

# ARM

CLIMATE RESEARCH FACILITY

## FACT SHEET



# U.S. Department of Energy Southern Great Plains

The Southern Great Plains (SGP) was the first field measurement site established by the Atmospheric Radiation Measurement (ARM) Climate Research Facility and is the world's largest and most extensive climate research field site. Deployment of the first instrumentation to the SGP site occurred in the spring of 1992, and the site was dedicated in November of that year. Data collected at this site have led to significant improvements in climate models, especially the relationship of the surface radiation budget to cloud properties.

## Laboratory Without Walls

The SGP field measurement site consists of a series of in situ and remote sensing instrument clusters arrayed in a 150 x 150-km square of north-central Oklahoma and south-central Kansas. The site is similar in size to a grid cell in a global climate model. The broad range of climate conditions at SGP, coupled with the extensive instrumentation, provides scientists with the opportunity to study meteorological conditions ranging from hot, humid summers dominated by convective clouds to cold winters with stratus clouds and synoptic-scale storm systems.

The SGP location was chosen for several reasons:

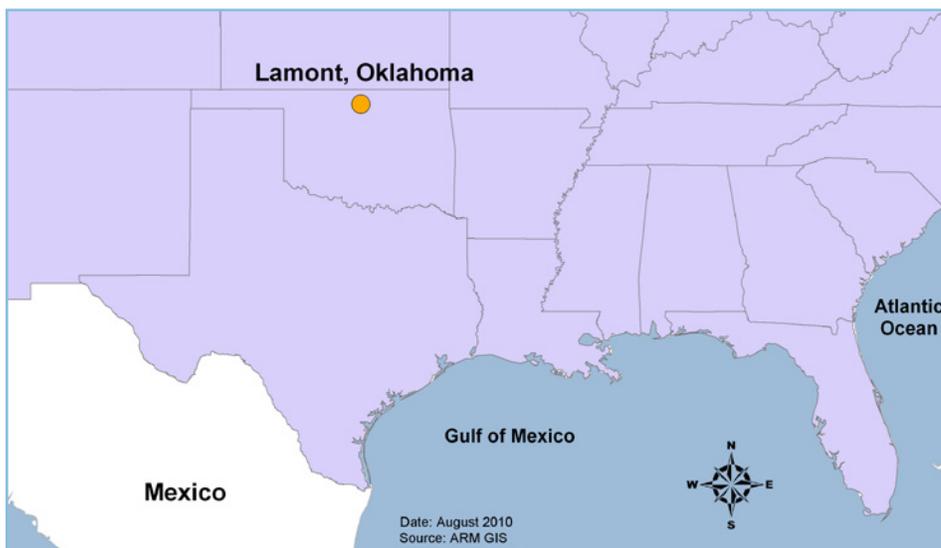
- a relatively homogeneous geography and easy accessibility
- a wide variability of climate cloud type and surface flux properties
- a large seasonal variation in temperature and specific humidity
- a large network of weather and climate research instrumentation
- the best opportunity for synergistic/cooperative activity with many other federal and state climate research programs.

The heart of the SGP site is the heavily instrumented Central Facility, located on 160 acres of cattle pasture and wheat fields southeast of Lamont, Oklahoma. In addition to numerous instrument systems, the Central Facility hosts an instrument calibration center and a guest instrument facility.

Additional “satellite” facilities throughout the site's domain host instruments such as radars, surface flux measurement systems, and radiometers. The locations for these instrument clusters were chosen so that the measurements reflect conditions over the typical distribution of land uses within the site.

Routine data collected throughout the site are supplemented by periodic field campaigns designed to address specific science questions. Both routine and field campaign data are transmitted to the ARM Data Archive and made available to the global scientific community.

Airborne carbon measurements are gathered on a weekly basis over the SGP site. These routine vertical profiles provide data for quantifying regional carbon exchange and tracing the balance between anthropogenic (human-produced) emissions and biogeochemical cycling, which are identified as priorities by the U.S. Climate Change Research Program and the North American Carbon Program.



## Instrumentation and Data

Scientists and researchers use data gathered at SGP to improve the performance of atmospheric global climate models used for climate research by dramatically improving the representation of radiative and cloud processes in these large numerical models. Baseline instrumentation at SGP consists of about two dozen different instruments, including radiometers, radars, a micropulse lidar, surface meteorological instrumentation, a total sky imager, a ceilometer, and radiosondes.

Through the American Recovery and Reinvestment Act of 2009, ARM received funds to purchase new instruments and upgrade existing instruments at all its sites, including SGP. The addition of new

scanning precipitation and cloud radars, as well as substantial upgrades to several existing instruments, was made possible by Recovery Act funding. These enhancements will permit the most detailed documentation of cloud characteristics and their time evolution ever obtained anywhere in the world.

New capabilities at SGP include:

- Five new scanning cloud and precipitation radars that provide three-dimensional information about cloud properties, including reflectivity and precipitation
- Doppler lidar
- Two shortwave array spectroradiometers—one zenith-pointing and one hemispheric.



Developed for ARM as the first turn-key operational Raman lidar in the world, the original ARM Raman lidar has operated nearly autonomously at the SGP site since 1996. Recovery Act upgrades include a new laser system, a new beam-expanding telescope for the transmitted beam, and updating the computer operating system and the lidar control software.

Other replaced or upgraded instruments include:

- Ceilometer
- Raman lidar
- Micropulse lidar
- Atmospherically emitted radiance interferometer (AERI)
- Millimeter wavelength cloud radar (now called the Ka-band ARM zenith radar, or KAZR).

For more information about Recovery Act activities at SGP, visit <http://www.arm.gov/about/recovery-act>.

## User Information

There are a number of ways that researchers can use SGP's facilities and data.

- Access data gathered during normal operations or field campaigns through the ARM Data Archive (<http://www.archive.arm.gov/>)
- Propose and conduct a field campaign (<http://www.arm.gov/campaigns/propose>)
- Make an in-person or virtual visit to the SGP site (<http://www.arm.gov/sites/sgp/visit>).

For more information, contact:

<http://www.arm.gov/sites/sgp>

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