ARM
CLIMATE RESEARCH FACILITY

LES Data Bundles* and User Access

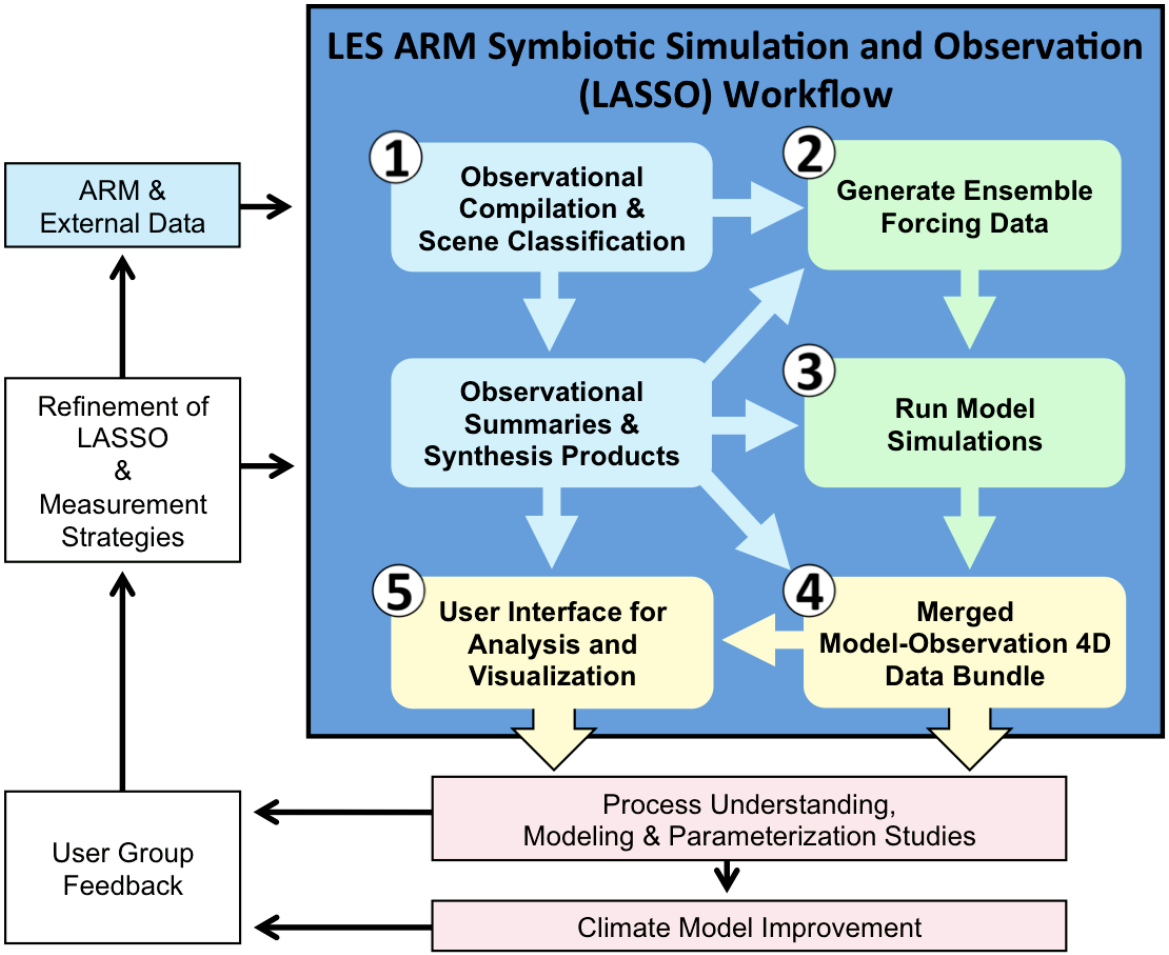
LES ARM Symbiotic Simulation & Observation Workflow (LASSO)

Package of observations and simulations aimed at providing the best description of the atmosphere

