

# Convective and Orographically Induced Precipitation Study

The U.S. Department of Energy's Atmospheric Radiation Measurement (ARM) Climate Research Facility is providing the ARM Mobile Facility (AMF) to support a long-term precipitation study in the Black Forest region of Germany. Requested by researchers from the University of Hohenheim, the AMF will be deployed as one of four heavily instrumented supersites established for the Convective and Orographically Induced Precipitation Study (COPS). The AMF will be deployed in the village of Heselbach in the Murg Valley. Beginning in March 2007, the AMF will collect measurements for 9 months to document the 4-dimensional state of the atmosphere. These data will help scientists to more accurately represent convective clouds in computer models that simulate weather and climate.



## Orographic Precipitation?

Typically, “normal” rain forms when cold and warm weather fronts pass through an area. Orographic precipitation is a specific type of heavy rainfall that occurs in areas where mountains and complex terrain (called orographic terrain) force moist air to quickly rise, forming thick rain clouds. Because convective processes in orographic terrain are not well understood, scientists have a difficult time representing them accurately in models that simulate these conditions.

Measurements obtained during the COPS field campaign will encompass the entire life cycle of precipitation—from pre-convective conditions to the development of clouds, followed by the onset, development, and organization of precipitation. These data will be combined with coincident radar, aircraft, and satellite data to improve how clouds and precipitation in low-mountain regions are represented in weather forecast and climate models, which currently have particularly low skill in these regions.



## Significance

Information obtained during COPS will not only aid regional weather forecasts to help protect people and land, but will also help scientists determine how clouds affect the climate in complex terrain around the world. Because of its relevance to society, COPS has been endorsed as a Research and Development Project by the World Weather Research Program. This program was established by the World Meteorological Organization to develop improved and cost-effective forecasting techniques, with an emphasis on high-impact weather. As one of their projects, COPS will be coordinated with additional program activities to result in one of the largest international weather research efforts performed to date in Europe. The COPS field campaign is funded by the German Research Foundation within the scope of the Priority Program 1167, “Quantitative Precipitation Forecast.”

## ARM Mobile Facility

The AMF requires a rotating staff of two people to maintain the instruments and ancillary equipment. It consists of the following main components:

- operations shelters
- standard meteorological instrumentation, broadband and spectral radiometer suite, and remote sensing instruments
- data and communications systems.

### Operations Shelters

A minimum of two large shipping containers serve as the facility shelters. Converted into laboratory space, these shelters house the computer and data systems connected to the high-tech instruments that obtain data from the atmosphere. They also provide space for spare parts storage and conducting repairs.

### Measurement Capabilities

Measurement capabilities include the standard meteorological instrumentation, broadband and spectral radiometer suite, and remote sensing instruments:

- 95-gigahertz W-band ARM Cloud Radar
- Micropulse Lidar and Laser Ceilometer
- Microwave Radiometer
- Microwave Radiometer Profiler
- Atmospheric Radiance Interferometer, including a dedicated shelter
- Sky Radiation system – a collection of radiometers to measure visible diffuse, global, and direct visible and infrared solar radiation
- Ground Radiation System – a collection of radiometers to measure visible and infrared radiation coming from the ground
- Radar Wind Profiler
- Total Sky Imager
- Balloon-Borne Sounding System – sondes launched each day at regular intervals
- Aerosol Observing System, including an aerosol sampling stack and dedicated shelter
- Surface Meteorology Station
- Eddy Correlation System
- Cimel Sunphotometer.



### Data and Communication System

Continuous measurements obtained by the sensors and instruments are collected by computers in the operations shelters. These data are routinely checked for quality and transmitted to the ARM Data Archive for storage and availability to the scientific community.

### Using the ARM Mobile Facility

The AMF is designed to collaborate with experiments (especially those involving aircraft) from other agencies. It can also accommodate other instruments in addition to, or in place of, the baseline collection. Organizations interested in using the AMF are encouraged to submit proposals at the following website:

[http://www.arm.gov/acrf/submit\\_proposals.stm](http://www.arm.gov/acrf/submit_proposals.stm)

## Sponsor

The AMF was developed by the ARM Program through funding from the DOE Office of Science. Managed by the ARM Program, numerous national laboratories are responsible for the science, engineering, and operation of the AMF.

### Contacts

Wanda Ferrell  
ACRF Program Director  
(301) 903-0043  
Wanda.ferrell@science.doe.gov

Doug Sisterson  
AMF Operations  
(630) 252-5836  
dlsisterson@anl.gov

Mark Miller  
AMF Science  
(631) 344-2958  
miller@bnl.gov

Jimmy Voyles  
AMF Engineering  
(509) 372-4856  
jimmy.voyles@pnl.gov

DOE/SC-ARM/P-06-019



Office of Science  
U.S. Department of Energy

**The ARM Climate Research Facility is funded through the U.S. Department of Energy's Office of Science. Additional information about ARM Program Science and the ARM Climate Research Facility is available at [www.arm.gov](http://www.arm.gov).**