ARM Science Products

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ARM

Argonne NATIONAL LABORATORY · Brookhaven National Laboratory · Los Alamos NATIONAL LABORATORY · BERKELEY LAB · Lawrence Livermore National Laboratory · NREL NATIONAL RENEWABLE ENERGY LABORATORY · OAK RIDGE National Laboratory · Pacific Northwest NATIONAL LABORATORY · Sandia National Laboratories

Science Data Products Update

New Value-Added Products (VAPs)

- PBL Height BE ML – Sonde / Ceil / MPL / Doppler Lidar / Raman Lidar (Zhang S1-65)

- Model Diagnostics – Land-atmosphere interactions (Tao S2-37)

- Lagrangian large-scale forcing data for MOSAiC

- Aerosol profiles: Aerosol feature mask (Wu S2-52)

- Airmass trajectories (Silber S3-24)

- Precipitation best estimate

- Convective cloud hydrometeor statistics (Gupta S2-72)
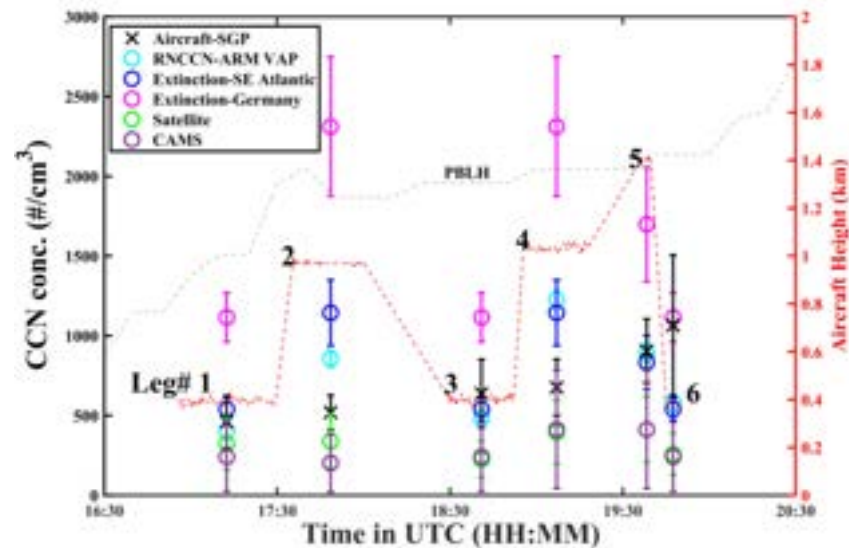
Core VAPs for Mobile Facility Campaigns

- Recent Focus on EPCAPE, SAIL,& TRACER

- Startup at CAPE-k (19), CoURAGE (8), and BNF (15)

Panel Discussion: Recommendations for future ARM data products
Tues. March 4, Breakout Session 1

