

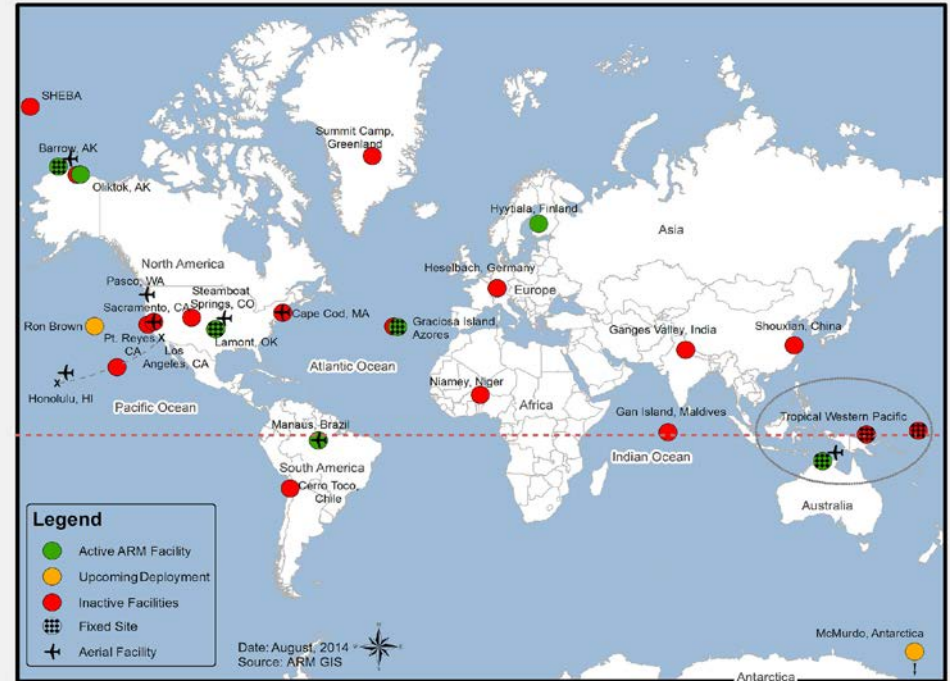
## Mission

The ARM Climate Research Facility, a DOE scientific user facility, provides the climate research community with strategically located in situ and remote sensing observatories **designed to improve the understanding and representation**, in climate and earth system models, **of clouds and aerosols** as well as their interactions and coupling with the Earth's surface.

## Vision

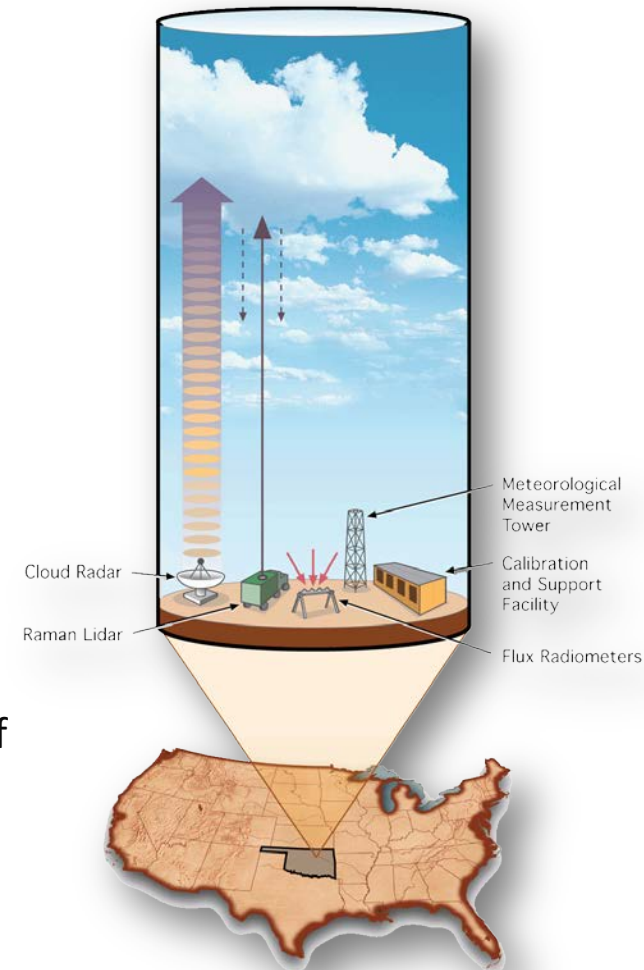
To provide a detailed and accurate description of the earth atmosphere in diverse climate regimes to resolve the uncertainties in climate and earth system models toward the development of sustainable solutions for the Nation's energy and environmental challenges.

