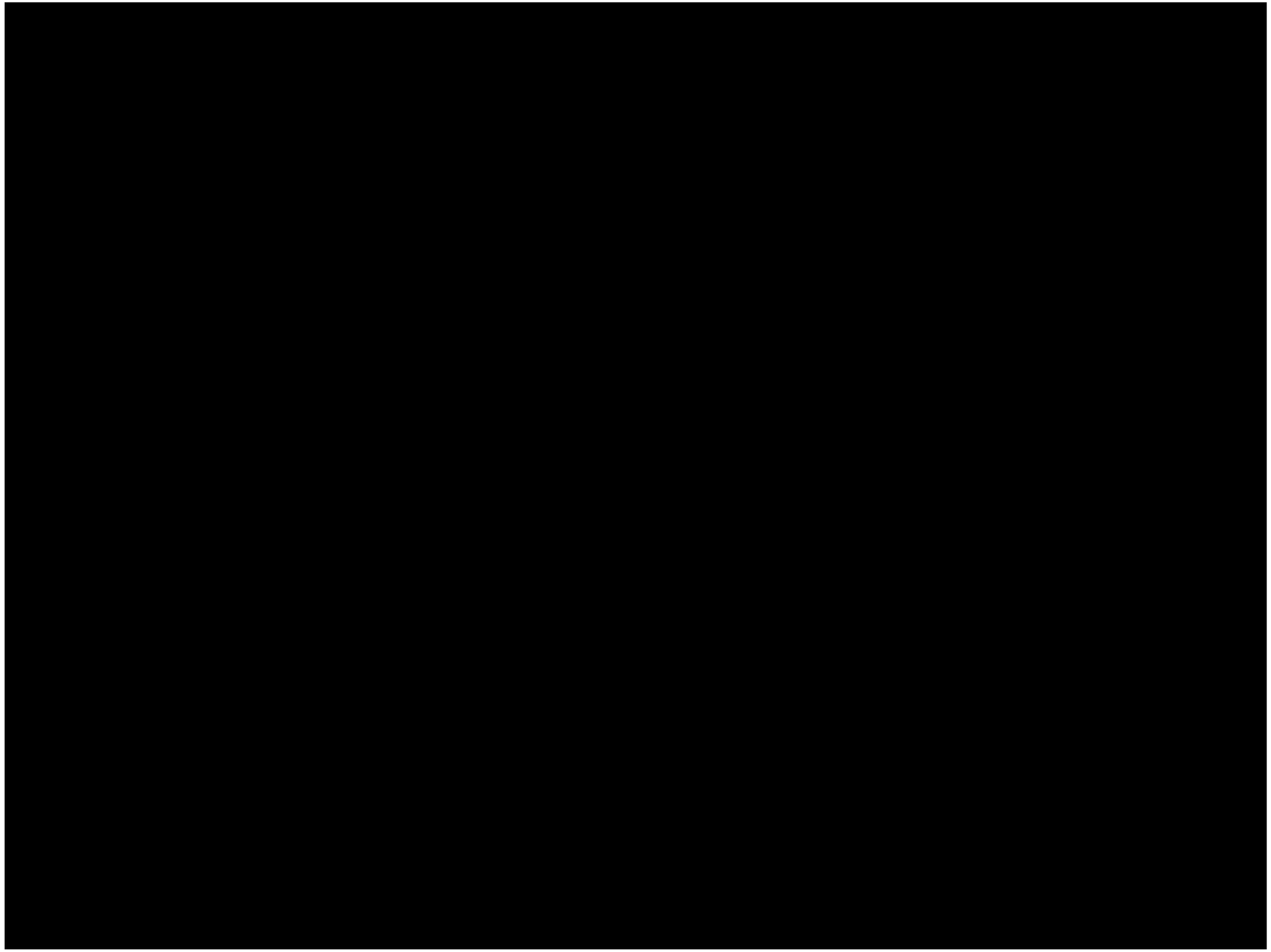
# EPCAPE Cases

April 27-28
May 16-17
July 3-4

**QUICKLOOKS:**
https://wordpress.cels.anl.gov/clouds/epcape/

**SOLEDAD DATASET:**
Russell, Lynn M.; Han, Sanghee; Williams, Abigail S.; Dedrick, Jeramy L.; Pelayo, Christian; Maneenoi, Nattamon; Petters, Markus; Ravichandran, Elavarasi; Chang, Rachel; Wheeler, Michael; Wentzell, Jeremy; Liggio, John (2023). Aerosol Microphysics and Chemical Measurements at Mt. Soledad and Scripps Pier during the Eastern Pacific Cloud Aerosol Precipitation Experiment (EPCAPE) from February 2023 to February 2024. UC San Diego Library Digital Collections.
https://doi.org/10.6075/J0NG4QT4



# Agenda

Introduction to Case Studies

| | | |
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| 4:00 | Lynn Russell | Introduction to EPCAPE Case Studies and Aerosol Properties |
| 4:10 | Virendra Ghate | Meteorological and Profile Quick-Looks |
| 4:15 | David Painemal | SatCorp Products for Case Studies |
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Introduction to Modeling Approaches for EPCAPE

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| 4:35 | Po-Lun Ma (remote) | E3SM-RRM for Coastal Zones for EPCAPE |
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4:55 Questions for Speakers

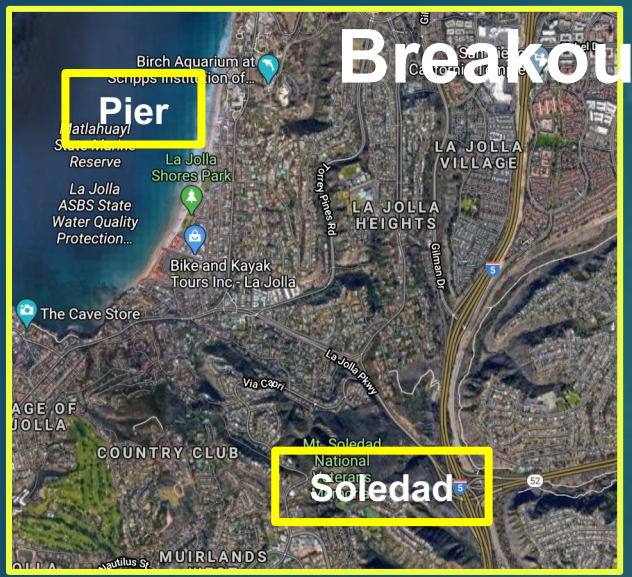
5:00 Discussion of EPCAPE-related Science Initiatives