New ARM Science Products Address User Identified Gaps
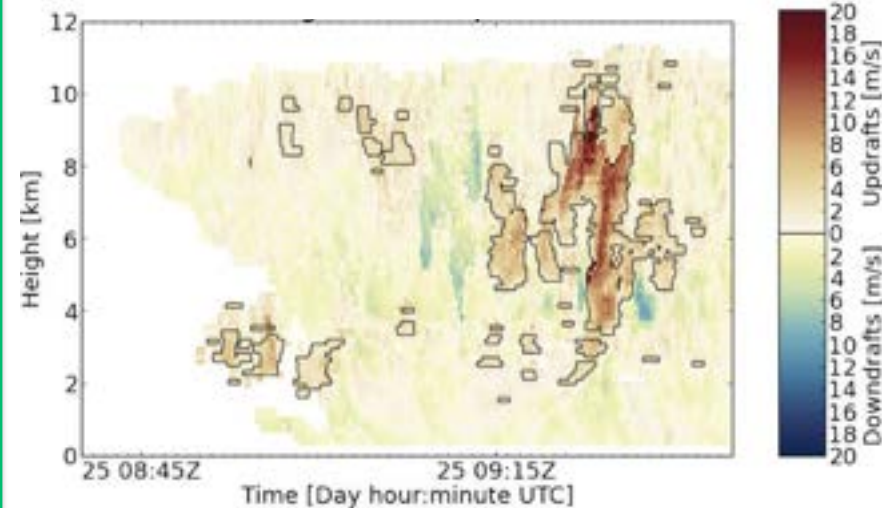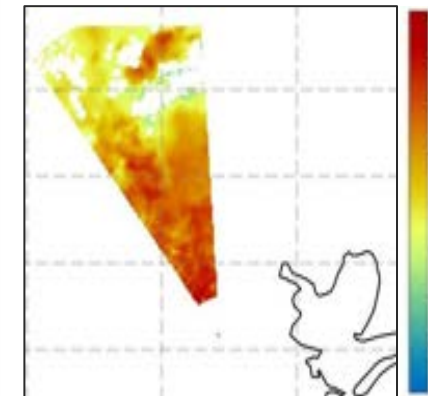
CCN Profile Evaluation

- CCN profiles – surface CCN and Raman lidar
- Evaluation – aircraft, TBS, ArcticShark
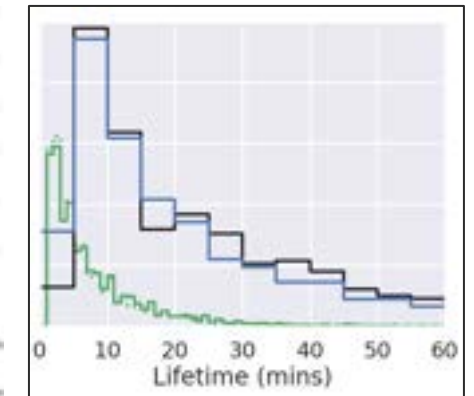- Kulkarni (S6-53)

Vertical Air Motion

- Radar Wind Profiler (RWP) precipitation mode retrieval
- Vertical air motion, convective/stratiform echo classification, and precip
- Williams/Giangrande (S3-28)
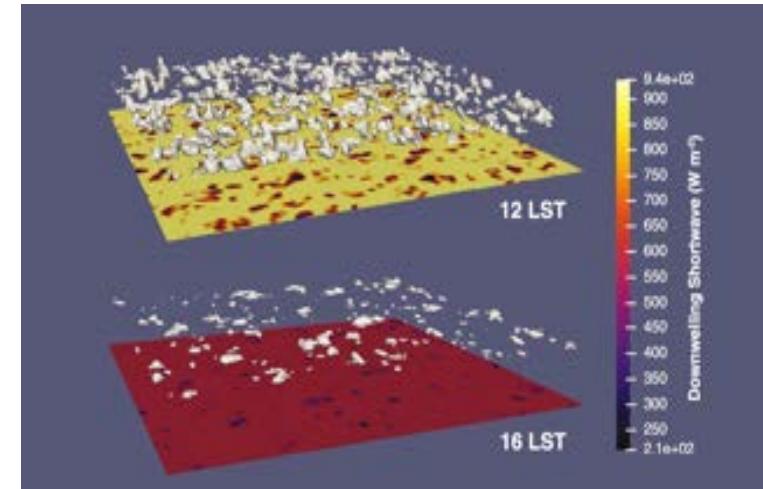
Composite Reflectivity   Cell Statistics