**Doug Sisterson**  
([dlsisterson@anl.gov](mailto:dlsisterson@anl.gov))  
**ARM Instruments Operation Manager**  
**Environmental Science Division**  
**Argonne National Laboratory**



# The SGP: Still the Flagship for ARM

- SGP site: first field measurement site established by DOE's ARM Program – 1992
- Largest site: *in situ* and remote-sensing instrument clusters arrayed across approximately originally 90,000 square kilometers in north-central Oklahoma and south-central Kansas
- Flagship of the ARM facility fixed sites
- Most extensive single climate research field site in the world
- Heart of the SGP site: most heavily instrumented central facility, on 160 acres southeast of Lamont, Oklahoma
- Subcontracted staff of 30 technicians ensure the operation, calibration, and maintenance of instruments and collection of data from the central facility instruments and from smaller, unstaffed facilities throughout the site



# Southern Great Plains: Challenges and Opportunities

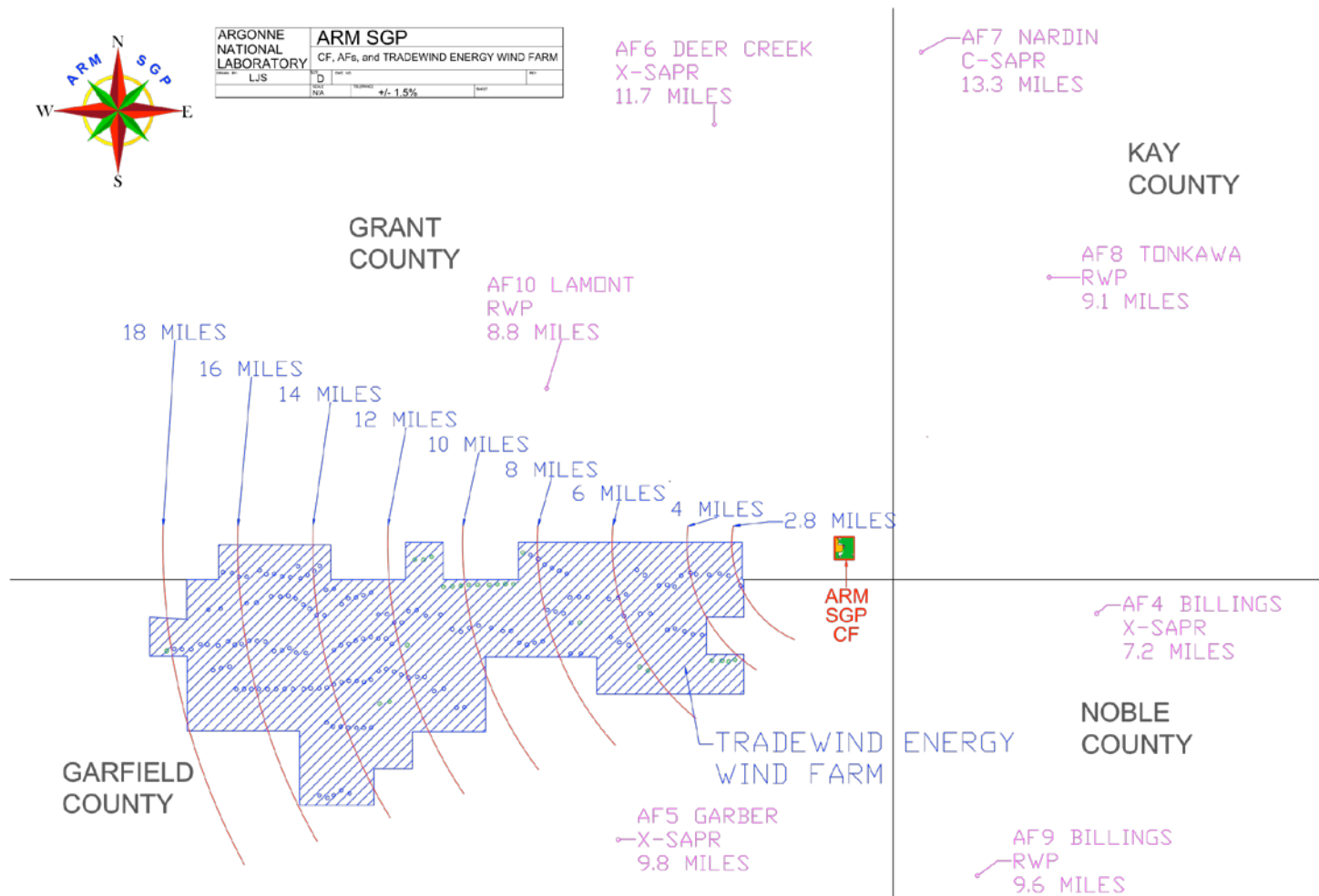
The installation of a large wind turbine farm has an impact on our radars (i.e., causes false targets that look like convective clouds).

