

# ARM

CLIMATE RESEARCH FACILITY

## FACT SHEET

# U.S. Department of Energy Eastern North Atlantic

The U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility provides the research community with continuous data about clouds, aerosols, energy, and precipitation from Graciosa Island in the Azores, Portugal. As ARM's newest observation facility, the Eastern North Atlantic, or ENA site, began operations in September 2013, and mirrors ARM's other long-term atmospheric measurement facilities around the world.



The Azores are an island group located in the northeastern Atlantic Ocean, a region characterized by marine stratocumulus clouds. Response of these low clouds to changes in atmospheric greenhouse gases and aerosols is a major source of uncertainty in global climate models. Interactions between aerosols and clouds intricately involve the formation of precipitation and its effect upon cloud dynamics, turbulence, and entrainment. Scientists currently lack sufficient observations to accurately quantify the links among these processes.

For the evaluation of both climate and process-based numerical models, statistically robust and physically accurate observational data sets obtained over long periods of time are needed. The ENA site will provide a rare data set from the subtropical marine boundary layer where climate models show the greatest discrepancy in cloud responses.



The new location for the ENA fixed site is shown in relation to the original mobile facility deployment site near the airport on Graciosa Island, Azores.



## Background

### Clouds, Aerosol, and Precipitation in the Marine Boundary Layer

This new site follows an extremely successful 18-month deployment of the ARM Mobile Facility—a portable climate observatory—that took place on Graciosa Island during 2009–2010 for the Clouds, Aerosol, and Precipitation in the Marine Boundary Layer (CAP-MBL) field campaign.

Data from the deployment resulted in the first climatology of detailed vertical structure of cloud and precipitation properties of low clouds at a remote subtropical marine site. These data provided particularly important new information about the structure and variability of the remote marine boundary layer system and the factors that influence it. Scientific results from this campaign confirmed that the Azores have the ideal mix of conditions to study how clouds, aerosols, and precipitation interact.

## Instrumentation and Data

This new ENA observation site provides significant enhancements to instruments previously deployed with the ARM Mobile Facility. Key instrument systems include:

### Aerosol and Trace Gas Systems

- Hygroscopic Tandem Differential Mobility Analyzer
- Aerosol Chemical Speciation Mass Spectrometer
- Cavity Attenuated Phase Shift Particle Extinction Monitor
- CO/NO<sub>2</sub>/H<sub>2</sub>O gas-phase monitor
- CO<sub>2</sub>/CH<sub>4</sub>/H<sub>2</sub>O gas-phase monitor
- Ultra-high Sensitivity Aerosol Spectrometer

### Atmospheric and Boundary State Systems

- surface meteorological instrumentations
- weather balloons (launched twice each day)
- total sky imager
- weighing bucket rain gauge
- total precipitation sensor
- eddy correlation flux measurement system
- disdrometer

### Lidars

- micropulse lidar
- Doppler lidar
- Raman lidar

### Radars

- zenith cloud radar
- scanning cloud radar
- scanning precipitation radar
- radar wind profiler

### Radiometers

- atmospheric emitted radiance interferometer



- microwave radiometers
  - multifilter rotating shadowband radiometer
  - pyranometer
  - pyrroheliometer
  - pyrgeometer
  - blackbody calibration system.
- Make an in-person or virtual visit to the ENA site [www.arm.gov/about/forms](http://www.arm.gov/about/forms).

## User Information

Researchers can use ENA's facilities and data in a number of ways:

- Access data gathered during normal operations or field campaigns through the ARM Data Archive [www.archive.arm.gov](http://www.archive.arm.gov)
- Propose and conduct a field campaign [www.arm.gov/campaigns/propose](http://www.arm.gov/campaigns/propose)

For more information, contact:

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