5:55 Wrap-Up and Lightning Talks

https://www.arm.gov/research/campaigns/amf2023epcape

# EPCAPE

## Breakout Session 4: 8 August 2023

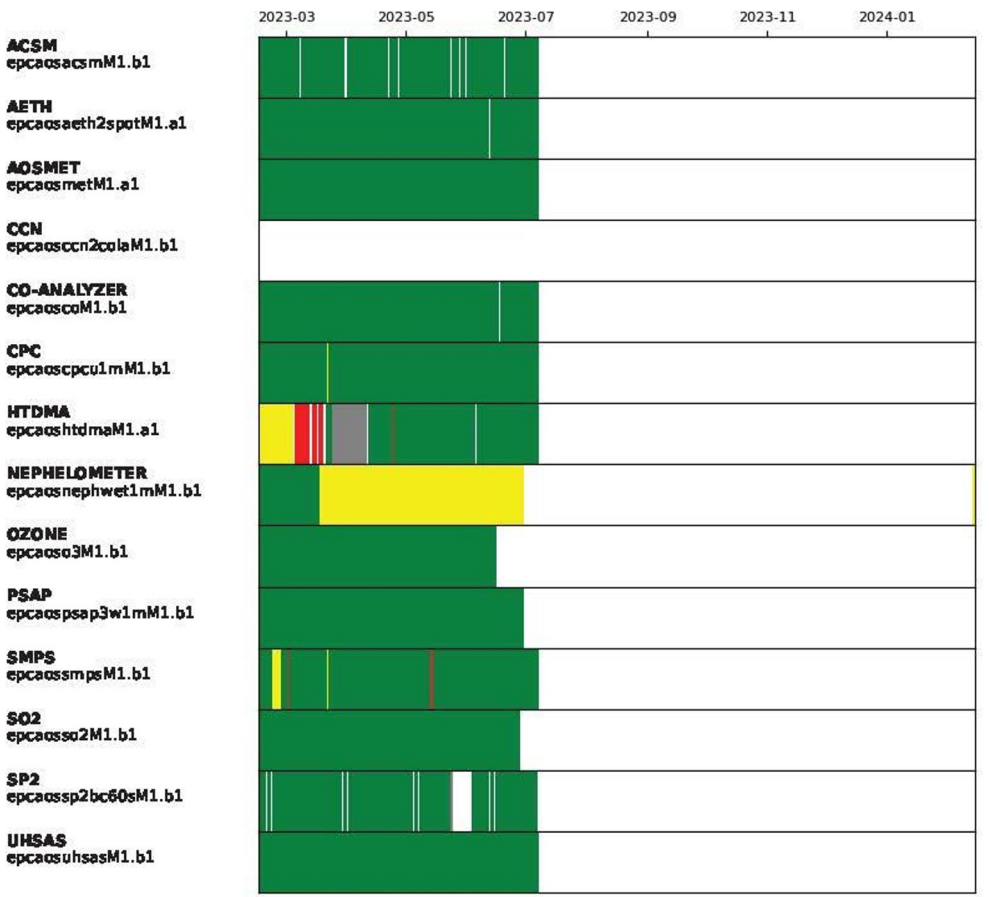



Ellen Browning
Scripps Memorial Pier

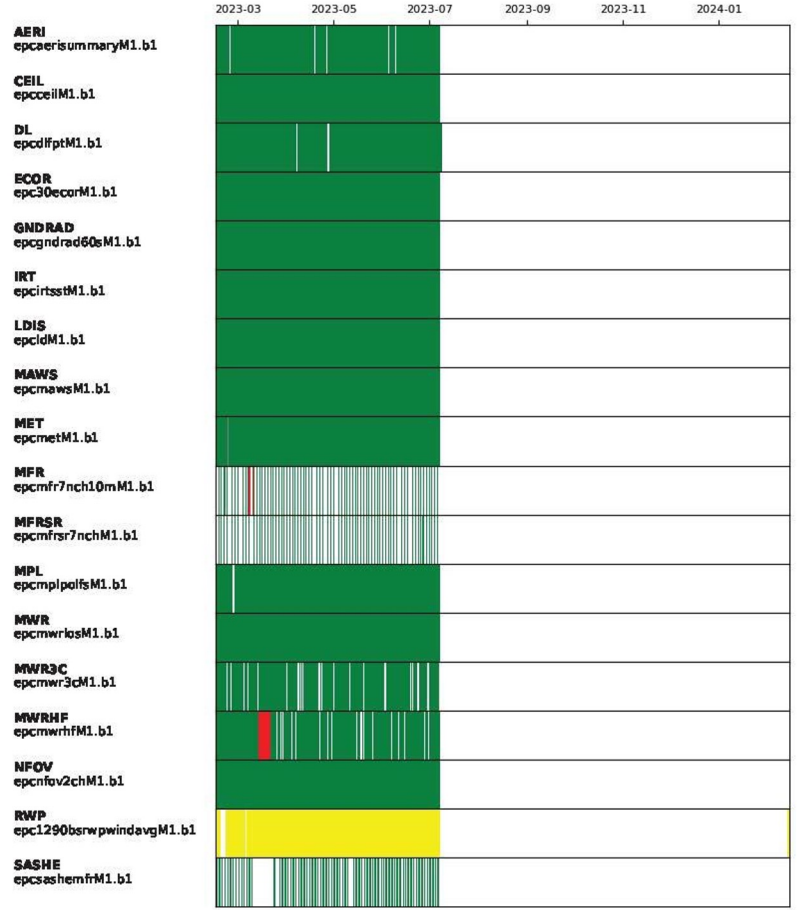
Eastern Pacific Cloud Aerosol Precipitation Experiment
DOE ARM AMF1 Deployment: February 2023 - February 2024
La Jolla, California: Scripps Pier and Mt. Soledad
Lead Scientist: Lynn Russell lmrussell@ucsd.edu
Proposal Team: Dan Lubin, Israel Silber, Ed Eloranta, Johannes Muelmenstaedt, Susannah Burrows, Allison Aiken, Die Wang, Markus Petters, Mark Miller, Andy Ackerman, Ann Fridlind, Mikael Witte, Matt Lebsock, David Painemal, Rachel Chang, John Liggio, Michael Wheeler

## La Jolla, CA; AMF1 (main site for EPCAPE on Scripps Pier)

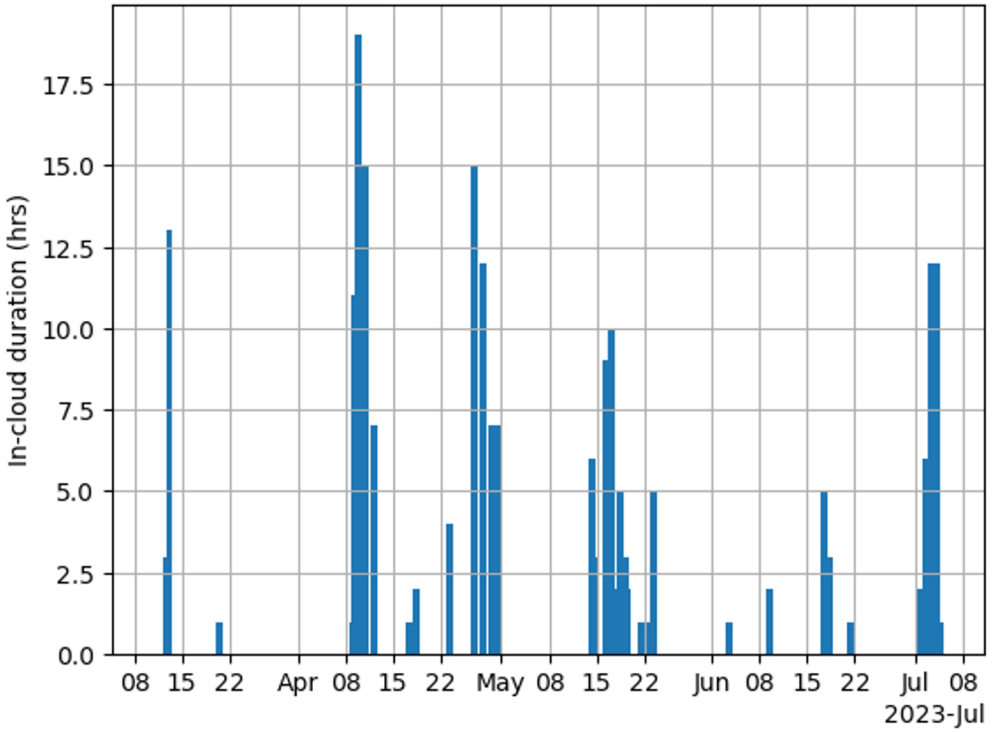
### Atmospheric Radiation Measurement User Facility




