LASSO Operationalization (LASSO-O)

Tami Toto[1], Andrew Vogelmann[1], William Gustafson[2], Karen Johnson[1], Krista Gaustad[2], Brian Ermold[2], Scott E. Giangrande[1]

[1]Brookhaven National Laboratory [2] Pacific Northwest National Laboratory

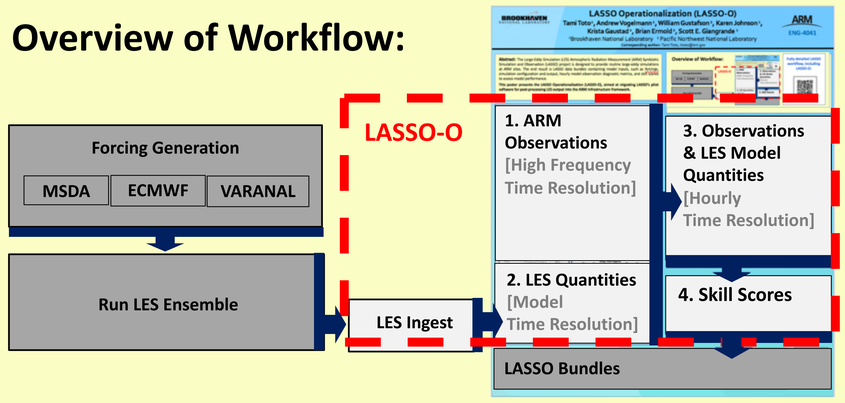
Corresponding author: Tami Toto, ttoto@bnl.gov

ENG-4041

Abstract: The Large-Eddy Simulation (LES) Atmospheric Radiation Measurement (ARM) Symbiotic Simulation and Observation (LASSO) project is designed to provide routine large-eddy simulations at ARM sites. The end result is LASSO data bundles containing model inputs, such as forcings, simulation configuration and output, hourly model-observation diagnostic metrics, and skill scores to assess model performance.

This poster presents the LASSO Operationalization (LASSO-O), aimed at migrating LASSO's pilot software for post-processing LES output into the ARM Infrastructure framework using the ARM Data Integrator (ADI).

Overview of Workflow:



Fully detailed LASSO workflow, including LASSO-O:

1. ARM Observations:

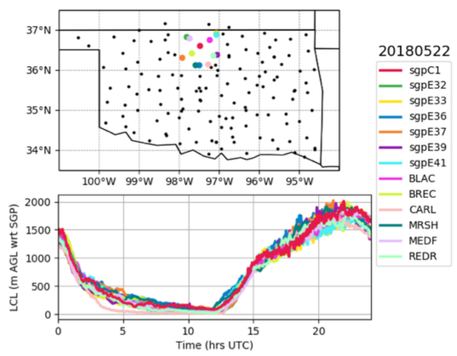
The following full-temporal-resolution observational data products are inputs to LASSO via the lassodiagobs(c1) VAP, an ARMBE-like VAP. Note the new products developed for LASSO.

Lifting Condensation Level VAP

MET & OKM MESONET –based, 1-min time resolution
Datastream: lcl.c1

New VAP

Available at ARM archive: SGP, 20170101 - 20181231

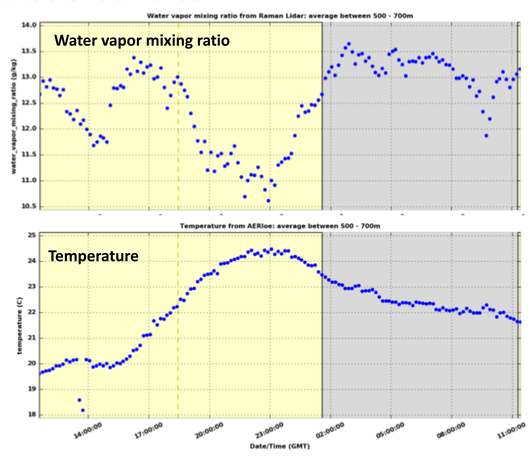


Mid-Boundary Layer Temperature & Moisture VAP

Raman Lidar & AERIoe –based, 10-min time resolution at SGP Central Facility
Datastream: lassoblthermo.c1