it is also an opportunity to study the impact of large wind farms on local boundary layer meteorology.



KZAR and Ka-W SACR in the foreground, looking WSW at our new neighbors.

# Southern Great Plains: Challenges and Opportunities



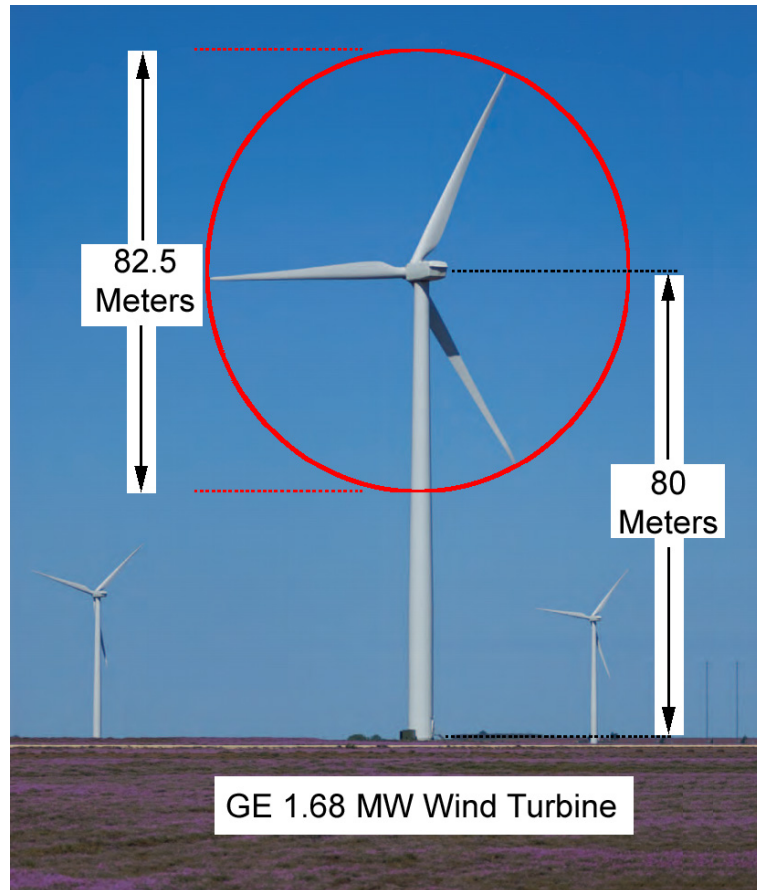
The location of the Central Facility and the 144 wind turbines. This phase is completed and a new phase is being planned.