La Jolla, CA; AMF1 (main site for EPCAPE on Scripps Pier)
Atmospheric Radiation Measurement User Facility



# In-Cloud Events at Mt. Soledad




March 1-31

- 28 hrs

April 1-30

- 131 hrs

May 1-31

- 71 hrs

June 1-30

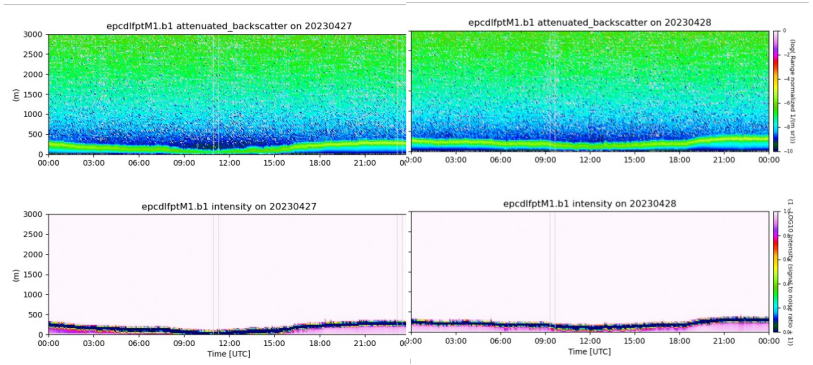
- 32 hrs

July 1-7

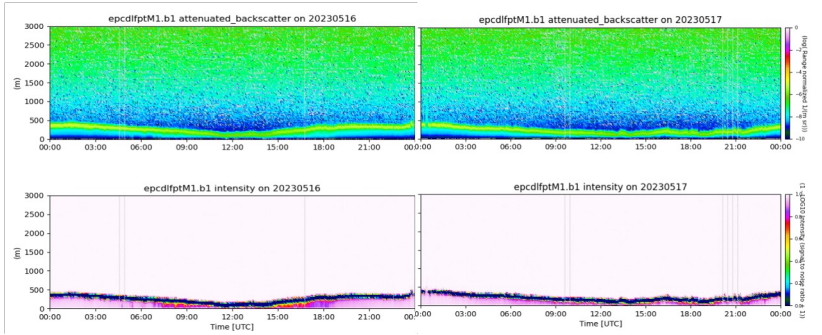
- 48 hrs

# EPCAPE Coastal Stratocumulus **Proposed Case Studies**

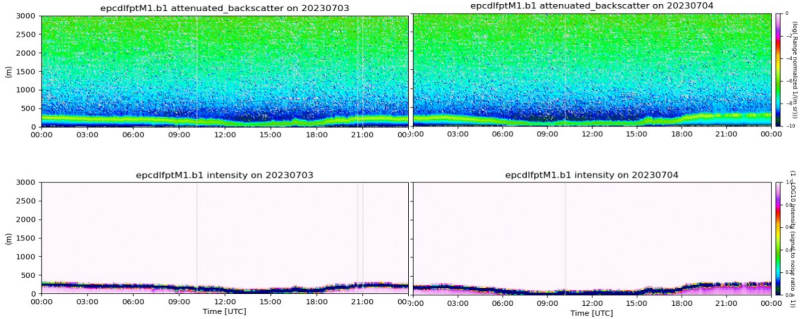
**April 27-28**



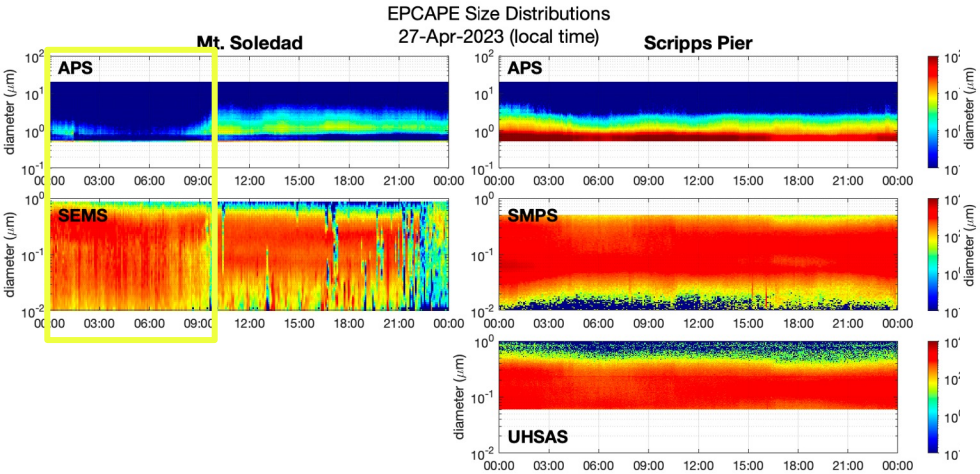

**May 16-17**

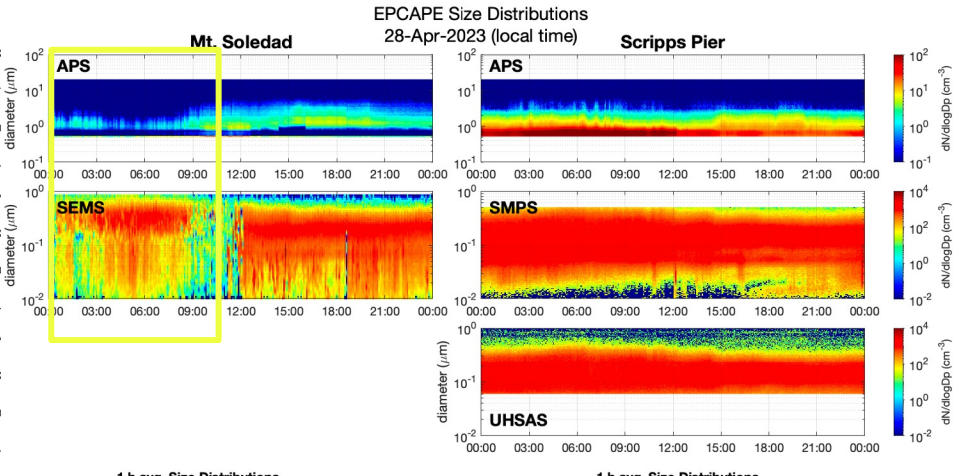


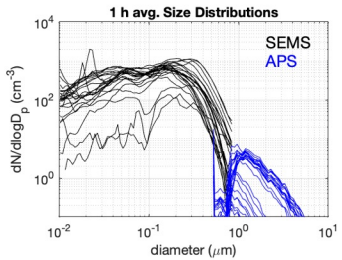

**July 3-4**

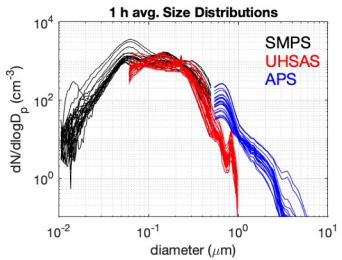


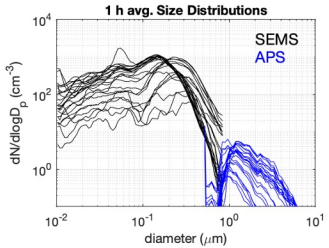
# April 27-28 Aerosol Particle Size Distributions

