ARM

CLIMATE RESEARCH FACILITY

LASSO: Progress Toward Tying LES Modeling and ARM Data Together for Climate Science

A key to creating the next-generation Atmospheric Radiation Measurement (ARM) Climate Research Facility is a pilot project tying together observational data and large-eddy simulation (LES) modeling to support the study of atmospheric processes, improvement of observational retrievals, and parameterizations of clouds, aerosols, and radiation in climate models. Approaching completion, this two-year pilot project has released an initial evaluation product and continues to refine how the modeling will be done when it goes operational in 2017.

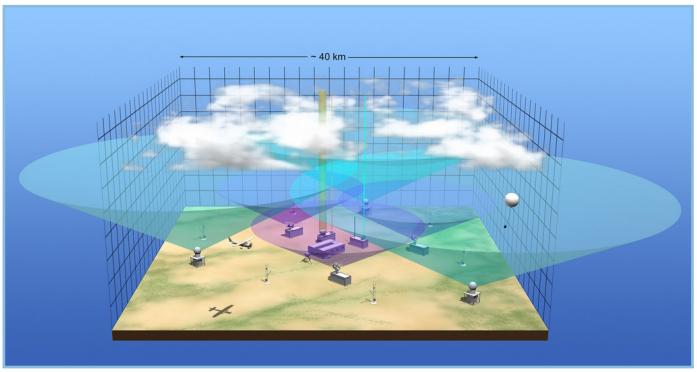
Since data collection began in 1992, ARM has been a key component of the U.S. Department of Energy's (DOE) efforts to better understand and predict Earth's climate in order to develop sustainable solutions to the nation's energy and environmental challenges. The ARM Facility is a world leader in providing unprecedented continuous observations of cloud and aerosol properties and their impacts on Earth's energy balance—data that have proved invaluable for understanding the atmosphere and improving the predictive capabilities of earth system models.

Next-generation ARM is adding new capabilities to further its mission and provide even more complete data sets. This pilot project, called LASSO—the LES ARM Symbiotic Simulation and Observation workflow—is one of those new capabilities.

LASSO is an integral part of achieving the goals in ARM's Decadal Vision to:

- Establish observation-modeling "megasites," starting with ARM's Southern Great Plains (SGP) atmospheric observatory
- Enhance ARM measurement excellence to support DOE climate science research
- Produce routine high-resolution model simulations over domains coincident with ARM sites
- Develop data products and software tools that facilitate the use of ARM data
- Strengthen interactions with the atmospheric science and modeling communities.

New profile measurements added to the Southern Great Plains observatory in May 2016 will provide more detail for constraining the LES model.



This illustration depicts the new Southern Great Plains observatory, incorporating a network of instruments to support model development and evaluation.

New Routine Modeling

LASSO is enhancing ARM observations by using LES modeling to provide context and a self-consistent representation of the atmosphere surrounding the SGP that will connect processes together and facilitate improved understanding. The project is already resulting in a library of simulations that can be used to test the accuracy of climate model parameterizations, serve as a proxy for the atmosphere to develop remote retrievals, as well as many other applications.

The LASSO data bundles combine ARM observations and high-resolution model output to provide as a description of the atmosphere in the vicinity of the SGP. Researchers can access the bundles through the Bundle Browser, which has metadata and metric search capabilities, presents modeled and observed values on a comparable grid, includes metrics and diagnostics to evaluate each case, and provides links to access the data bundle files.

LASSO Alpha 1 Release

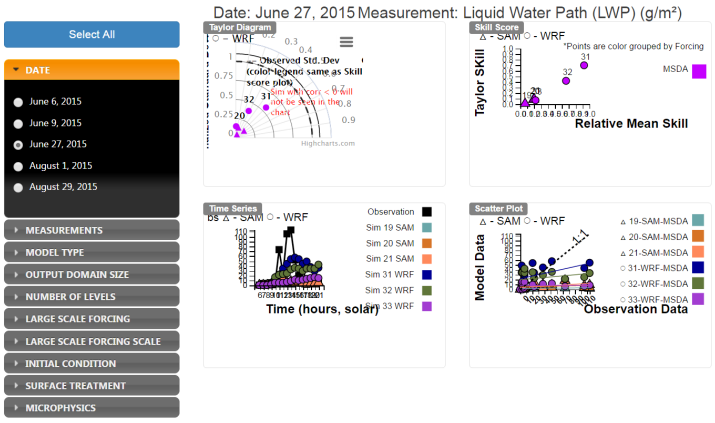
The LASSO pilot project is laying the groundwork to produce routine LES modeling at the SGP observatory, beginning in 2017. The pilot project released the Alpha 1 product that includes "data bundles," which combine ARM observations and high-resolution model output and the Bundle Browser, which is a new web interface to access the data bundles. This release is a step toward the final version that will become the routinely generated datastream. Initially targeting shallow clouds, the implementation will later expand to other phenomena and ARM locations.

These new products will evolve and be carried forward into ARM's routine high-resolution modeling capability. Combining simulations with detailed observations, the ARM Facility is providing powerful new research capabilities for climate researchers and modelers.

Researcher and Modeling Community Input

LASSO is being developed for the benefit of the atmospheric science and climate modeling communities. To ensure this DOE project meets researcher and modeler needs, community input is sought regarding its value and potential enhancements that would make LASSO more valuable to researchers.

To be included in LASSO project email updates, sign up for the LASSO information e-mail list at ***http://eepurl.com/bCS8s5***



LASSO's Bundle Browser offers scientists a new way to search for the data most relevant to their work.

Additional Information

- LASSO Alpha 1 Release
  http://www.arm.gov/science/themes/lasso/releases
- ARM Decadal Vision
  http://www.arm.gov/publications/programdocs/doe-sc-arm-14-029.pdf
- LES ARM Symbiotic Simulation and Observation (LASSO) Implementation Strategy
  http://www.arm.gov/publications/programdocs/doe-sc-arm-15-039.pdf

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