# Southern Great Plains: Challenges and Opportunities

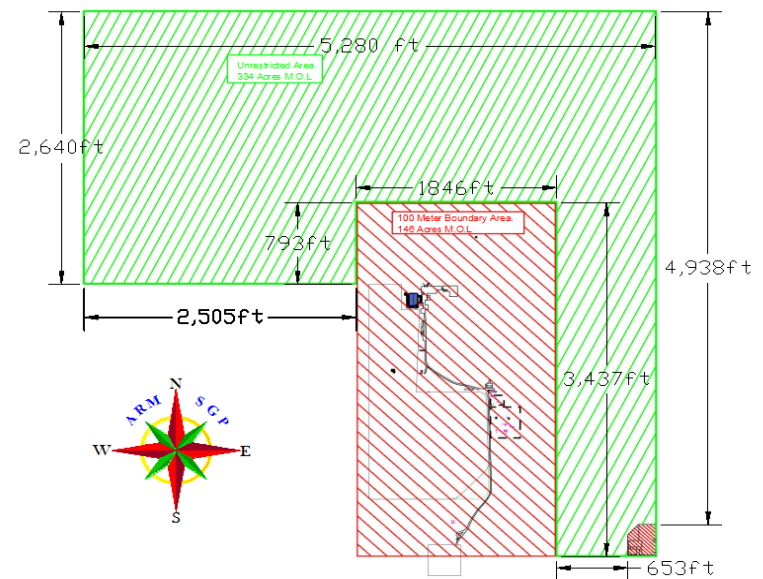
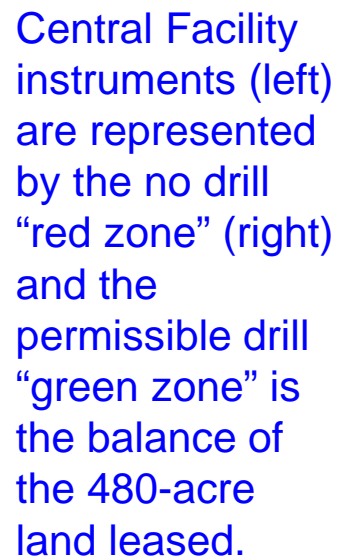
Perspective!



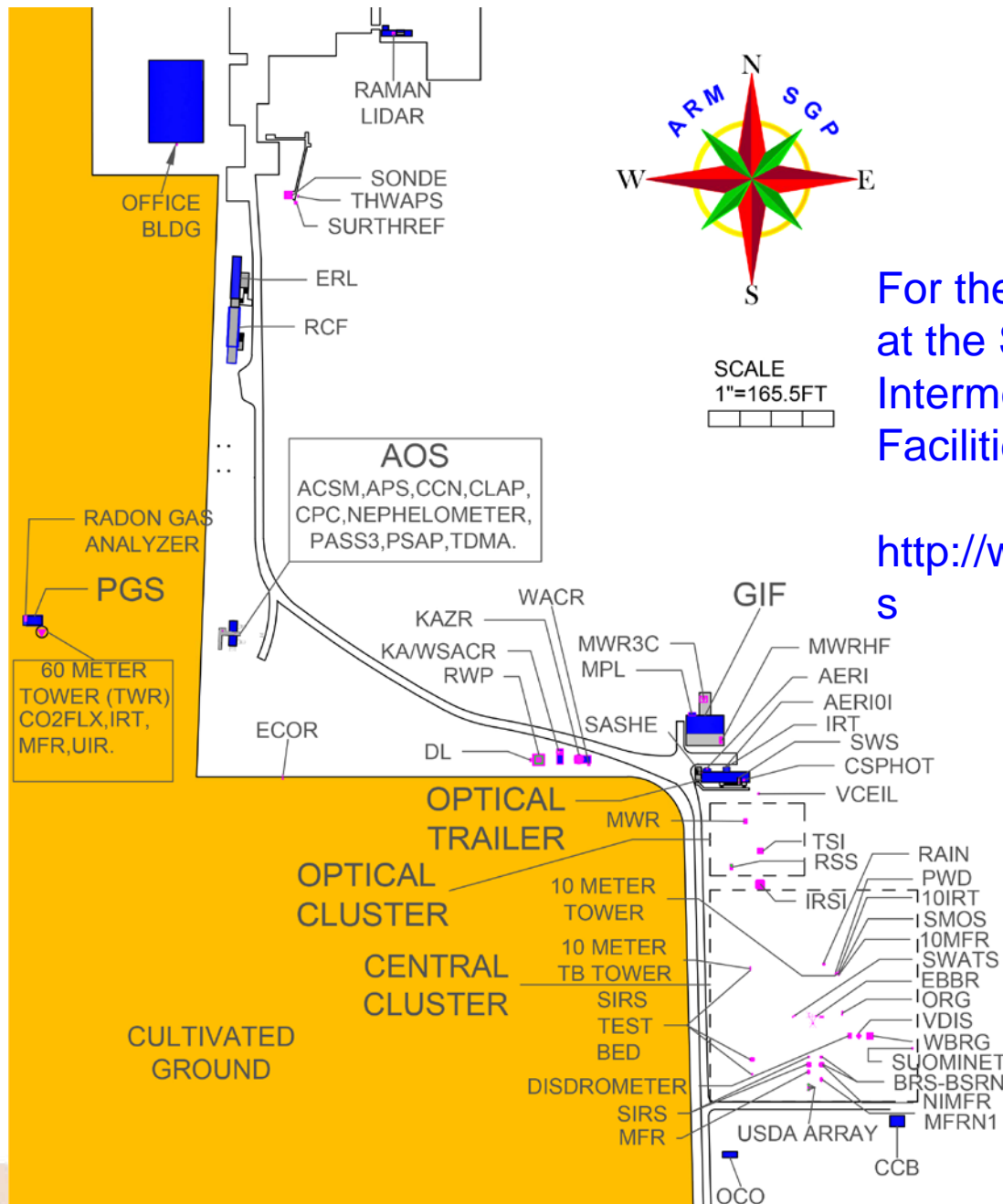
The Central Facility structures and instruments are no longer the prominent silhouette driving in on the East road!