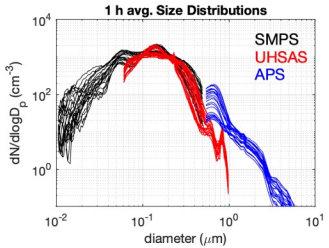


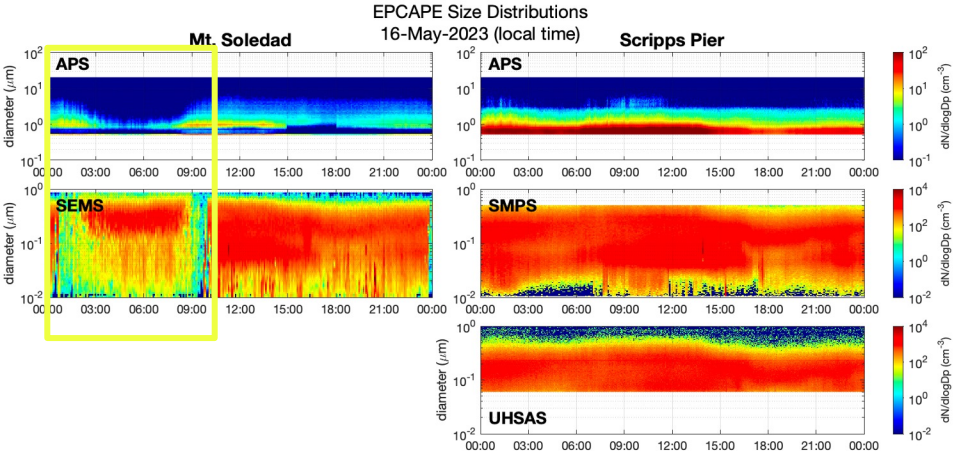



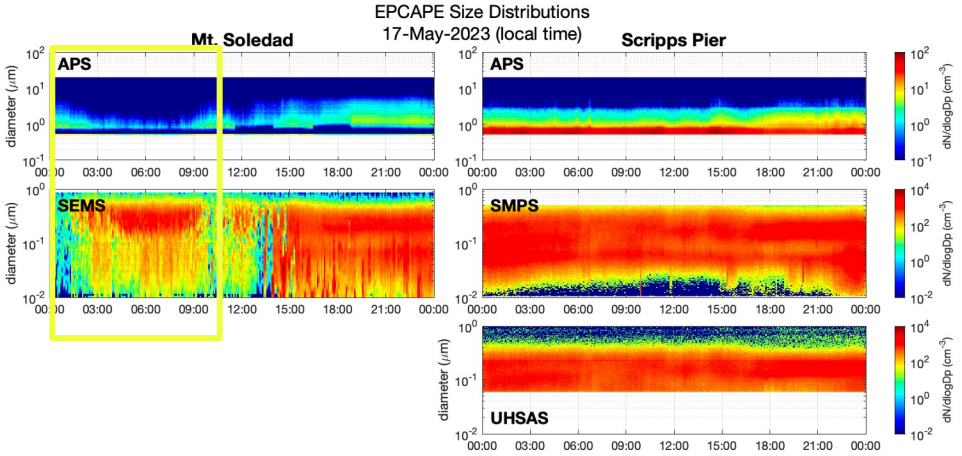



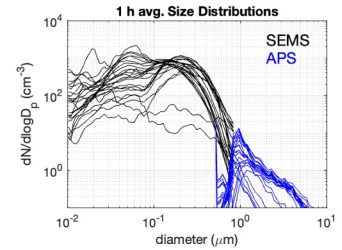



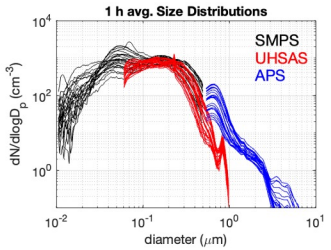



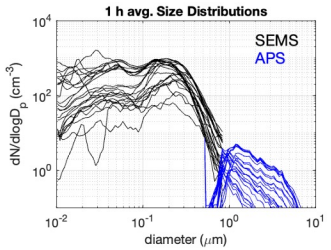
# May 16-17 Aerosol Particle Size Distributions

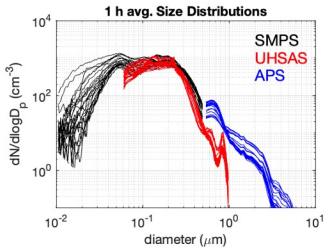


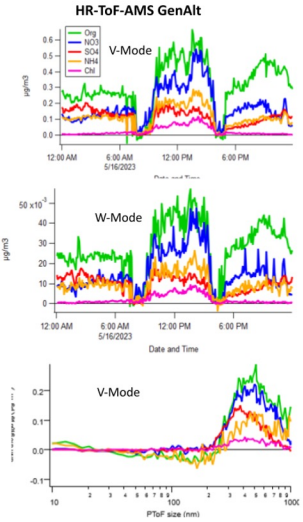



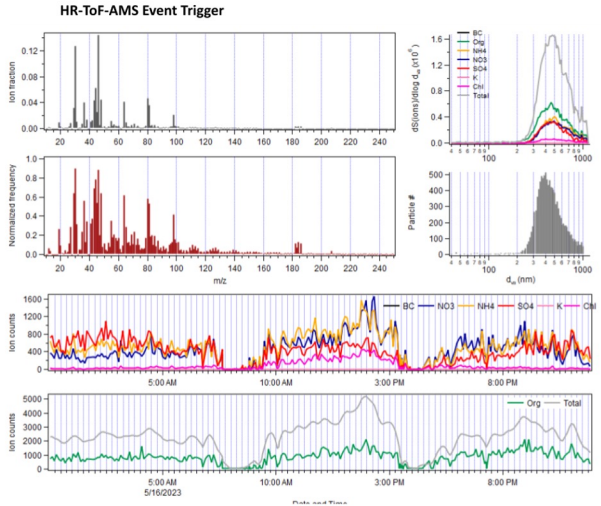



# May 16-17 Aerosol Submicron Composition

## 2023-05-16

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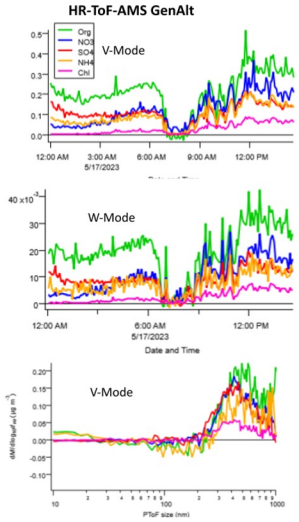
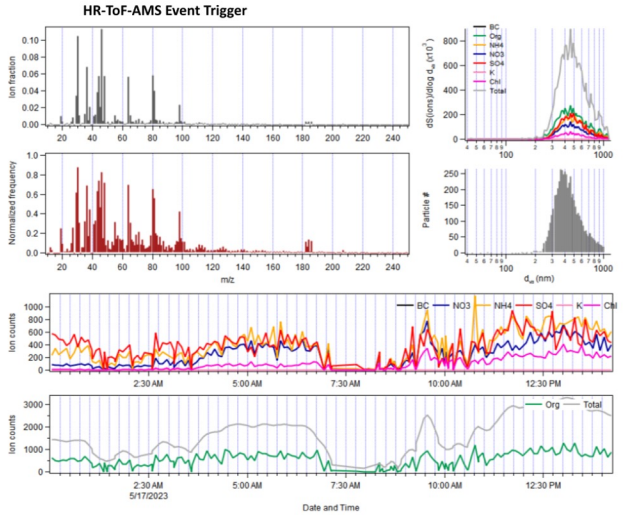
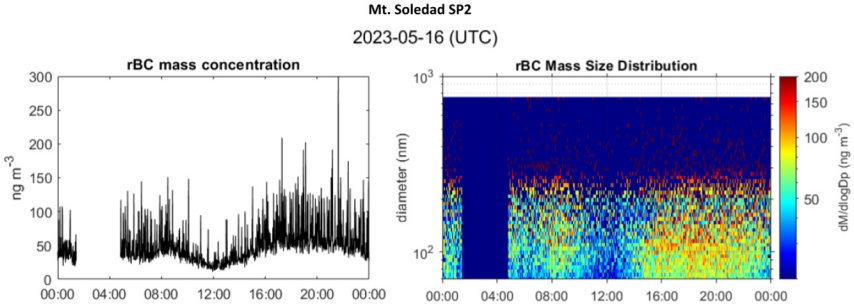
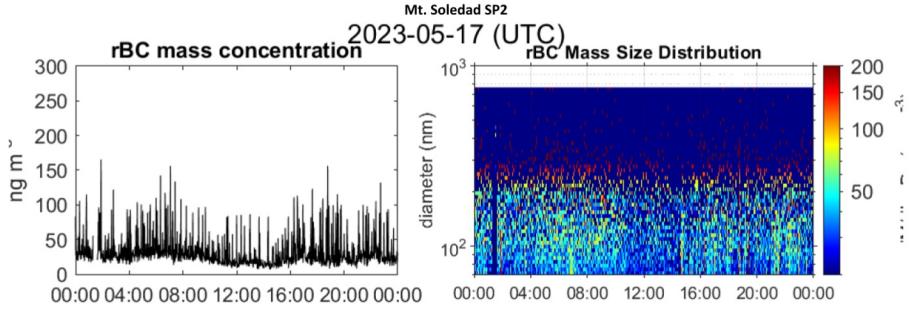


