

# ARM

CLIMATE RESEARCH FACILITY

## FACT SHEET



# U.S. Department of Energy Southern Great Plains

The Southern Great Plains (SGP) site near Lamont, Oklahoma, is the world's largest and most extensive climate research facility. SGP data are providing details about cloud, aerosol, and atmospheric processes that have never before been available for computer models that simulate Earth's climate. Scientists use these data to dramatically improve the representation of radiative and cloud processes in global climate models. Being able to understand and accurately predict these kinds of fundamental, yet complex, atmospheric processes is critical to the nation's ability to address current and future energy and environmental challenges.

With substantial measurement capabilities, the SGP is the premier research site of the Atmospheric Radiation Measurement (ARM) Climate Research Facility, funded by the U.S. Department of Energy's Office of Science. It is about to become even more powerful.

The SGP is one of two ARM measurement sites being reconfigured to meet next-generation science questions about the complex interactions among atmospheric circulations, thermodynamics, aerosols, clouds, and the land surface. Changes underway to create "megsites" will result in even more comprehensive scientific data and the processes and tools for scientists to more easily integrate them into climate models.

### Laboratory Without Walls

When data collection began in the spring of 1992, the SGP became ARM's first field measurement site. Today, the SGP provides data from more than 50 instruments over 25 locations covering over 35,000 square miles (90,000 square kilometers) and can be viewed as a real "laboratory without walls."

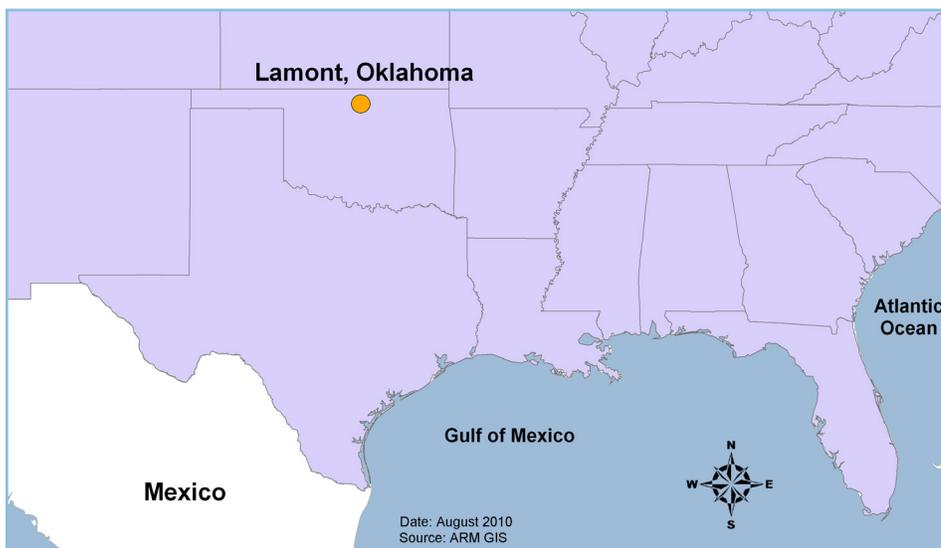
The heart of the SGP is the heavily instrumented Central Facility, located on 160 acres of cattle pasture and cultivated land. Scientists and technicians collect and monitor data from Central Facility instruments, as well as from the smaller, unstaffed "extended" facilities throughout the site. The Central Facility also hosts an instrument calibration center and a guest instrument facility.

Data collected routinely throughout the SGP are supplemented by temporary field research campaigns designed to address specific science questions. Both routine and field campaign data are transmitted to the ARM Data Archive and are made available at no cost to the global scientific community.

### Diverse Applications

The SGP is an exceptional research site because it has a fairly uniform geography and experiences widely varying atmospheric, aerosol, and cloud conditions and strong seasonal temperature and humidity changes. As a result, the collected data support a large range of scientific investigation.