- Oil exploration by hydraulic fracking in the area has resulted in a measurable increase to our background diesel emissions aerosol measurements.
- Completed a survey with all Instrument Mentors for the possibility of oil exploration at the Central Facility that allowed us to illustrate where hydraulic fracking would be permissible with minimum impact.
- Have an agreement with the land owner – with regard to mineral rights.
- And almost unimaginable increase in small earthquakes!



# The SGP Central Facility Layout

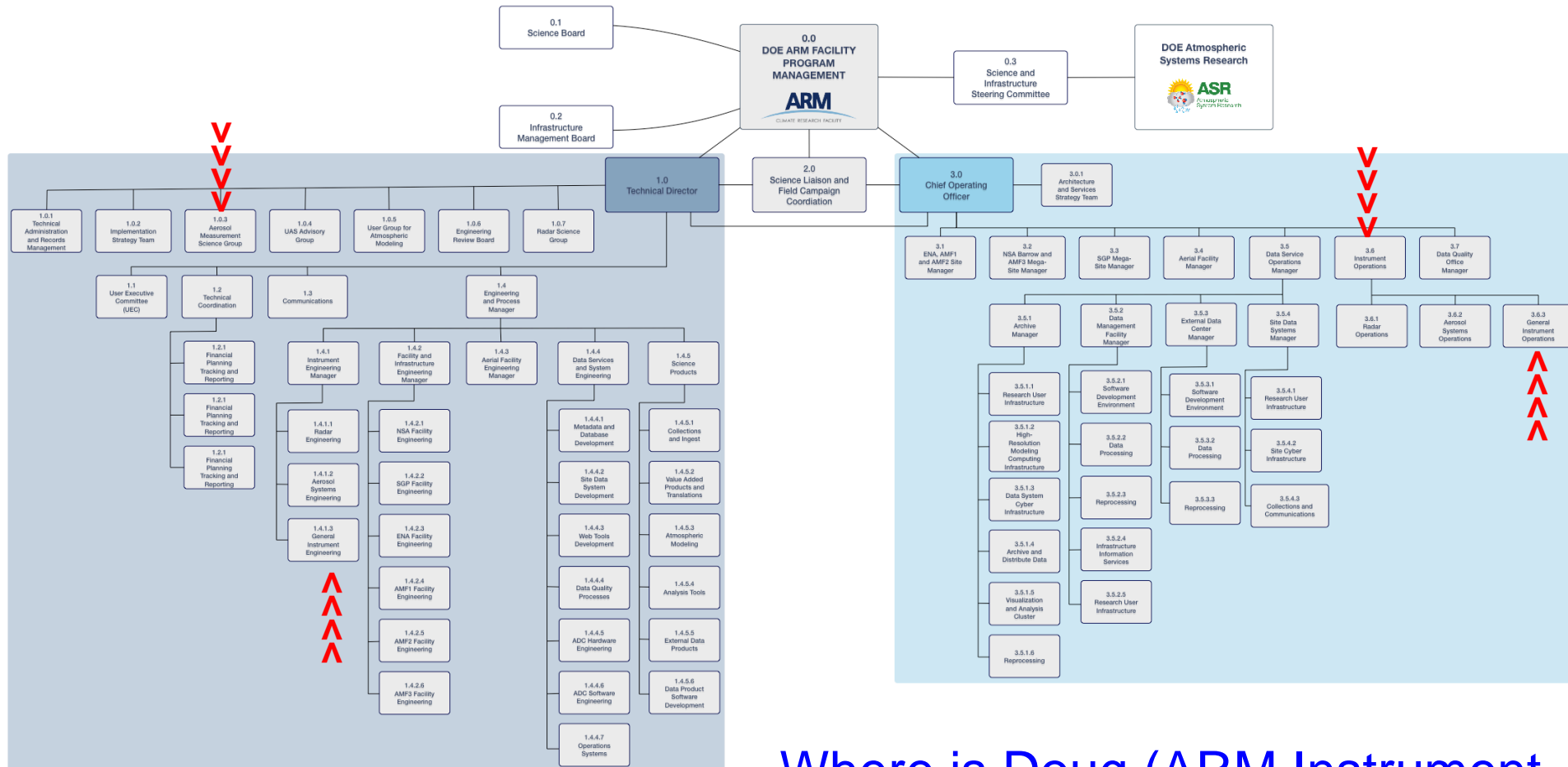


For the most current list of instruments at the SGP Central Facility, Intermediate Facilities, and Extended Facilities, please go to:

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



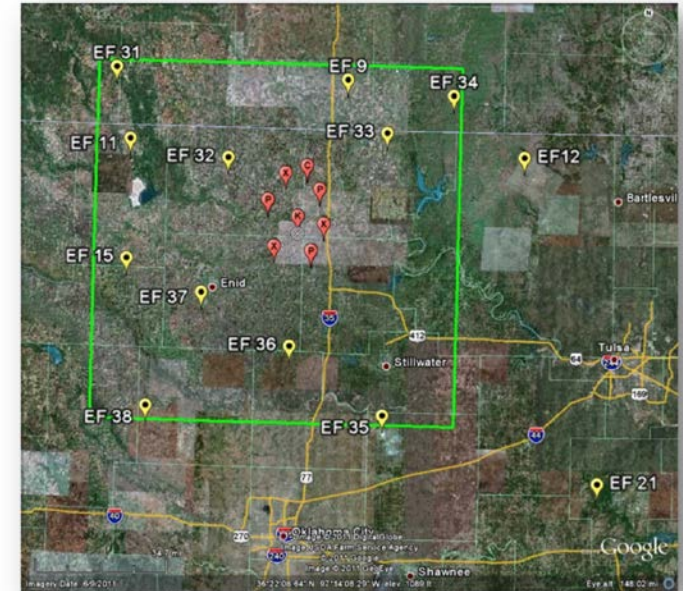
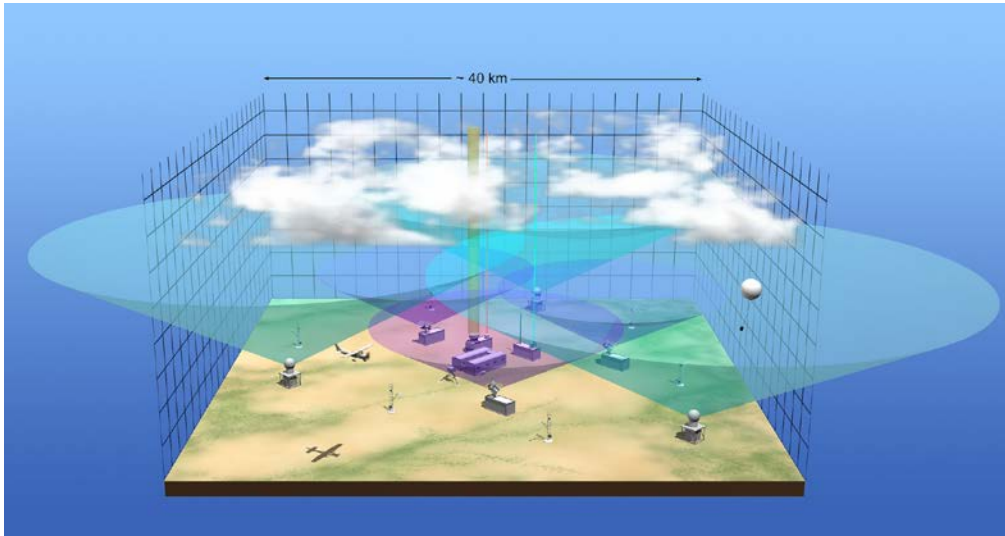
# ARM Climate Research Facility Organization Chart



Where is Doug (ARM Instrument Operations Manager)?



