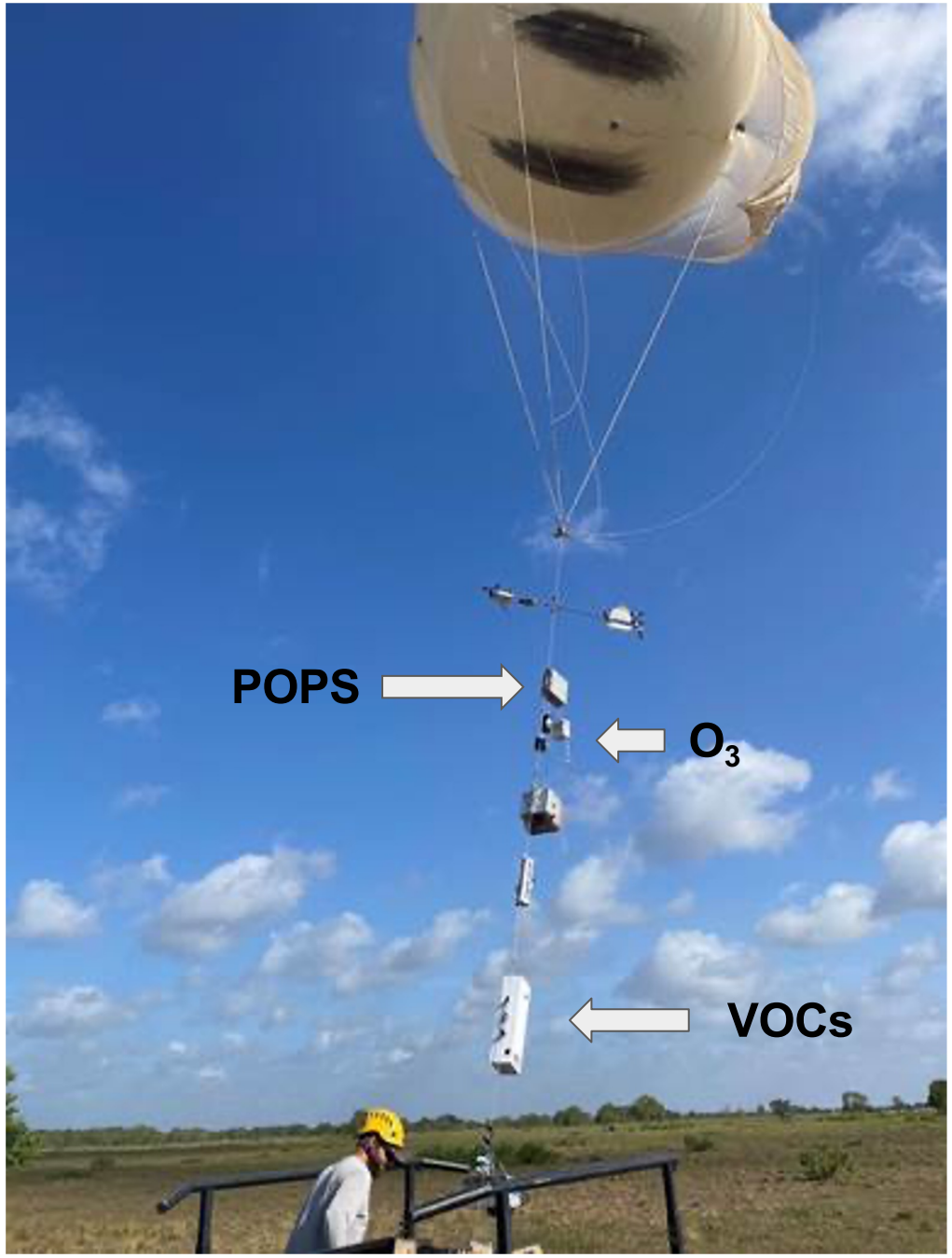
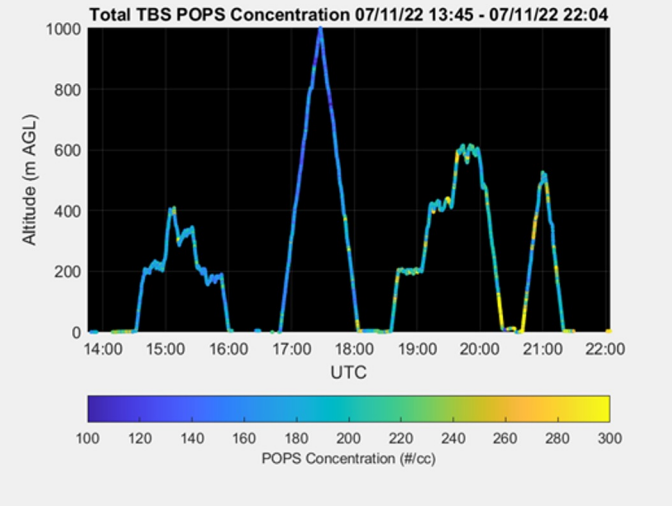


