Atmospheric Radiation Measurement
Climate Research Facility
U.S. Department of Energy

FACT SHEET

U.S. Department of Energy
ARM Climate Research Facility Sites

Through the Atmospheric Radiation Measurement (ARM) Program, the U.S. Department of Energy (DOE) establishes and operates three world-class field research sites and one mobile facility to study the effects of clouds on global climate change. Each site has been heavily instrumented to gather massive amounts of climate data. Using these data, scientists are studying the effects and interactions of sunlight, radiant energy, and clouds to understand their impact on temperatures, weather, and climate.

To provide more research capability for the global scientific community, ARM's field research sites have been designated a national user facility and are now being made available for use by scientists worldwide through the ARM Climate Research Facility (ACRF). ARM's climate research sites serve as a national scientific user facility for collaborative research primarily with university, government agency, and national laboratory researchers. These sites provide significant research capability for the global scientific community.

Southern Great Plains

The Southern Great Plains (SGP) site was the first field measurement site established in 1992. Establishment of this site began the data flow for a research effort designed to improve the performance of the atmospheric global climate models used for climate research by dramatically improving the representation of radiative and cloud processes in these large numerical models.

The SGP field measurement site is a series of in situ and remote-sensing instrument clusters arrayed across approximately 143,000 square kilometers (55,000 square miles) of north-central Oklahoma and south-central Kansas. The site is similar in size to a grid cell in a global climate model. The SGP site has a highly instrumented Central Facility near Lamont, Oklahoma, and smaller facilities scattered over the site.

The ARM SGP site is the largest and most extensive climate research field site in the world and can be viewed as a real "laboratory-without-walls." In 2003, the site hosted a large field campaign sponsored by NASA, to study water vapor in the upper troposphere. The goal of this campaign was to evaluate the accuracy of observations from a wide variety of water vapor sensors to provide a well-characterized water vapor profile for the atmospheric infrared sounder (AIRS). Field campaigns at the site have helped new advanced remote sensors, such as high-resolution spectral radiometers, lidar, and radar.

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North Slope of Alaska

The ARM Program established the North Slope of Alaska (NSA) locale to provide data about cloud and radiative processes at high latitudes and in cold environments. It is widely believed that the polar regions will be more affected by changing climate associated with global warming than other areas of the globe. The NSA locale is centered at Barrow with another site located to the south at Atqasuk.

In implementing its NSA activity, ARM took advantage of an early opportunity. The Surface Heat Budget of the Arctic (SHEBA), a multi-agency initiative led by the National Science Foundation, established an ice station around a "frozen-in" icebreaker in the fall of 1997. SHEBA successfully completed a one-year drift experiment in 1998. SHEBA provided a wealth of data on atmospheric, ice, and ocean conditions, and provided ARM with first-hand experience in acquiring data successfully under arctic winter conditions.

Implementation of the NSA land site at Barrow actually began in the spring of 1997, in part to ensure complementary measurements to those being acquired by SHEBA during the latter part of that experiment. The Atqasuk site was established in 1999 with the basic set of instruments returning from SHEBA and remains a site with a more limited suite of instruments. Additional instrument sites are anticipated as required for specific measurement efforts.

Tropical Western Pacific

The ARM Program established the Tropical Western Pacific (TWP) locale to obtain data to better understand phenomena such as the El Niño/Southern Oscillation. Information collected at the site will help scientists understand the role of the tropics in modulating or controlling significant aspects of the global climate and improve models that predict global climate change.

Three instrument sites operate in the TWP. The first site was installed at Manus Island in Papua New Guinea in 1996. It is operated in collaboration with the Papua New Guinea National Weather Service. Nauru hosts the second site, which is operated with the cooperation of the Nauru Department of Island Development and Industry. A third site at Darwin, Australia, is operated in partnership with the Australian Bureau of Meteorology.

ARM Mobile Facility

In addition to these fixed sites, the ARM Mobile Facility (AMF) is a new capability that was initially deployed in 2005. The AMF provides a flexible instrument platform for conducting atmosphere experiments lasting up to a year in any environment, from the cold of the Arctic to the heat of the tropics. The AMF is portable and allows the program to extend its capabilities to different climatic regimes around the globe.

The AMF consists of large shipping containers, a basline suite of instruments, data communications, and data systems, the AMF is easily transported. An experienced two-person team is deployed with the facility to set up and maintain the shelters and instruments.

The purpose of the AMF is to collect essential information about cloudy and clear atmospheres in under-sampled climatically important regions. The AMF will produce datasets for use by the atmospheric community to test and improve parameterizations in global climate models. The AMF is designed to collaborate with experiments (especially those involving aircraft) from other agencies.

Point Reyes is the location of the first deployment of the AMF. The ARM Program is collaborating with the U.S. Office of Naval Research and DOE's Aerosol Science Program in the Marine Stratus, Radiation, Aerosol, and Drizzle project. Their objectives are to collect data from cloud/aerosol interactions and to improve understanding of cloud organization that is often associated with patches of drizzle.

For more information, contact:

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