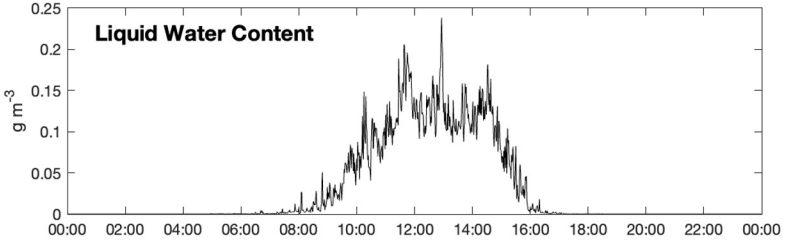



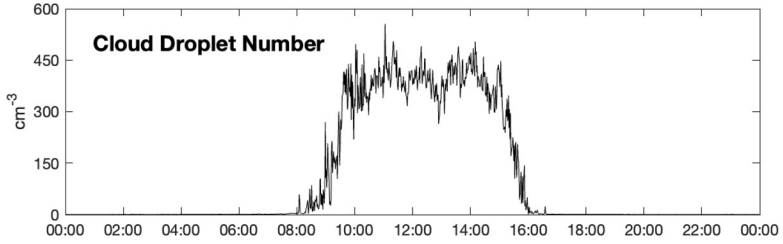



# Fog Monitor Drop Distribution

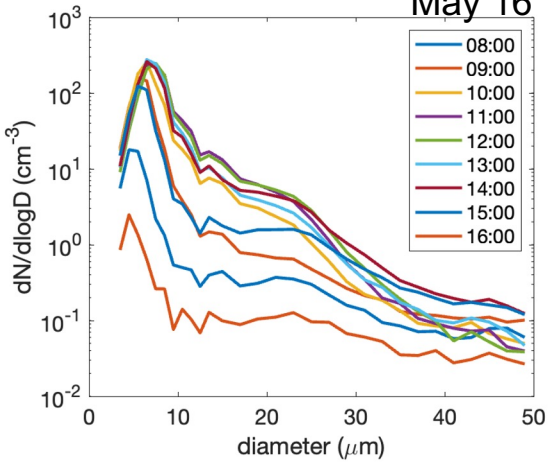
Rachel Chang and
Lauren Robinson,

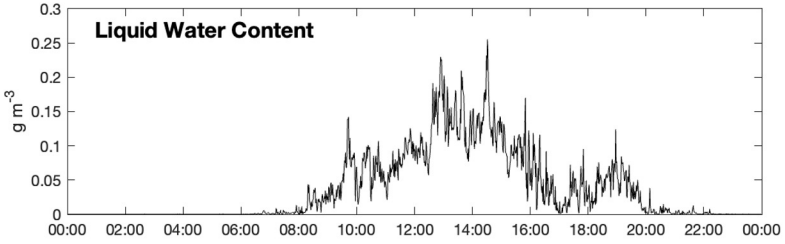
Dalhousie University

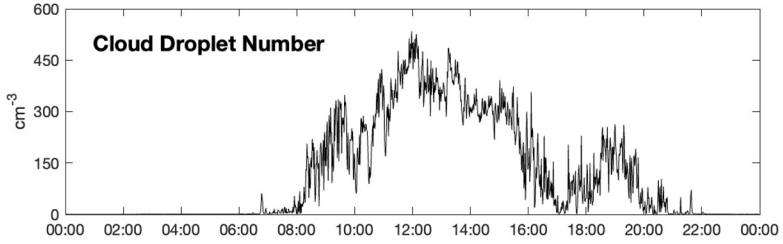


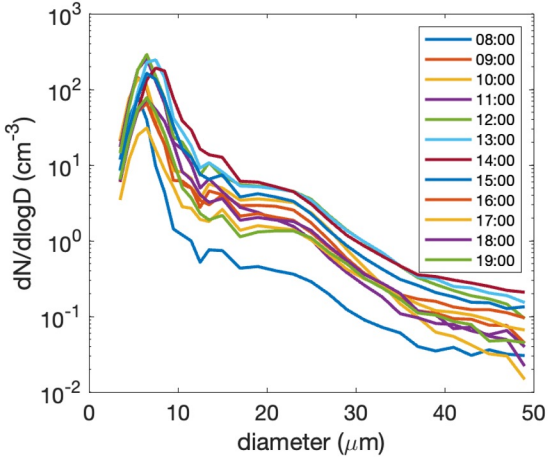

May 16




May 17



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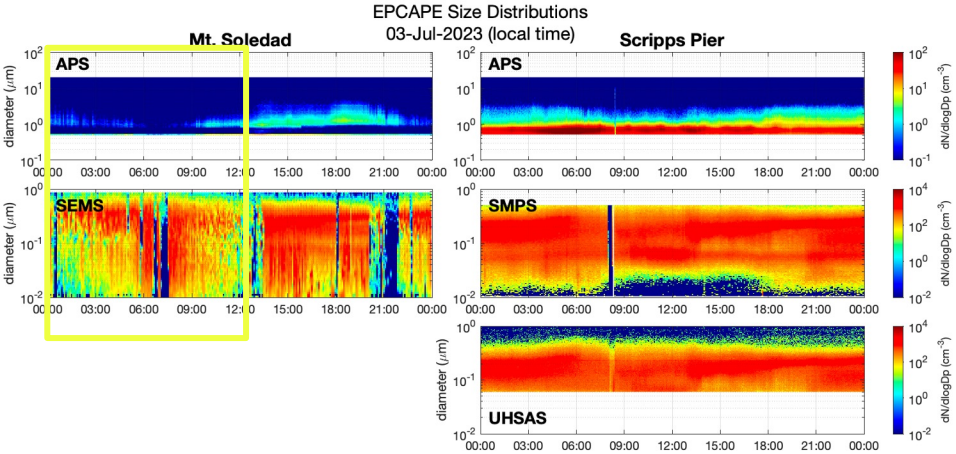