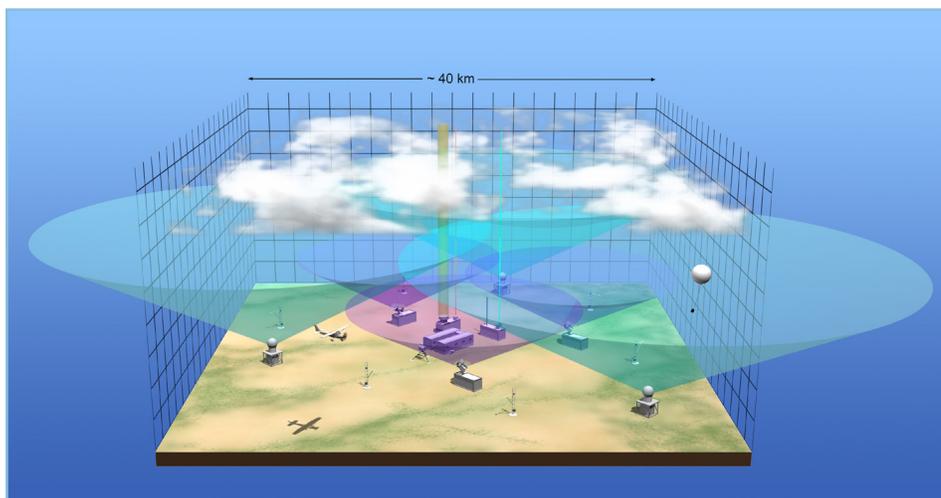
For instance, the field campaign Midlatitude Continental Convective Clouds Experiment (MC3E) used the comprehensive array of ground-based instruments at the SGP and two instrumented aircraft over a two-month period to gather an important data set for studying convective cloud systems. A smaller example of a field campaign is the Lower Atmospheric Boundary Layer Experiment, which used only four instruments at the SGP to characterize different vertical turbulence profiles in the air layer near the ground at various locations at the site—an important process that is parameterized, or simplified, in most atmospheric numerical models.



As part of its reconfiguration, ARM is expanding the measurement capabilities at the SGP and its Alaska sites in Barrow and Oliktok Point and is developing processes to use these new data to constrain a Large-Eddy Simulation (LES) model, a mathematical model for turbulence used to simulate atmospheric air currents and cloud processes. High-resolution model simulations will be run on a routine basis, and combined with the detailed ARM observations to provide powerful new research capabilities.

## Instrumentation and Data

Baseline instrumentation at SGP consists of about three dozen different instruments, including radiometers, radars, lidars, surface meteorological instrumentation, aerosol instrumentation, a total sky imager, a ceilometer, and radiosondes. These instruments automatically collect data on atmospheric properties and the land surface. Airborne carbon measurements are gathered during research campaigns on a regular basis over the SGP.



This illustration depicts the new megasite, incorporating a network of instruments to support model development and evaluation.

As part of the expansion to a megasite, SGP instrument additions include multiple scanning cloud radars to provide extraordinary 4-dimensional information on the life cycle of clouds, and in situ and profiling instruments to provide horizontal boundary constraints for the LES model. These enhancements will permit the most detailed documentation of cloud characteristics and their time evolution ever obtained anywhere in the world.

## New Megsites

To develop its first megasite, ARM is moving instrumentation from its now-closed Tropical Western Pacific site to the SGP. By consolidating these measurement capabilities, the ARM Facility is effectively moving from a vertical column of measurements to multi-dimensional measurements that provide a 4-dimensional view of the atmosphere in a defined space. In combination with the LES, these “data cubes” will create a powerful new capability for furthering the ARM mission.

## Additional Information

- For general information on the SGP [www.arm.gov/sites/sgp](http://www.arm.gov/sites/sgp)
- To access data gathered during normal operations or field campaigns through the ARM Data Archive [www.archive.arm.gov](http://www.archive.arm.gov)
- To propose and conduct a field campaign [www.arm.gov/campaigns/propose](http://www.arm.gov/campaigns/propose)
- To take a virtual tour of the SGP site [www.arm.gov/tour/southern-great-plains.html](http://www.arm.gov/tour/southern-great-plains.html)

For more information, contact:

**Nicki Hickmon**  
SGP Facility Manager  
Argonne National Laboratory  
nhickmon@anl.gov

**Sally McFarlane**  
DOE Program Manager  
ARM Climate Research Facility  
sally.mcfarlane@science.doe.gov