The DOE ARM LASSO Workflow: Routine LES of Continental Shallow Convection

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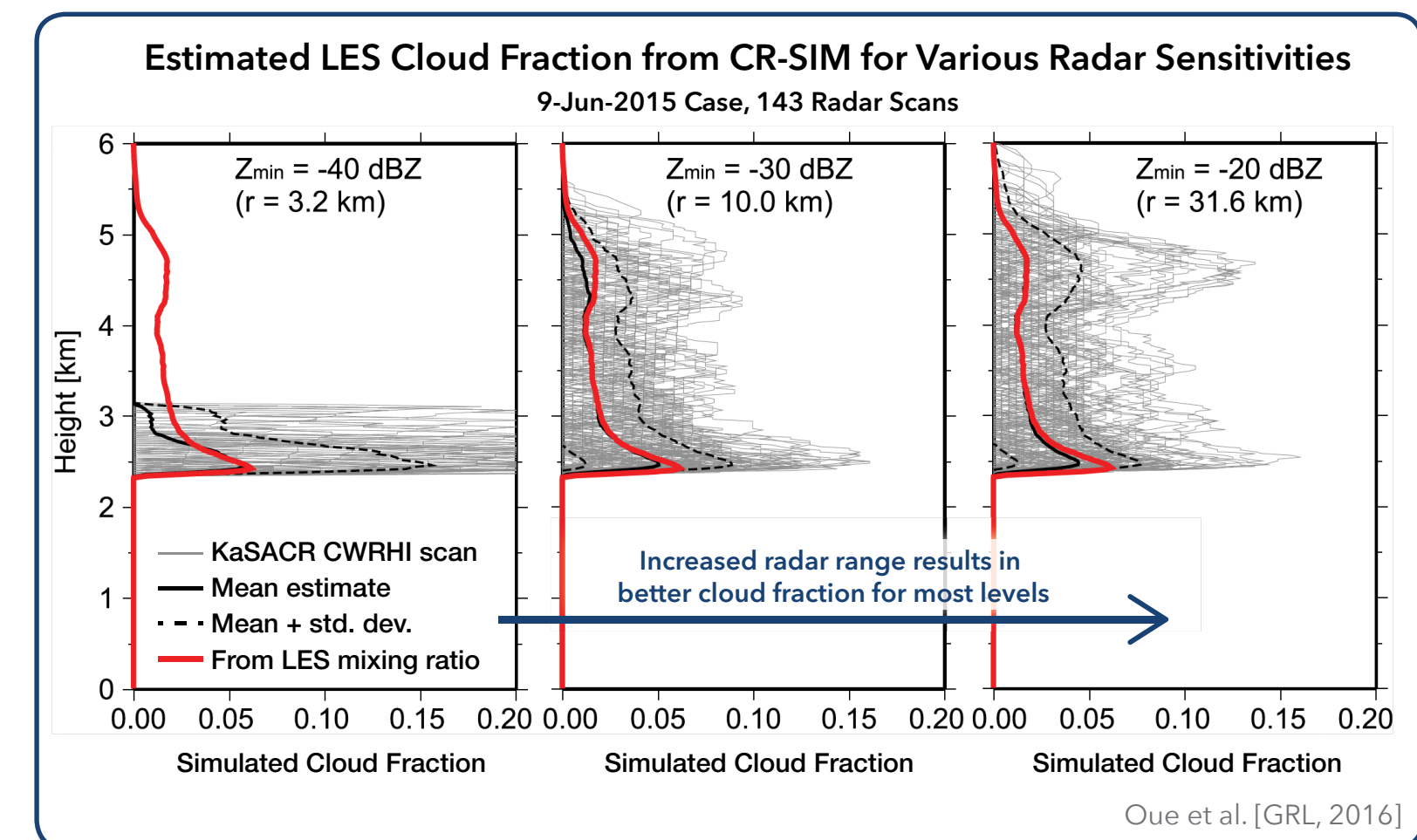**ARM** CLIMATE RESEARCH FACILITY

What is LASSO?