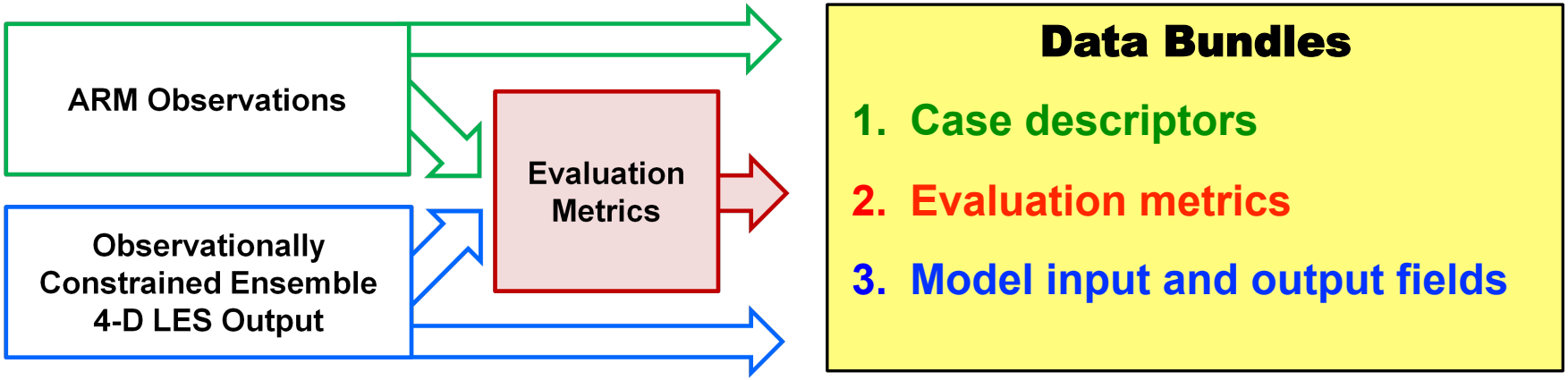
*The data structure former known as data cubes

LASSO Overview

- Operational LES simulations at the SGP starting in 2017
- Initial focus on ShCu before other sites and phenomena