# The ARM Future -2016 and Beyond



## Illustration of the SGP Site

The ARM Facility is now embarking on a reconfiguration strategy for even better observations of atmospheric processes to constrain high-resolution process models. Key elements of the new strategy include the creation of two "super sites" in the United States.

**Southern Great Plains** – measurements at the SGP Site will be augmented to include additional scanning and profiling remote sensors and more detailed measurements of the land-atmosphere interface that support high resolution climate modeling.

**North Slope of Alaska** – aerial operations will link the measurements from Barrow and Oliktok, and unmanned aerial systems will provide additional spatial information around Oliktok.



# LES ARM Symbiotic Simulation and Observation (LASSO)

Lead PI's:

Andy Vogelmann, Brookhaven National Laboratory

William Gustafson, Pacific Northwest National Laboratory

LASSO Webpage:

<http://www.arm.gov/science/themes/lasso>

LASSO e-mail list sign up:

<http://eepurl.com/bCS8s5>



# LES ARM Symbiotic Simulation and Observation (LASSO)

## Goal of routine LES modeling at the ARM sites

- **Add value to ARM observations by using LES modeling** to provide context and a self-consistent representation of the atmosphere that connects processes and facilitates improved understanding.
- **Produce a library of simulations** to support the statistical study of atmospheric processes and support the improvement of the parameterizations of these processes in climate models. Also serve as a proxy for the atmosphere to develop remote sensing retrievals.

## The plan

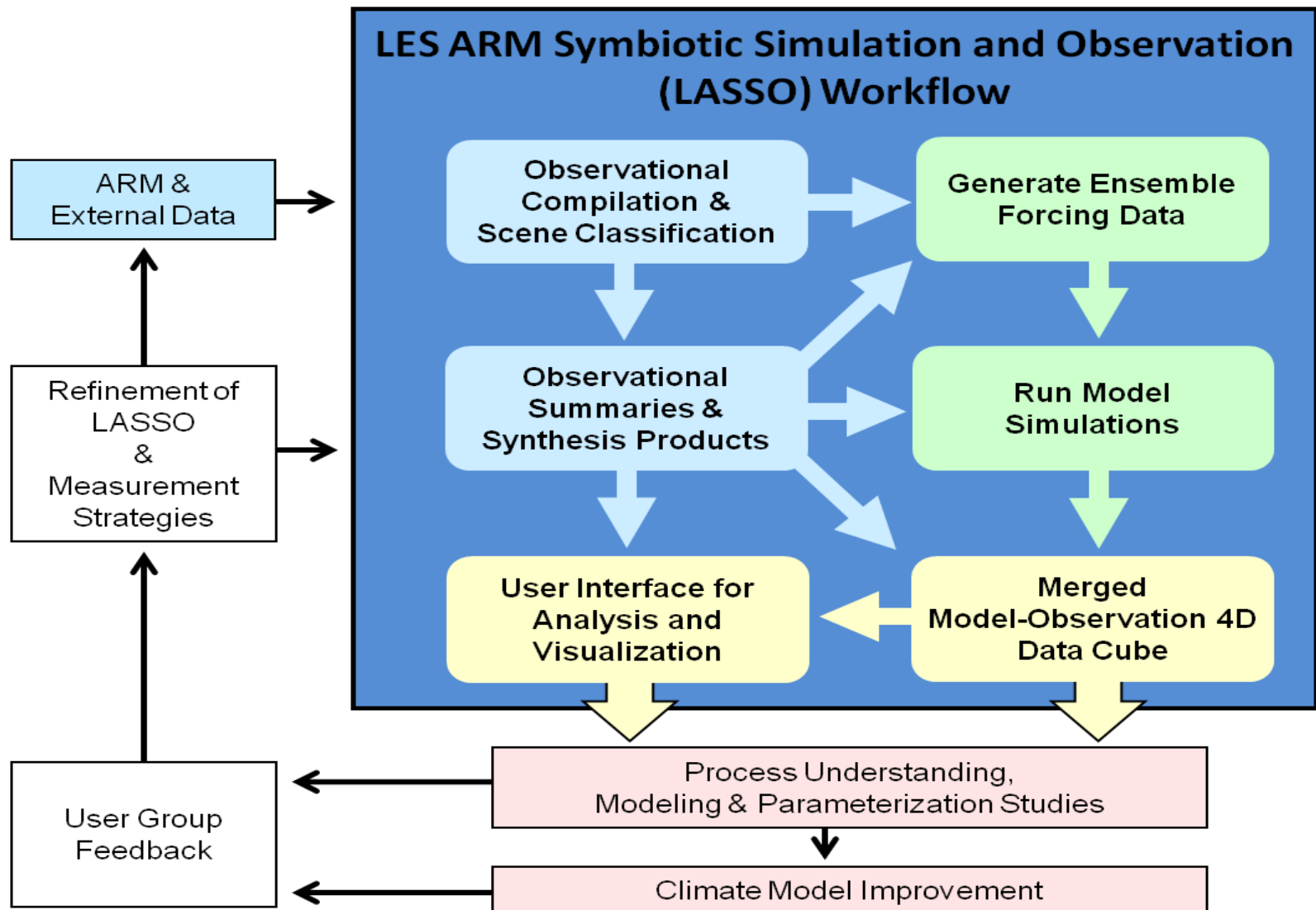
- Initial implementation **targets shallow clouds at the SGP Site**