The Large-Eddy Simulation (LES) ARM Symbiotic Simulation and Observation (LASSO) workflow generates routine LES simulations of shallow convection over the Southern Great Plains region in Oklahoma. The simulations are coupled with ARM observations, diagnostics, and skill scores to form a library of data bundles to quicken scientific discovery.
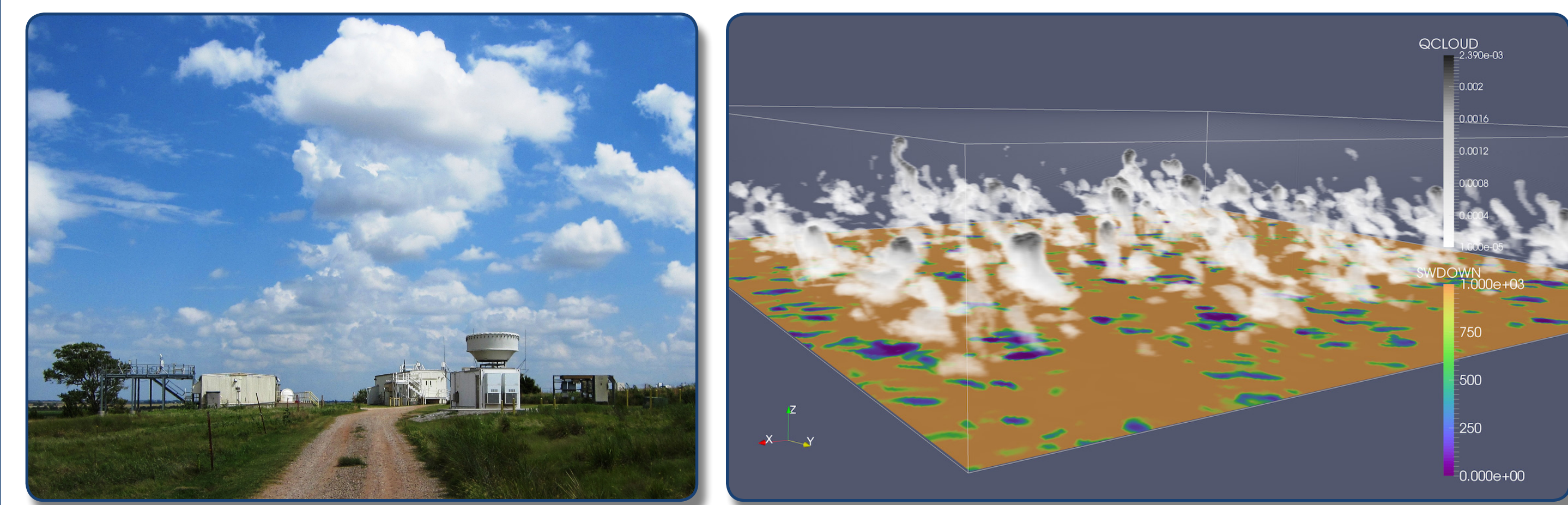
LASSO Benefits Many Research Areas

As an observationalist

» Inform instrument remote sensing retrievals
» Conduct Observation System Simulation Experiments
» Test implications of scan strategies or flight paths

Estimated LES Cloud Fraction from CR-SIM for Various Radar Sensitivities
9-Jun-2015 Case, 143 Radar Scans

Oue et al. [GRL, 2016]

As a theoretician

» Get estimates of fluxes & co-variability of values
» Test relationships without having to run the model yourself

As a modeler

» Pre-evaluated forcings simplify and speed research
» Have co-registered observations at high-resolution scales
» Have inputs and corresponding outputs to test parameterizations

Currently Available Simulations

Two "alpha" releases of shallow convection simulations have been released to preview the data bundle concept.