Model-Observation Data Bundles



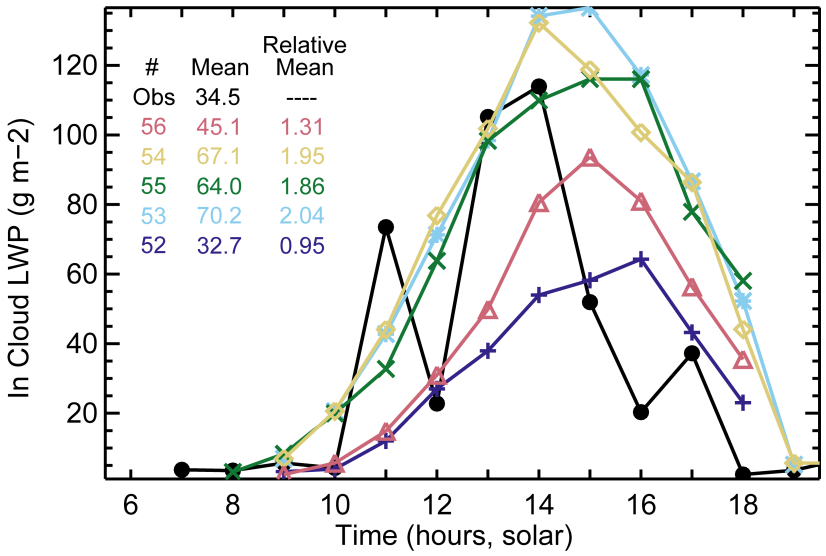
Data Bundle Example Fields

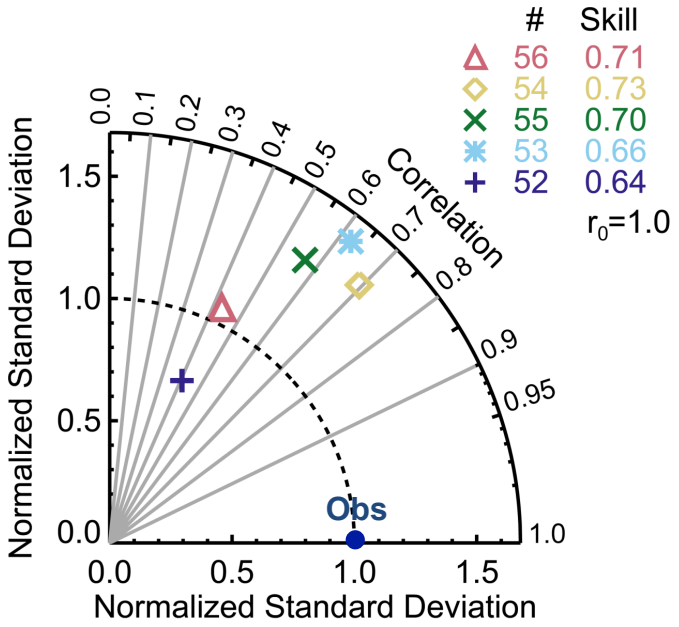
1. **Case descriptors**
   - Cloud type, weather state, inversion strength, etc.
2. **Evaluation Metrics**
   a. **Model-observation diagnostics**
      - Co-registered model-comparable obs and obs-comparable model output.
      - Includes use of instrument simulators where applicable
   b. **Model skill scores**
      - Model performance of cloud an environmental observables
3. **Model input and output fields**
   - Include 3-D model fields, profile statistics, and model-based budget terms
   - Forcings and initial conditions

Model-Observation Diagnostics

Ensemble LES simulations are assessed using ARM observations of cloud and environmental variables (currently ~7)

- **Time series** with average difference, RMS, and correlation coefficient
- **Taylor diagrams** for standard deviation and correlation phase space
- **Regression analysis** for slope and intercept
- **Heat maps** for differences of the simulated time series from observations
- **Relative Euclidean distance** for overall model performance of a variable
- **Phase space relationships** for relative relationships between a set of variables
- **2-D cloud masks** for simulated model location and timing





Model Skill Scores

Skill scores from NWP and climate modeling communities

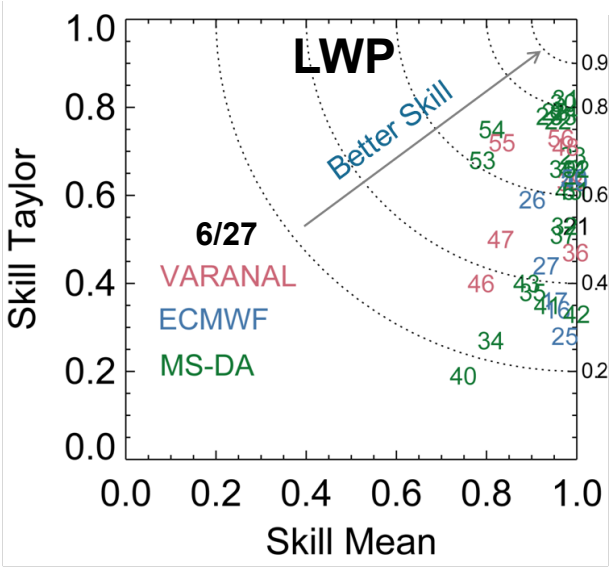
- Monotonically increases [0,1], where 1 is best agreement with the observations

