

## ARM West Antarctic Radiation Experiment

West Antarctica is one of the most rapidly warming regions on Earth, and this warming is closely connected to global sea level rise. With limited atmospheric observations in the remote region since the late 1950s, there has been no comprehensive explanation for the rapid warming of the West Antarctic Ice Sheet (WAIS). To find answers, there is a need to quantify the role of changing air masses on the surface energy balance, including all surface energy components and cloud radiative forcing. These data are needed to improve global climate models, which are known to perform poorly over the Southern Ocean due to lack of cloud observations.

To gather these critical data, the Atmospheric Radiation Measurement (ARM) Climate Research Facility, a national scientific user facility managed by the U.S. Department of Energy (DOE) Office of Science, is conducting a climate-related field campaign in West Antarctica that will use some



The WAIS is experiencing rapid changes in temperature and stability, without any comprehensive explanation for the dramatic warming.

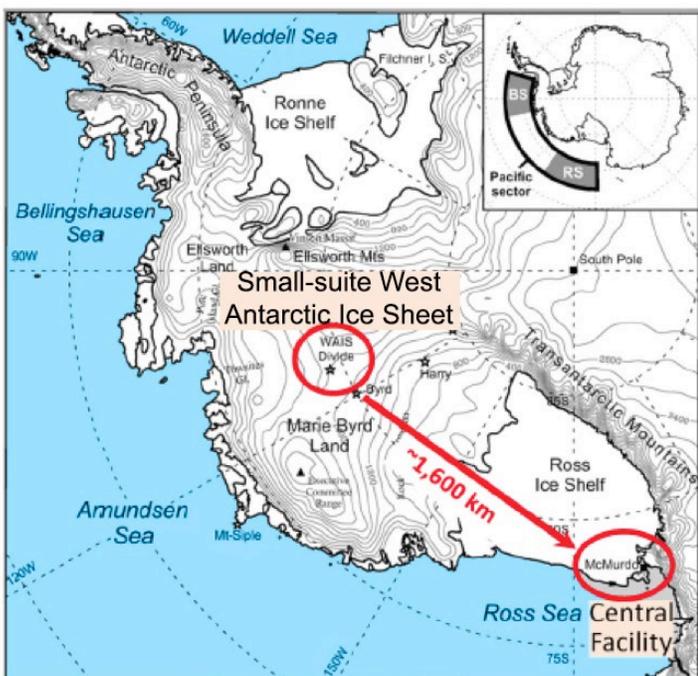
of the most advanced atmospheric research instrumentation for cloud, radiative, and aerosol observations.

From the fall of 2015 to early 2017, the **Atmospheric Radiation Measurement (ARM) West Antarctic Radiation Experiment (AWARE)** will gather data from McMurdo Station at the southern tip of Antarctica's Ross Ice Shelf. Using a portable observatory ARM Mobile Facility (AMF), researchers will be measuring clouds, aerosols, and energy coming from the sun and Earth. An additional smaller suite of instruments on the WAIS will be transported from McMurdo to operate for 56 days between November 2015 and January 2016.

### Science Objective

AWARE will use the joint capabilities of the U.S. Antarctic Program, managed by the National Science Foundation, and the second AMF (AMF2) to provide quantitative data about energy components, changing air masses, and cloud microphysical data to improve model simulations of the ice sheet as influenced by global climate. These data will be vital in understanding the complex processes occurring in this remote area. The team will focus on three specific objectives:

1. Obtain quantitative information on WAIS energy balance components and clouds as they relate to changing air masses and warm air advection.



One of the world's three great ice sheets—the WAIS—is situated in a relatively warm marine geologic basin that drains into the Weddell, Bellingshausen, Amundsen, and Ross seas through fast-moving ice streams and outlet glaciers.

2. Provide cloud microphysical data to evaluate and improve climate model performance in the coldest and most pristine environment on Earth.
3. Fully characterize an annual cycle of aerosol properties by combining the microphysical information from AMF2 with chemical composition analysis of samples performed at Scripps Institute of Oceanography at the University of California at San Diego.



The portable AMF2 consists of instruments, operation shelters, and data and communications systems.

## Research Instrumentation

Onsite operators monitor and maintain the facility to assure the best and most complete data set are acquired. Data are collected 24-hours a day, every day, and provided free of charge online to scientists worldwide.

**Measurement Capabilities.** Measurement capabilities include cutting-edge meteorological instrumentation, broadband and spectral radiometer suite, and remote sensing instruments, such as:

- W-Band Scanning ARM Cloud Radar
- High Spectral Resolution Lidar
- Micropulse Lidar and Laser Ceilometer
- X- and Ka-Band Scanning ARM Cloud Radar
- Microwave Radiometer
- Atmospheric Emitted Radiance Interferometer

- Multifilter Rotating Shadowband Radiometer
- 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
- Balloon-Borne Sounding System—sondes launched each day at regular intervals
- Radar Wind Profiler
- Total Sky Imager
- Aerosol Observing System
- Surface Meteorology Station.

## Collaboration

AWARE is one of the most challenging missions ever conceived for the ARM mobile facilities, and its success requires close collaboration between the DOE's Office of Science and the National Science Foundation.

[www.arm.gov/sites/lamflawr](http://www.arm.gov/sites/lamflawr)

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