LASSO Simulation #10, 27-Jun-2015

Links to case details and files
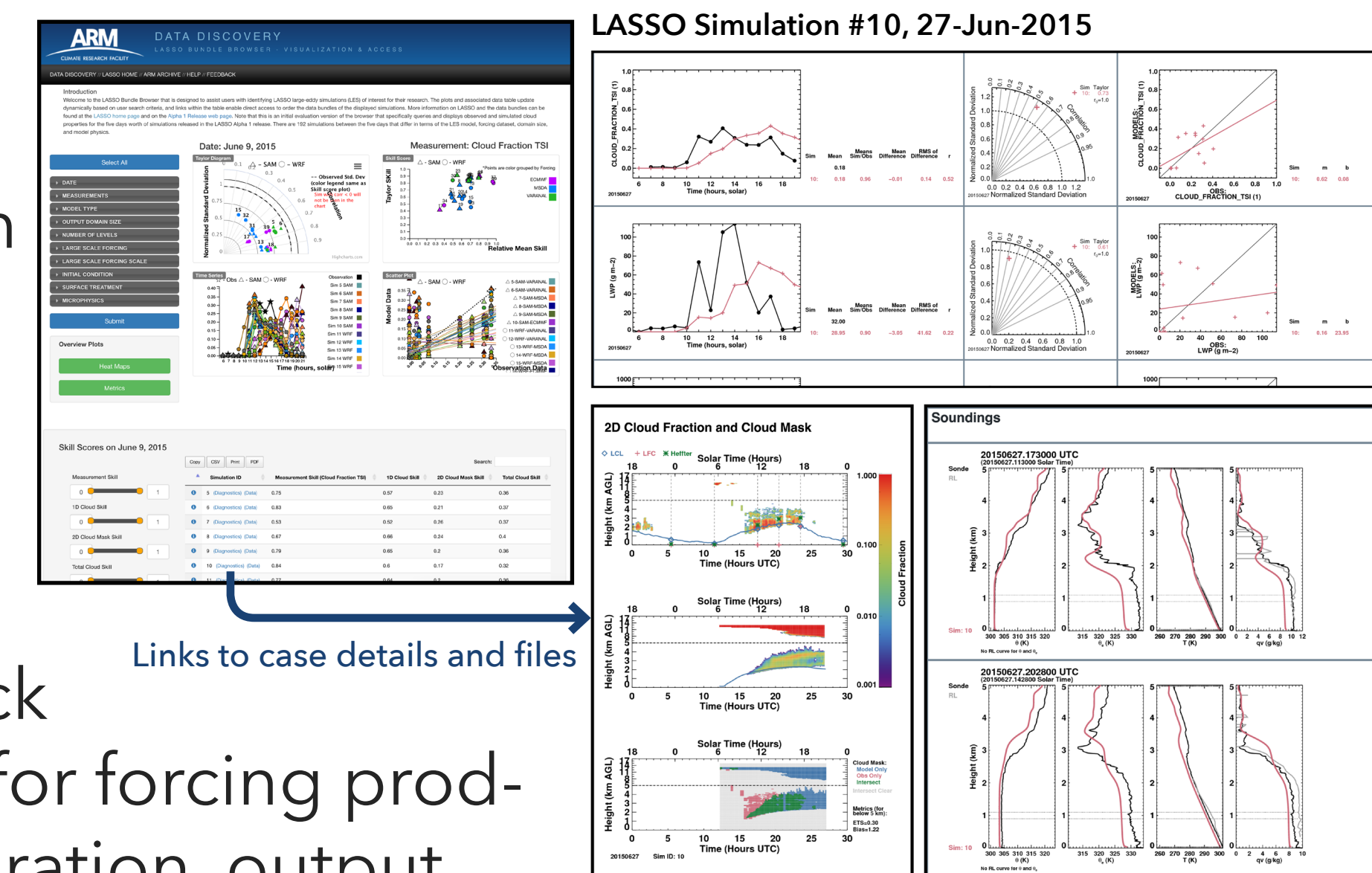
» Opportunity for community feedback regarding concept for forcing products, model configuration, output, and observation-model integration

» Use an ensemble approach based on multiple forcing data sets

Alpha 1, doi:10.5439/1256454

192 simulations spread over 5 days from 2015, compare SAM vs. WRF using three forcing styles and varied forcing scales
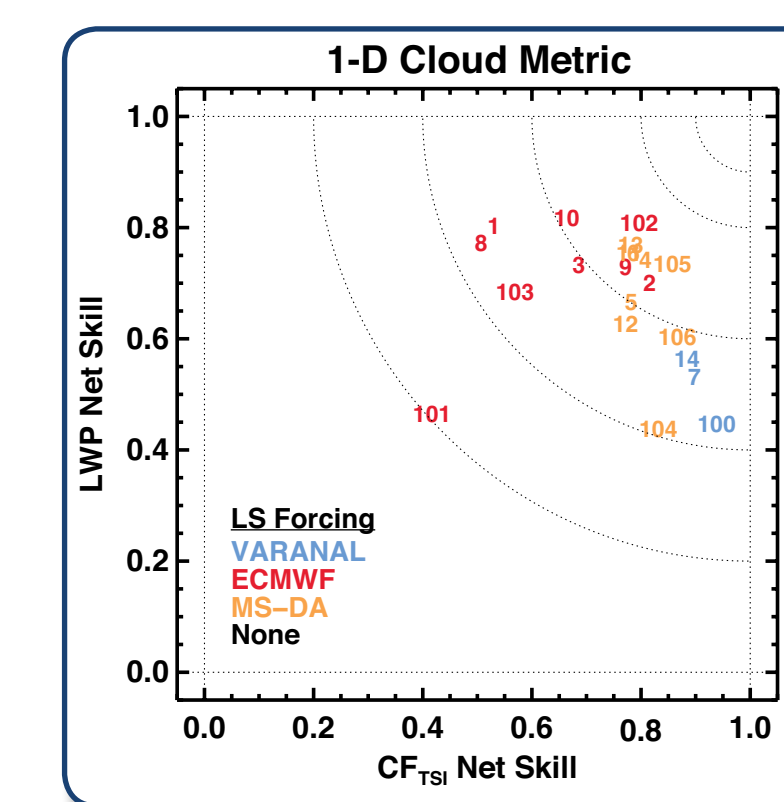
Alpha 2, doi:10.5439/1342961