New Addition to LASSO Bundles

Coming soon as part of the LASSO bundles

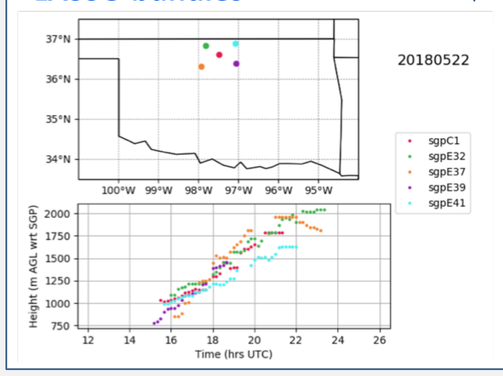


Doppler Lidar Shallow Cumulus Cloud-Base Height VAP

DL –based, 10-min time resolution
Datastream: lassodlcbhshcu.c1

New Addition to LASSO Bundles

Coming soon as part of the LASSO bundles

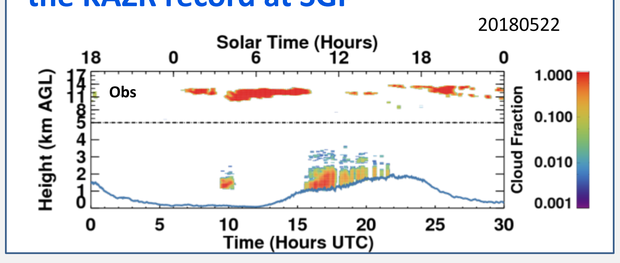


Cloud Fraction VAP

KAZR & TSI –based, 1-min frequency for 1, 5, and 15-min averaging intervals
Datastream: cldfracset.c1

New VAP

Plans are to produce VAP for the KAZR record at SGP



In addition to the new VAPs developed as part of LASSO-O, existing ARM observations used in LASSO are:

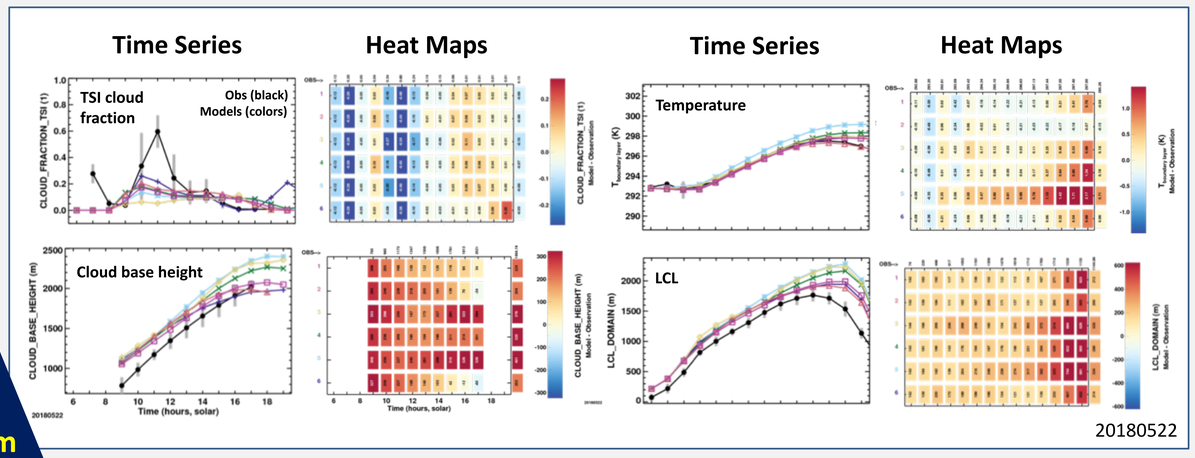
- AERIoe Thermodynamic Profile and Liquid Water Path Retrieval VAP
- MWRRET LWP
- MET surface atmospheric state

2. LES Model Observation-Comparable Quantities:

Observation-comparable quantities are computed from WRF simulation output by the lassomod(m1) VAP for eight ensemble members for each LASSO case date.