- TRACER CSAPR2 adaptive scanning
- Composite reflectivity and cell statistics (i.e., lifetime, distance to nearest cell)
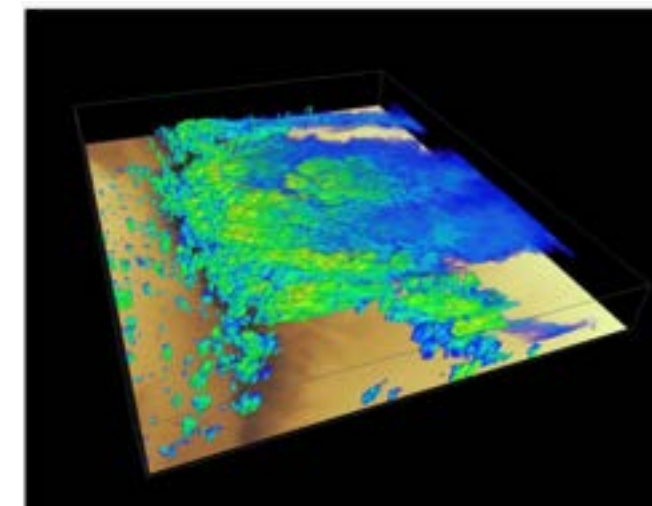- Gupta (S2-72); Breakout session 5

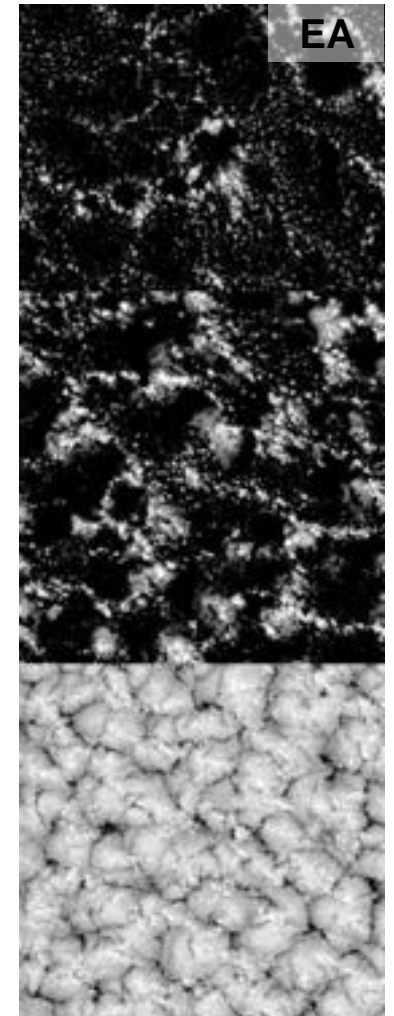# LASSO Library of High-resolution Simulations Enables Research Using ARM Data

- Provides foundational modeling for targeted field campaigns

- Aids modelers by evaluating boundary conditions and large-scale forcing ensembles for a variety of case dates

- Case libraries
  - Provide context for ARM observations
  - Facilitate process understanding, parameterization development, and testing of retrieval algorithms

- 35 publications demonstrate diverse use of LASSO for atmospheric research

- Breakout Session 4 – Gustafson & Giangrande

SGP Shallow Convection – 95 cases

CACTI Deep Convection – 30 cases

ENA Marine Stratocumulus

Integrating ARM Data and Tools for Broader Community Engagement

ARM Modeling Data and Tools

The ARM Best Estimate (ARMBE)

The ARM Cloud Retrieval Ensemble Data (ACRED)

The Variational Analysis Forcing (VARANAL)

LES ARM Symbiotic Simulation and Observation (LASSO)

ARM Cloud Radar and Lidar Simulator

The ARM Diagnostics Package (ARM-Diags)

Successful Outreach Activities

- **ARM-Diags** is integrated into E3SM-Diags and participated in NOAA's MDTF v3.
- **VARANAL** and **LASSO-ShCu forcing** is now part of E3SM SCM forcing library.
- **ARMBE** is included into the NCAR AMWG diagnostics.