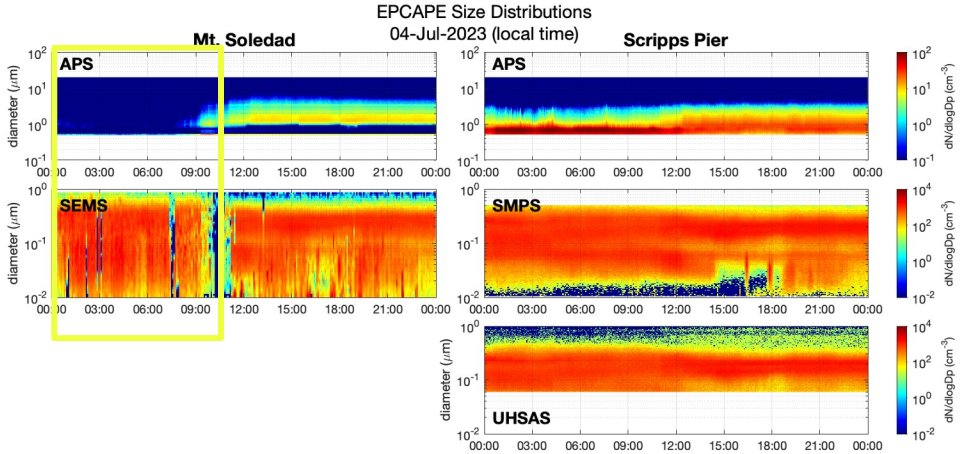


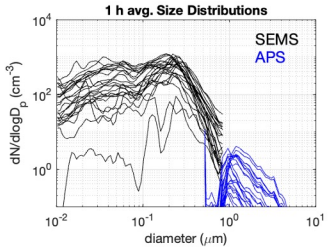


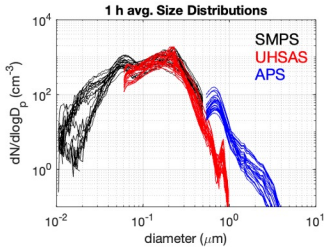


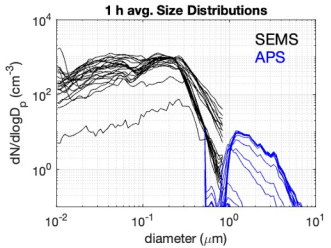


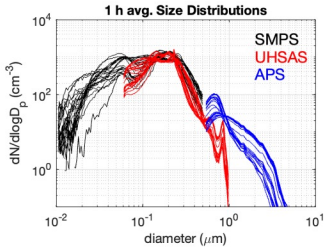

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# Discussion Questions

1. What science questions would modeling address?

2. What meteorological features are needed to address questions?

3. What would be better cases than these?

4. Which instrument datasets are needed to …
    a. Initialize?
    b. Evaluate?
5. What steps would help for collaboration and coordination?

# “Lightning” Talks

# EPCAPE WRF?

### EPCAPE Observations

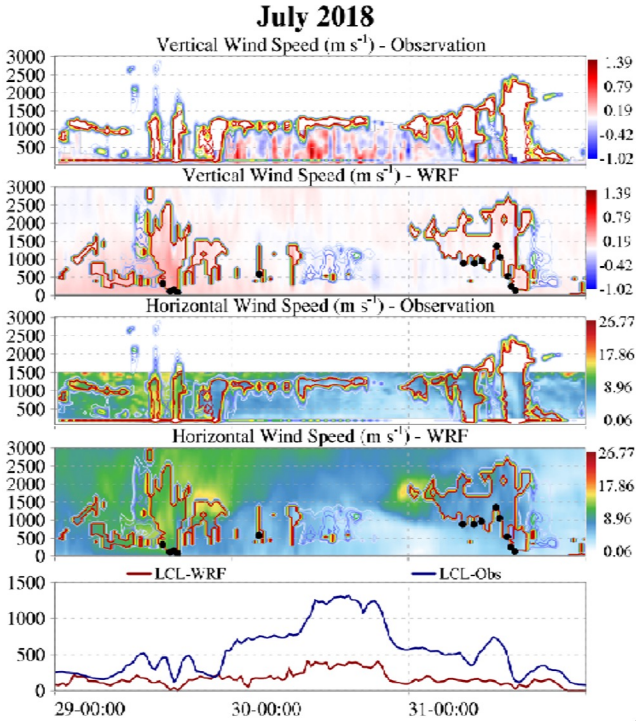
- Surface meteorology station (SMET)
- Doppler Lidar (DL) data to measure the Doppler velocity in sub-cloud layer
- K-a band, Zenith-pointing Radar (KAZR) used to compute the average height-dependent cloud fraction over 30-min averaging interval
- Wind profiler: horizontal wind profile

### WRFDomain Configurations

- **Horizontal Resolutions**: 4050 and 1350 m, with 750×750 and 1050×1050 horizontal grid points, respectively, 82 vertical levels with 15 m resolution near the ocean surface and an average of 70 m in the lowest 3-km

### Model Parameterizations

- Thompson Aerosol-aware Microphysics Scheme
- Mellor-Yamada Nakanishi and Niino Level 3 (MYNN3) Planetary Boundary Layer Scheme
- RRTMG SW and LW Radiation Schemes
- MYNN Surface Layer Scheme
- NOAH Land Surface Scheme



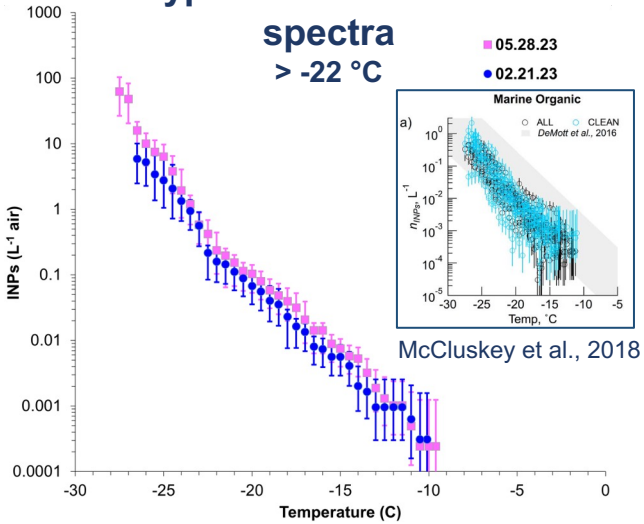
# EPCAPE ice nucleating particles (INPs)

- **INPs catalyze the formation of ice in clouds and influence precipitation, latent heat release, cloud electrification, cloud albedo and cloud lifetime**
- **0.2 µm pore filters run for 24 h every 3-4 days on Scripps Pier**

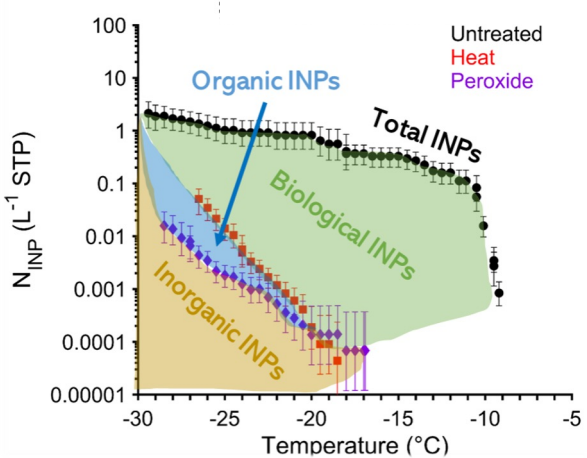
ARM
CLIMATE RESEARCH FACILITY

Jessie Creamean, Tom Hill, Carson Hume, Tim Devadoss

**Preliminary data: typical clean marine spectra > -22 °C**




McCluskey et al., 2018




Select samples will be retested after heating (95°C) and $H_2O_2$ digestions to estimate abundance of biological, heat stable organic, and inorganic INPs.