3. Diagnostics from Comparable ARM Observations & LES Model Quantities:

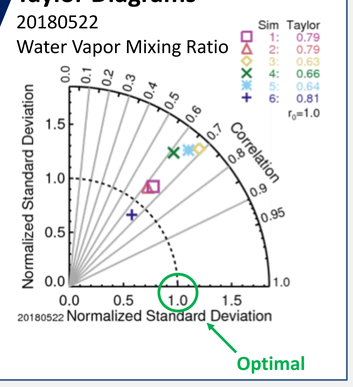
The ARM observations and LES output are put on a common temporal and vertical grid in, respectively, the lassodiagobsmod(m1) and lassodiagobsmodz(m1) VAPs that produce diagnostic plots. Examples shown here for six of eight ensemble members:



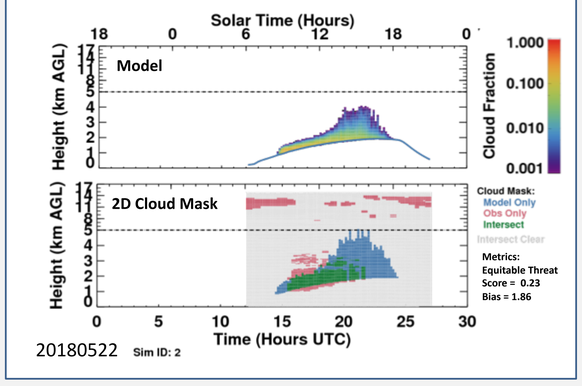
Perform Diagnostics

Taylor Diagrams

20180522
Water Vapor Mixing Ratio

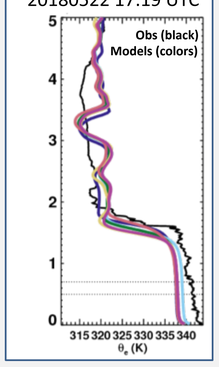


2D Cloud Fraction & Cloud Mask



Soundings

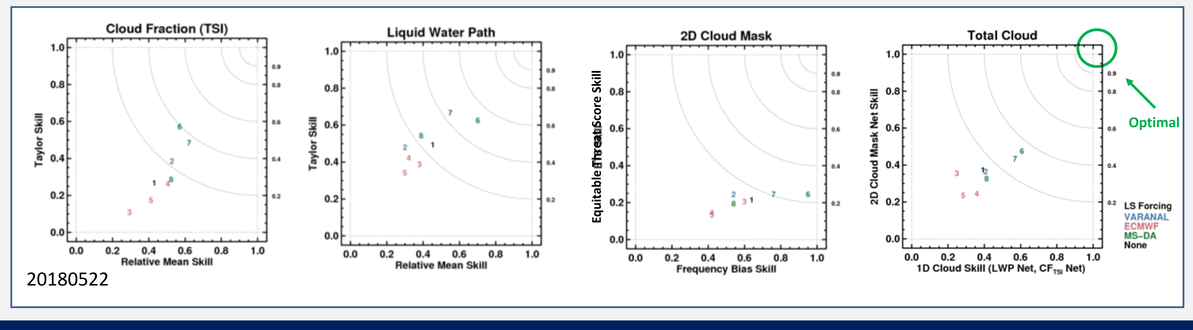
20180522 17:19 UTC



Compute Skill

4. Skill Scores:

The lassoscore(m1) and lassoscorez(m1) VAPs produce the following types of skill scores and plots:



Bundle Data

LASSO Bundles:

Users visualize and access LASSO data for download via the LASSO Bundle Browser: https://adc.arm.gov/lassobrowser.

Bundle: Configuration, Diagnostic Data, and Skill Scores
lassodiagconfobsmodSIMID.m1

- WRF Namelist
- Initial conditions
- Skill scores
- Forcing inputs
- Surface inputs
- Plots

Bundle: Raw WRF Model Output
lassodiagrawSIMID.m1

- wrfout, wrfstat

Bundle: High Frequency (< 1-hr) Observations
lassohighfreqobs.c1:

- LWP
- Mid-Boundary Layer Temp & Moisture VAP
- Doppler Lidar Shallow Cu Cloud-Base Height VAP

New

Note: The LASSO-O ENG (4041) does not include operationalization of data bundling