E³SM Energy Exascale Earth System Model

NCAR

Shaocheng Xie (S2-1), Cheng Tao (S2-37), Yuying Zhang, Chengzhu (Jill) Zhang

Workforce Development
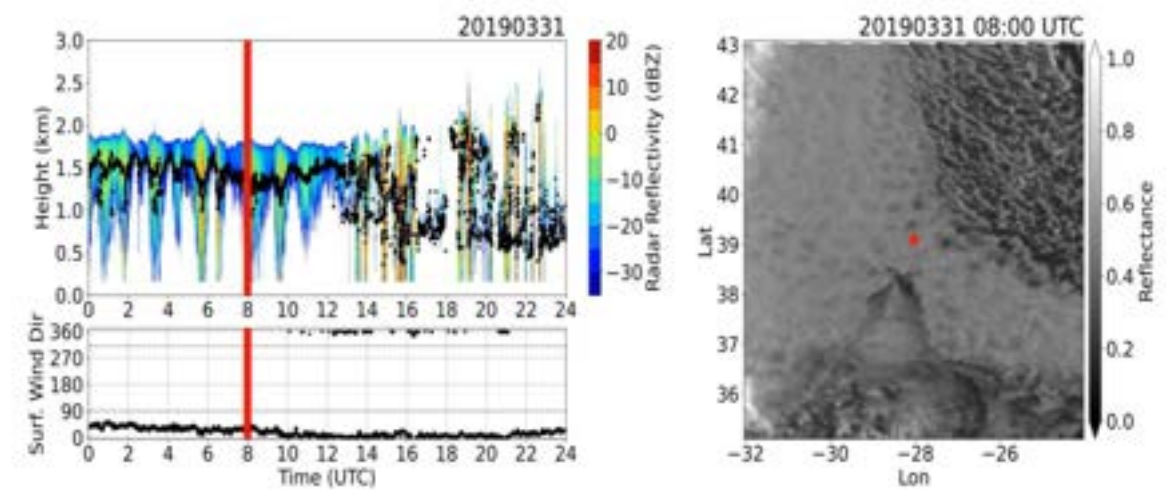### CAPE-k Summer School

- Education Outreach Coordination group (EOC)

- Summer schools: Cleveland St. and CAPE-k

- Accomplishments:
  - BAMS article in press, one in development
  - 55 students trained
  - Library of interactive cookbooks spanning ARM and ASR science.
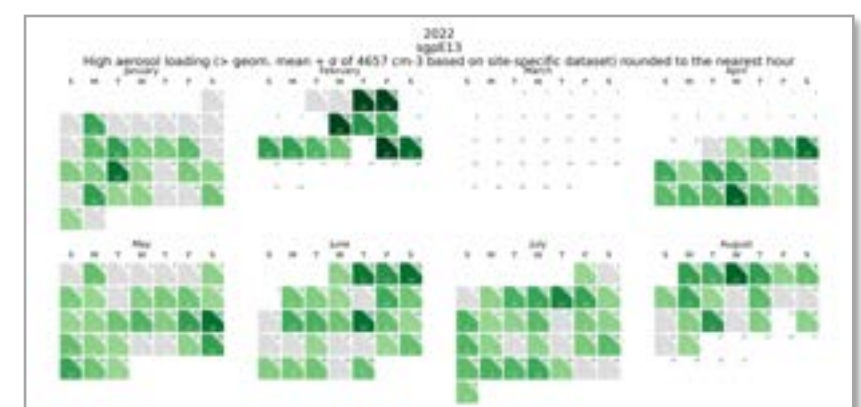
- Wed: breakout session 2