544 simulations spread over 13 days from 2016, available via the Bundle Browser
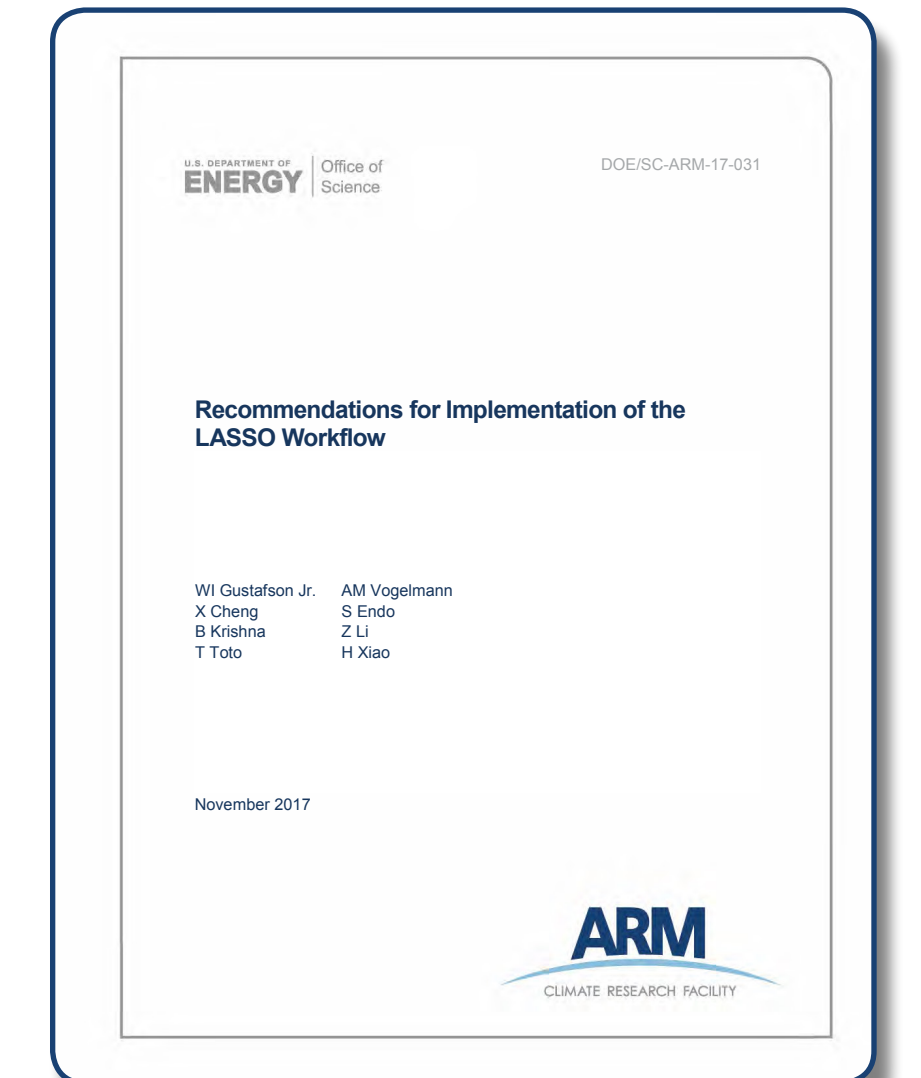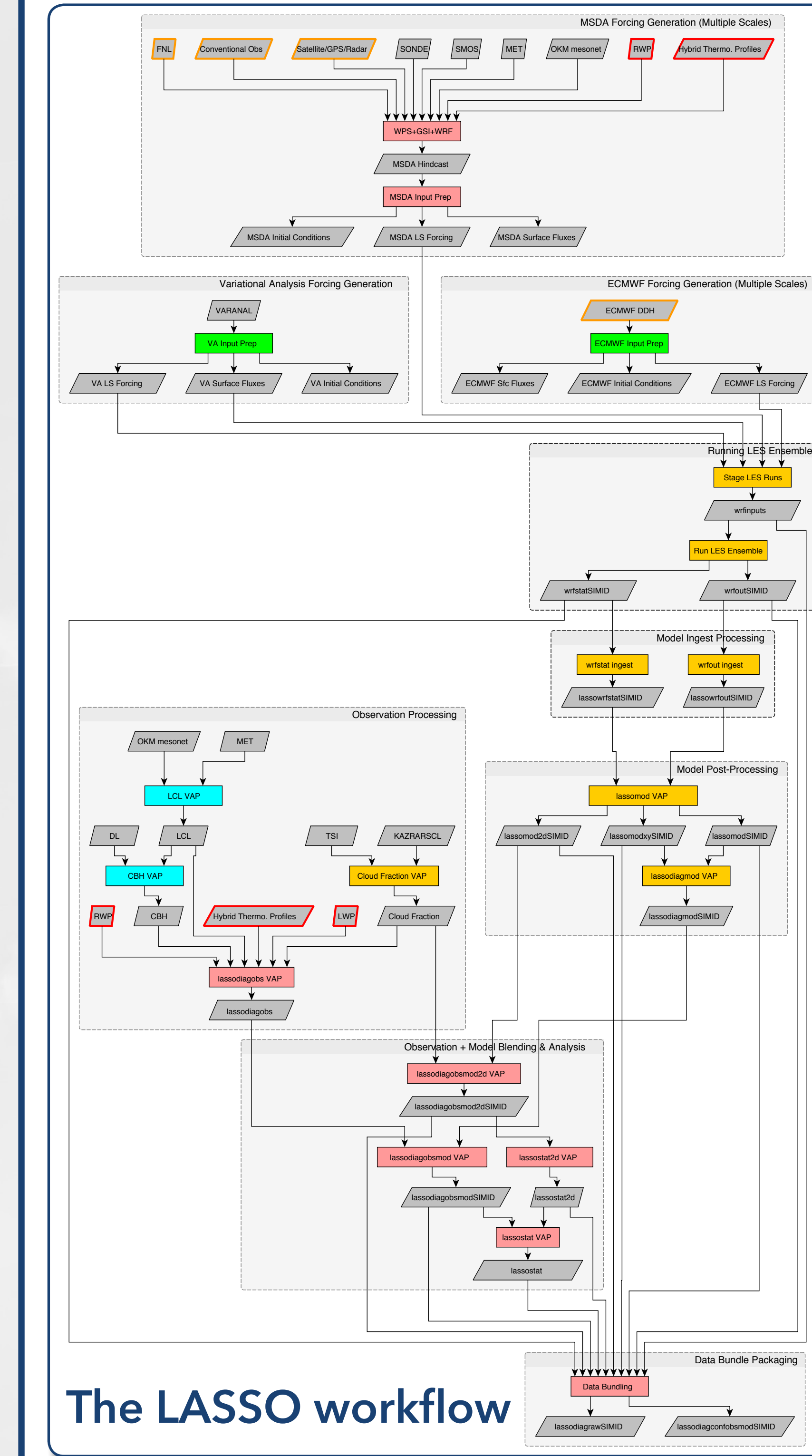
Data Bundles Provide Easy Usability

A "data bundle" is constructed for each simulation and is discoverable with the Bundle Browser. The bundles contain:

BASIC USERS
ADVANCED USERS

» Diagnostics and metrics for model evaluation
» ARM observations in a form directly comparable to the LES output
» Domain-wide and time averaged profiles for LES statistics, e.g., meteorological state, cloud fraction, variances
» Instantaneous 3-D LES output fields at regular intervals
» LES initialization and forcing data based on an ensemble of forcing sources

1-D Cloud Metric

Implementation Status

The LASSO workflow

Recommendations for Implementation of the LASSO Workflow

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November 2017

ARM

» Pilot phase completed in summer 2017
» Recommendation report released for implementation, doi:10.2172/1406259
» Work progressing to integrate LASSO into routine ARM production status
» In process of producing data bundles for 2017 cases

Expansion Planning

Planning for expansion beyond shallow convection has begun and will progress into 2019.

» Science-driven decision process: what science questions would you choose to address?
» Soliciting configuration scenarios from the community for different meteorological regimes and/or locations
» We want your input!

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