Scan for link to our Ice Nucleation Spectrometer (INS) ARM instrument page

# EPCAPE-Partitioning Thrust-LANL

## Fall deployment to Mt. Soledad

*Kyle Gorkowski, Allison C. Aiken, Katherine Benedict, James Lee, Manvendra Dubey, Abu Sayeed Md Shawon*

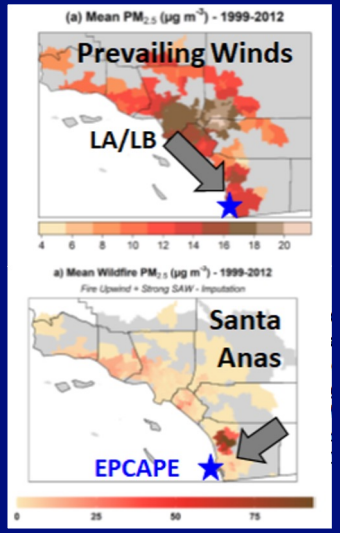
**Science Questions:** **What is the role of carbonaceous aerosols from different sources in a complex marine environment including**

- **Urban emissions that have aged over the ocean during prevailing winds**
- **Continental sources from Santa Ana winds?**

- **What are the dominant aerosol processes and how do they impact cloud formation?**

**Research Objectives:** **Determine which aerosols dominate the CCN-activated fraction when continental aerosols impact marine boundary layer cloud formation in the fall.**

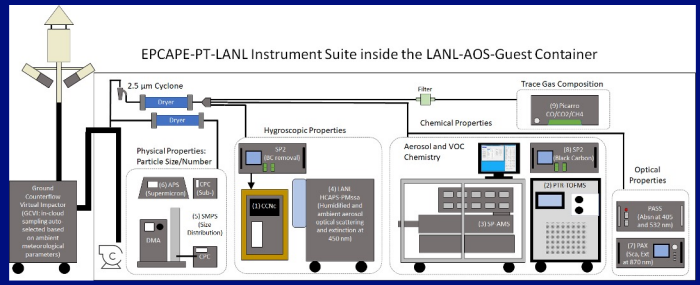
- **EPCAPE-PT-LANL will perform new observations**
  - **Vapor partitioning between aerosols and cloud droplets**
  - **Effects of cloud processing on aerosol optical properties**
  - **Participation of black carbon in aerosol-cloud interactions**




*Aguilera et al., Nat. Commun., 2021.*

**LANL Science Team on the LANL-Guest-AOS**

*9 key measurements of aerosol physical, optical, hygroscopic and chemical properties and trace gas measurements inside the LANL-AOS-Guest for deployment on Mt. Soledad in October 2023*




ASR Atmospheric System Research
ARM
LDRD LABORATORY DIRECTED RESEARCH & DEVELOPMENT