Location-based Atmospheric Phenomena and Associated Well-characterized Datasets

- Shallow, deep convection, and surface precipitation events during CACTI

- Cold-air outbreaks during COMBLE

- Unique events

- Open & closed cellular convection at ENA

- Automated epoch generation for long-term fixed observatories

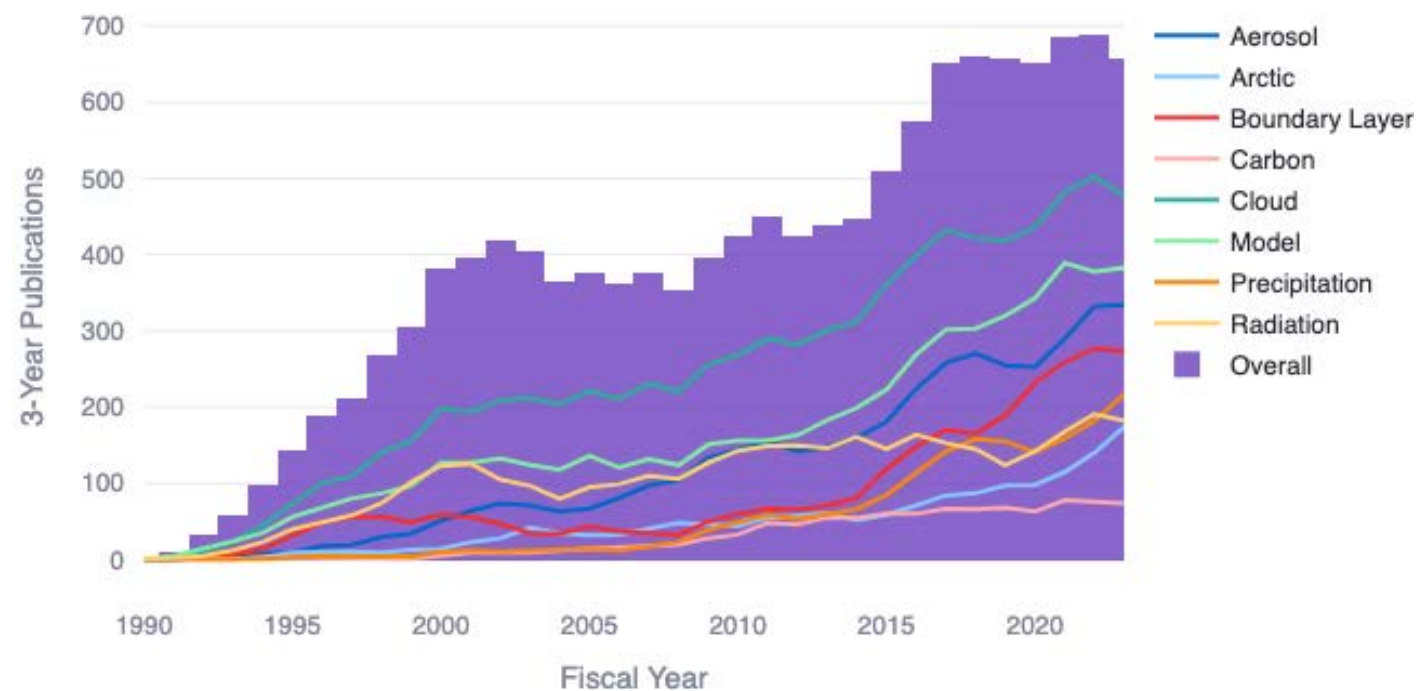## Automated Detection using Deep Learning

J. Tian (S3-69)

I. Silber

ARM Capabilities, Long-Term Datasets, and Field Campaigns Lead to High-Impact Science

3-year Publication Totals per Science Area

Top Campaigns FY20-FY23

Aerosol	Warm BL	Convective	High-Lat
GoAmazon 2014	GoAmazon 2014	GoAmazon 2014	MOSAiC 2019
LASIC 2016	ACE-ENA 2017	CACTI 2018	AWARE 2015
ACE-ENA 2017	MC3E 2011	AMIE-GAN 2011	MARCUS 2017
HI-SCALE 2016	HI-SCALE 2016	TWP-ICE 2006	SHEBA 1997

Indicates G-1 aircraft deployment

Translator and Analyst Team

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Clouds + BL

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Precip Radar

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