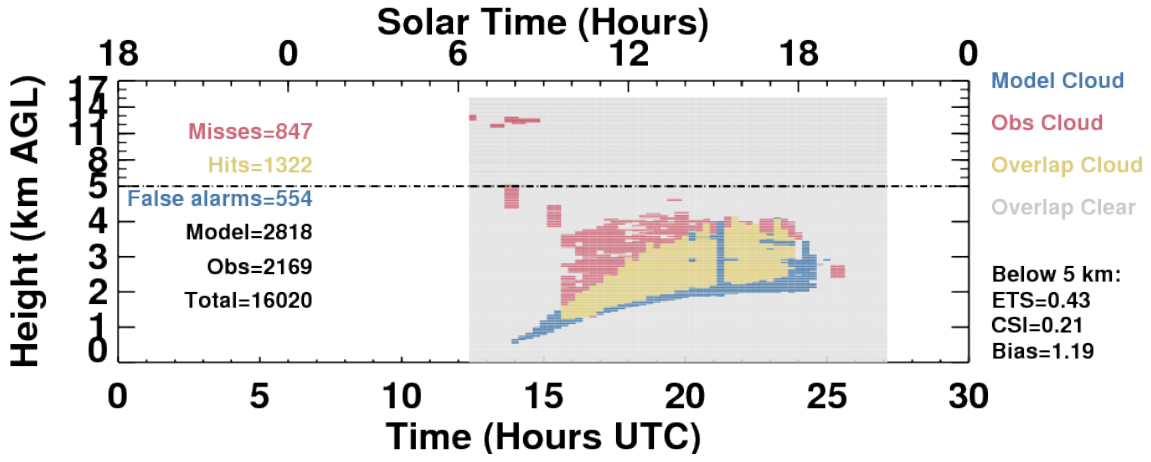
Cloud property skill score from the time series of LWP

- Based on the Taylor diagram skill and relative mean
- A skill score per variable is based on their combination

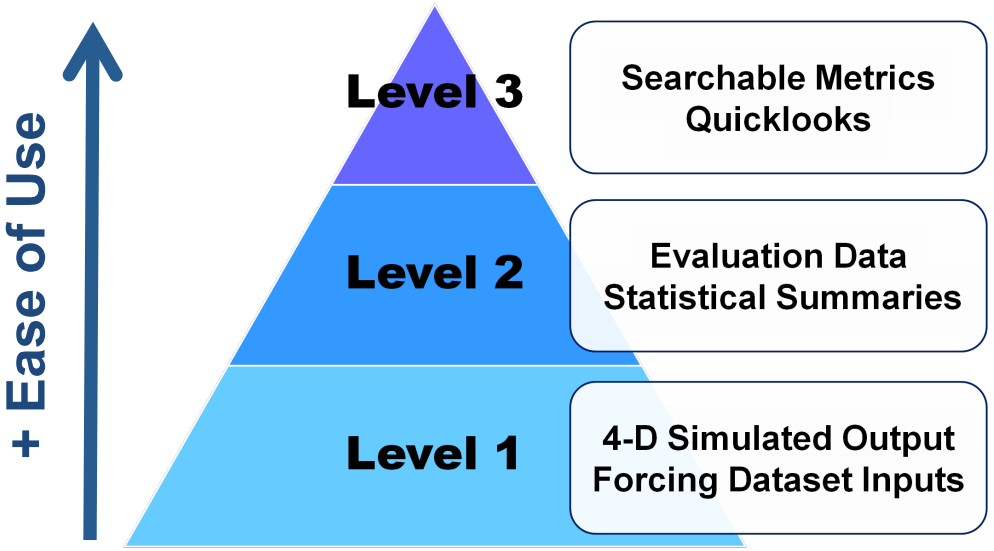
2-D masks of observation and simulation of cloud occurrence

- Based on the Equitable Threat Score (ETS) & bias
- A single skill score is based on their combination





Data Bundle Search and Access



- The data bundles will be searchable, have quicklooks and efficient filtering methods to find and order cases of interest.
- Tools will be developed to simplify analysis and visualization. Examples include:
  - NoSQL on-the-fly mix and match for multi-case comparisons and compositing
  - Interactive computation, display, and order
  - Goal to enable easier data transfer from the ARM Archive via Globus

Contact Information

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LASSO Resources

- Website: http://www.arm.gov/science/themes/lasso
- E-mail list: http://eepurl.com/bCS8s5