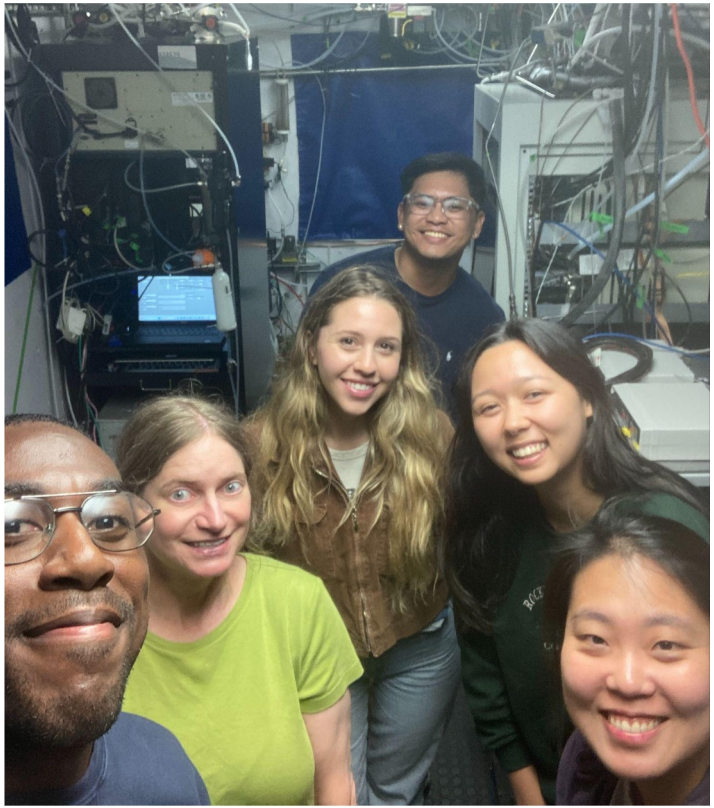
Los Alamos NATIONAL LABORATORY

**Campaign Website:** https://www.arm.gov/research/campaigns/amf2023epcape-pt-lanl

# Extra Slides

# Thank you!

**Acknowledgements:**
ARM&ASR Funding,
ARM Techs&Mentors;
EPCAPE Science Team.



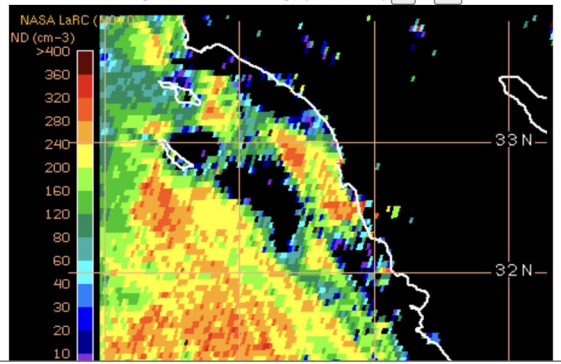
VISST Cloud Product Page

Domain: ARM EPCAPE Small Domain | Imagery | Satellite: GOES-W

Date: 2023 | 05 | 16 | Image Time: 20:00 UTC

Image: Cloud Nd | Animate: Frames ---

Viewing 2000 UTC CND image (05-16-2023). - +




**May 16-17**

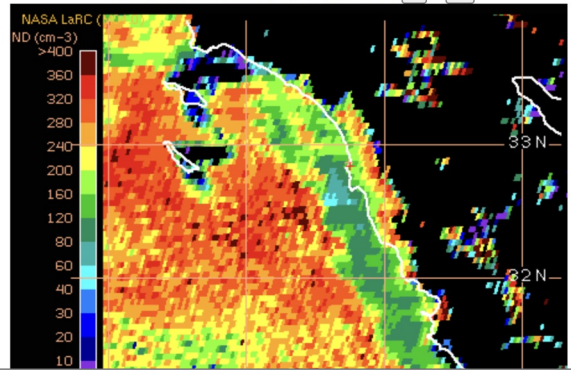
VISST Cloud Product Page

Domain: ARM EPCAPE Small Domain | Imagery | Satellite: GOES-W

Date: 2023 | 05 | 17 | Image Time: 20:00 UTC

Image: Cloud Nd | Animate: Frames ---

Viewing 2000 UTC CND image (05-17-2023). - +



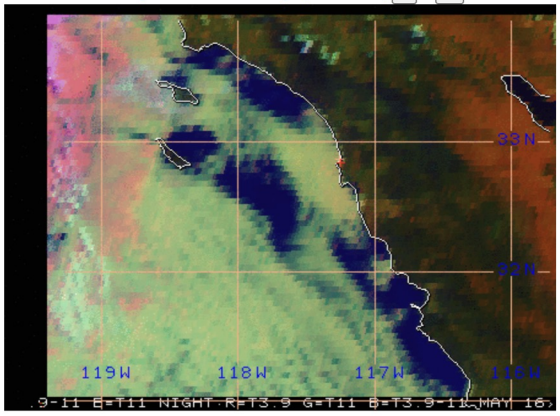

VISST Cloud Product Page

Domain: ARM EPCAPE Small Domain | Imagery | Satellite: GOES-W

Date: 2023 | 05 | 16 | Image Time: 20:00 UTC

Image: Multi-Channel RGB | Animate: Frames ---

Viewing 2000 UTC RGB image (05-16-2023). - +




**2000 UTC**

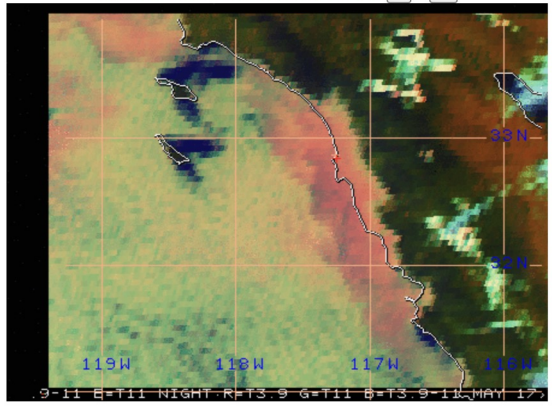
VISST Cloud Product Page

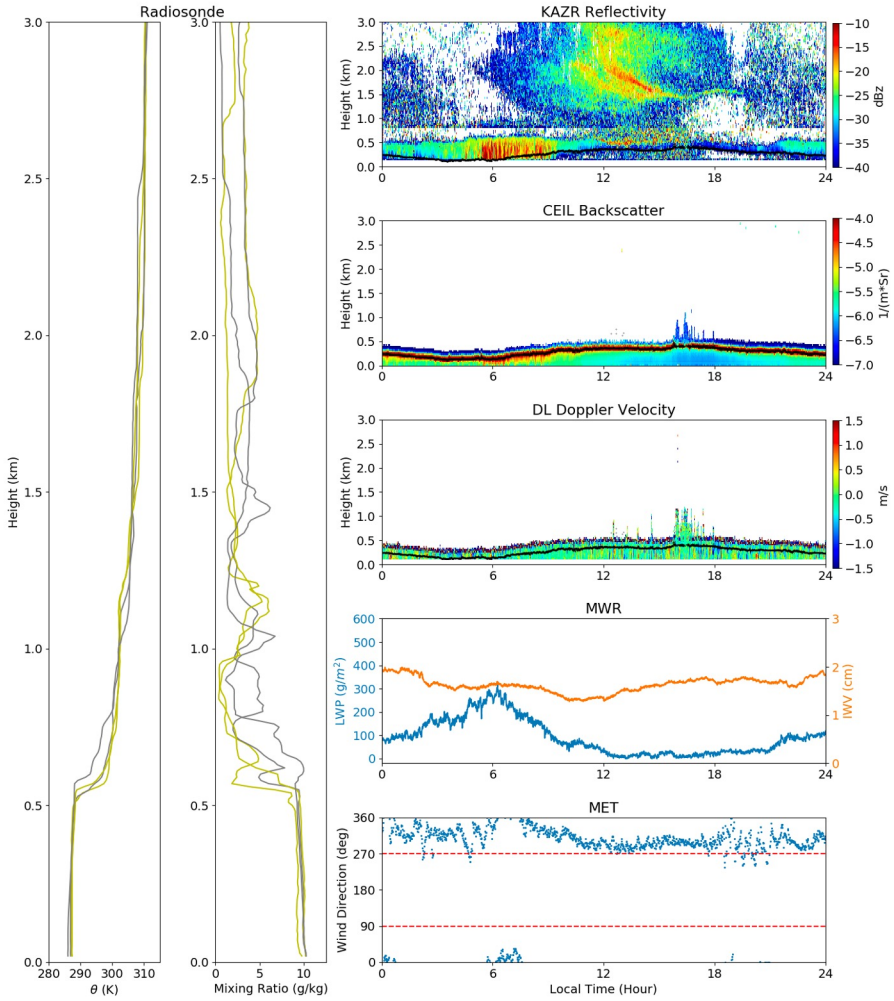
Domain: ARM EPCAPE Small Domain | Imagery | Satellite: GOES-W

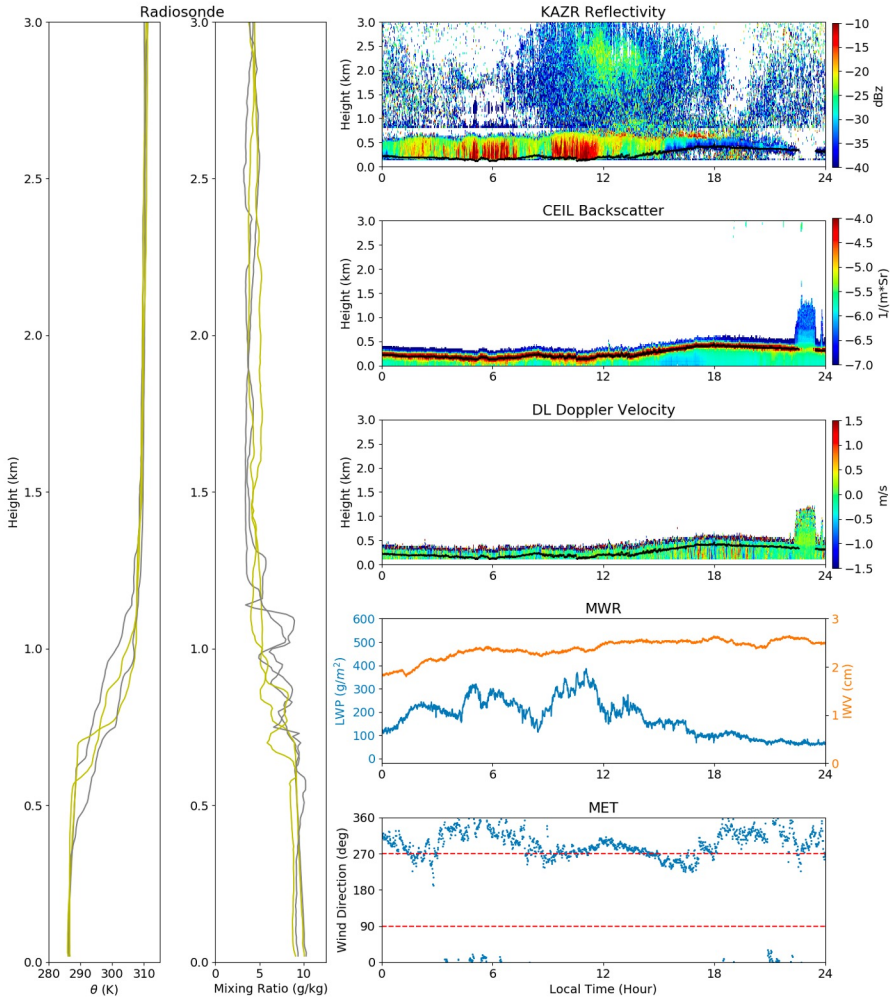
Date: 2023 | 05 | 17 | Image Time: 20:00 UTC

Image: Multi-Channel RGB | Animate: Frames ---

Viewing 2000 UTC RGB image (05-17-2023). - +



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# EPCAPE “Coastal Stratocumulus” Case Studies