## ARM observations integral to the effort

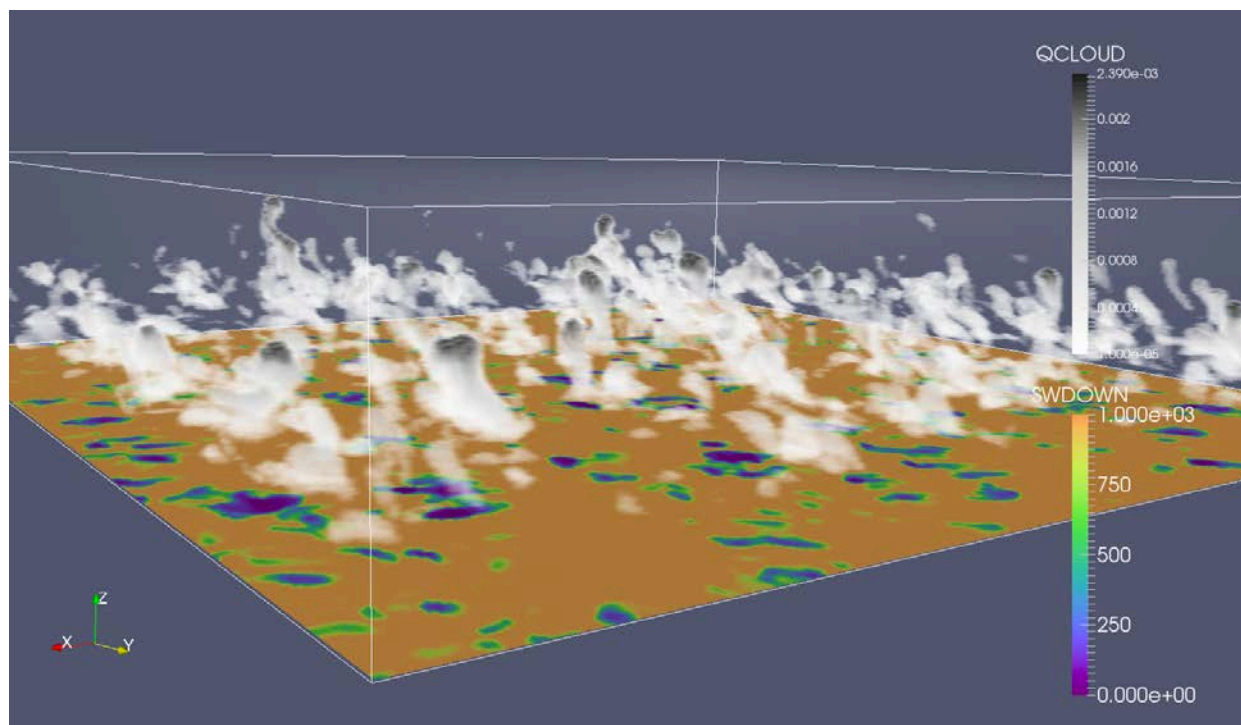
- **Model initialization and forcings**, including a data assimilation effort
- **Evaluation of simulations**
- **Generation of model-observation “data cubes”** for analysis by the community



# The LASSO Workflow



# Combining Observations and LES Model Output



A “data cube” is being developed that will combine ARM observations and high-resolution model output to provide a highly detailed description of the atmosphere in the vicinity of the SGP megasite.