- **MicroARSCL** – product development and tools for advanced algorithms applied to Doppler spectra data. MicroARSCL enables the processing of very large volumes of spectra data for geophysical retrieval.
- **Python ARM Radar Toolkit (Py-ART)** – a community-based toolkit for the ingest and processing of radar data. Py-ART, through advanced algorithms and the power of Python™, facilitates the retrieval of geophysical variables and archives it in widely used file formats.

Browse ARM data using the Data Discovery Browser:
http://www.archive.arm.gov/discovery/

For more information, contact:

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ARM CLIMATE RESEARCH FACILITY

Sponsored by the U.S. Department of Energy Office of Science, the Atmospheric Radiation Measurement (ARM) Climate Research Facility maintains heavily instrumented fixed and mobile field sites that measure clouds, aerosols, radiation, and precipitation. Data from these sites are used by scientists to improve the computer models that simulate Earth's climate system.

Cloud and Precipitation Radars

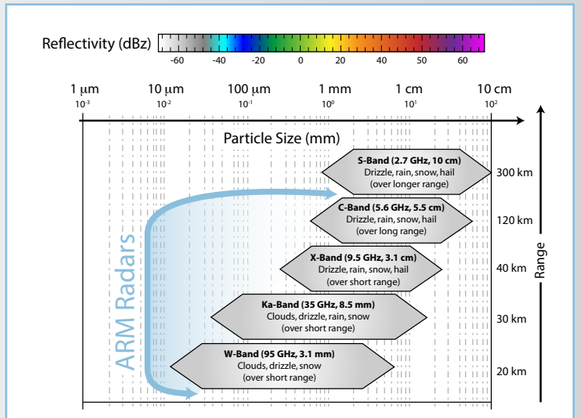
Cloud systems vary with climatic regimes, and observational capabilities must account for these differences. Radars are the only means to obtain both quantitative and qualitative observations of clouds over a large area.

At each ARM fixed and mobile site, millimeter and centimeter wavelength radars are used to obtain observations of the horizontal and vertical distributions of clouds, as well as the retrieval of geophysical variables to characterize cloud properties. This unprecedented assortment of 32 radars provides a unique capability for high-resolution delineation of cloud evolution, morphology, and characteristics.

One-of-a-Kind Radar Network

All ARM radars, with the exception of three, are equipped with dual-polarization technology. Combined with multiple frequencies, this technology provides improved retrievals of cloud properties, including better discrimination of liquid from ice.

Through scanning strategies developed for these radars, ARM is extending its observations of clouds and precipitation beyond the confines of the vertical atmospheric column to include a spatial picture for process studies and evaluation of models. Observations from ARM's scanning cloud radars around the world will help reduce uncertainties in the cloud parameterizations used in global climate models.



For illustrative purposes only; does not depict actual data.

Scanning Radars
- C-Band
- Ka-Band
- X-Band
- W-Band

Zenith Cloud Radars
- Ka-Band
- W-Band

INSTRUMENTATION

Scanning ARM Cloud Radars (SACR)

These systems use pulse compression technology to improve sensitivity. SACRs use corner reflector observations for calibration consistency and system monitoring.

- **Ka/W-SACR** (Ka- and W-Band, λ ~ 8 mm and 3 mm): Uses a klystron and operates in depolarization mode with horizon-to-horizon scanning capability. The antenna beamwidths are matched (0.3°) to keep nearly identical resolutions.

- **X/Ka-SACR** (X- and Ka-Band, λ ~ 3 cm and 8 mm): Simultaneously sends and receives horizontal and vertical polarization signals. X-SACR uses a low-powered traveling wave tube (20 kW) transmitter.

ARM Mobile Facility

Three separate, fully instrumented facilities give researchers the flexibility to obtain climate observations anywhere in the world. Each mobile facility comes with different radars:

- **AMF1:** Ka/W-SACR, WACR
- **AMF2:** KAZR, X/Ka-SACR, MWACR
- **AMF3:** KAZR, Ka/W-SACR, C-SAPR.

North Slope of Alaska

High-latitude Arctic observations over both land and sea. Ice and mixed-phase clouds form the predominant cloud systems most of the year.

- KAZR
- Ka/W-SACR
- X-SAPR: the only dual-polarized weather radar with coverage over land and sea in the Arctic.

Southern Great Plains

Wide variability of cloud types and large seasonal variations in temperature and humidity.

- KAZR
- Ka/W-SACR
- X-SAPR
  - Three radars around the SGP central facility
  - Separated by 25-30 km
  - Observation of the drizzle and rain over the cloud profiling radars
- C-SAPR: the only operational radar that provides range height indicator scans in the mid-latitude, mid-continental regime.

Eastern North Atlantic

Observations of low marine cloud systems in subtropical oceans.

- KAZR
- Ka/W-SACR
- X-SAPR: high-powered and high-resolution system with 0.5° beam targeting marine clouds and drizzle.

Tropical Western Pacific (Darwin, Australia; Manus, Papua New Guinea)

Observations of deep atmospheric convection in the "Pacific Warm Pool" that drives global climate.

- KAZR
- X/Ka-SACR
- C-SAPR: located on Manus Island, it is the only weather radar deployed in the region.

Scanning ARM Precipitation Radars (SAPR)

These weather radars make observations of precipitation systems (and certain non-precipitating clouds), simultaneously transmitting and receiving horizontal and vertical polarization signals.

- **X-SAPR** (X-Band, λ ~ 3 cm) and **C-SAPR** (C-Band, λ ~ 5 cm): High-powered magnetron systems (200 kW, X-SAPR; 300 kW C-SAPR), pencil beam with horizon-to-horizon scanning capability for X-SAPR, and horizon-to-Zenith for C-SAPR.

C-SAPR

X-SAPR

ARM Cloud Profiling Radars

Vertically pointing, these radars provide high-resolution profiles of reflectivity, Doppler velocity, and spectral width from near-ground to nearly 20 km. Their co- and cross-polar Doppler spectra are recorded 24 hours daily for advanced spectral processing, and the systems use pulse compression technology to improve sensitivity.

- **KAZR – Ka-Band Zenith Radar** (λ ~ 8 mm): Uses a burst pulse to cover the blind zone.

- **MWACR – Marine W-Band ARM Cloud Radar** (λ ~ 3 mm): Operates on a stabilized platform for marine deployments, and on a pedestal for land-based deployments.

* All of ARM's cloud profiling radars are unattended, around-the-clock, operational radars that are remotely monitored and operated via the Internet.