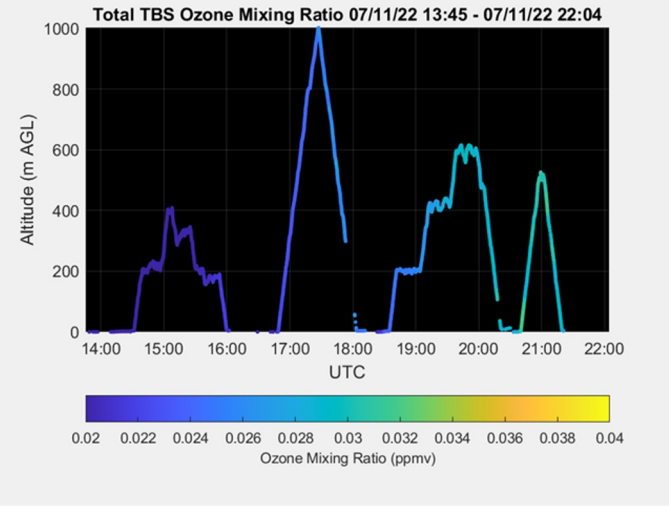
TRACER Tethersonde

(see poster by R. Sheesley)

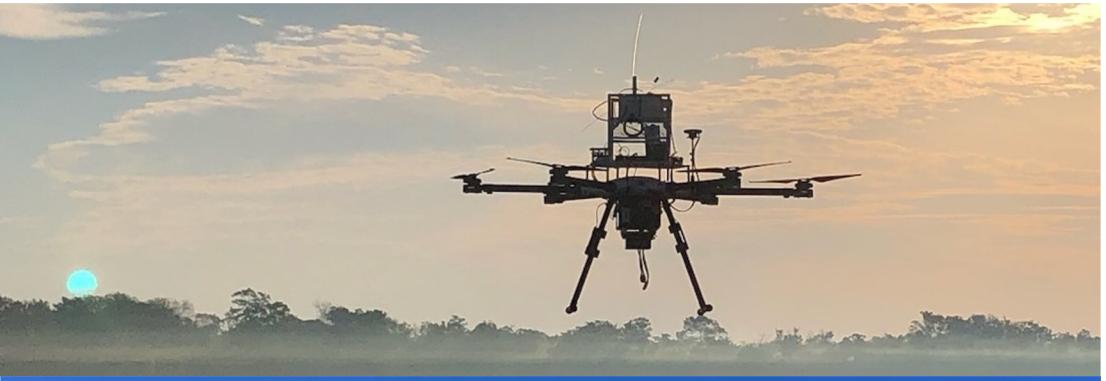
Data sets: First two weeks of June - September at Ancillary site near Guy, TX

- Ozonesondes
- VOCs: resin tube sampling on select days
  - Total of 38 resin tubes over 12 different days
- POPS: aerosol number and size (Dexheimer)





Baylor University: Meghan Guagenti, Sascha Usenko, and Rebecca Sheesley
University of Houston: James Flynn
St. Edward's University: Paul Walter
Sandia National Labs: Darielle Dexheimer and Casey Longbottom



TRACER-AQ2

Data set: Measurements of VOCs and trace gases

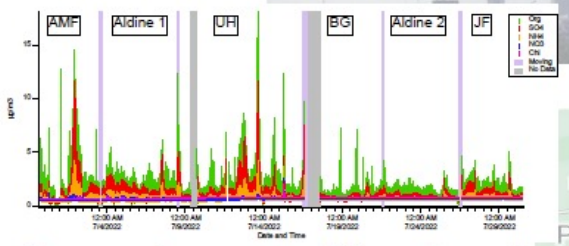
- Mobile Air Quality Labs
  - MAQL1 (UH, Aug/Sept)
  - MAQL2 (Baylor, Sept)
- Boats
  - UH Pontoon (Galveston Bay)
  - Victory (Houston Ship Channel)
  - Red Eagle (Gulf of Mexico)
- Ozonesondes (65 total)
- UAV (drone, vertical profiling)
- Remote sensing (Pandora)
- FluxSense

Funded by the Texas Commission on Environmental Quality (TCEQ). Project managers: Doug Boyer and Madison Knapp

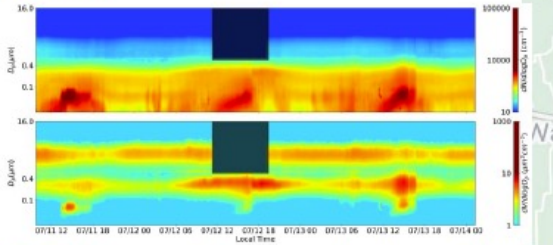
University of Houston: **James Flynn**, Sergio Alvarez, Travis Griggs, Subin Yoon, Alex Ulinski, Yuxuan Wang, and Shan Zhou
Baylor University: Sascha Usenko, Rebecca Sheesley, Meghan Guagenti
St. Edward's University: Paul Walter and Mark Estes
Virginia Tech: Elena Lind
FluxSense: Jerker Samuelsson, Marianne Ericsson

TRACER-MAP: Mapping Aerosol Processes across Houston during convective cell events

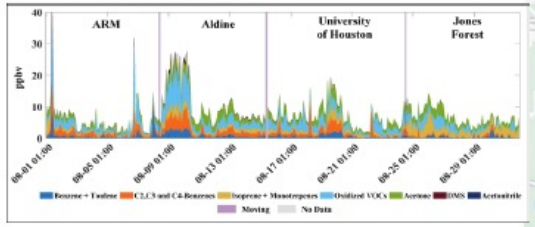
PIs: Rebecca Sheesley, Sascha Usenko, Yuxuan Wang, Jimmy Flynn, Rob Griffin, Don Collins



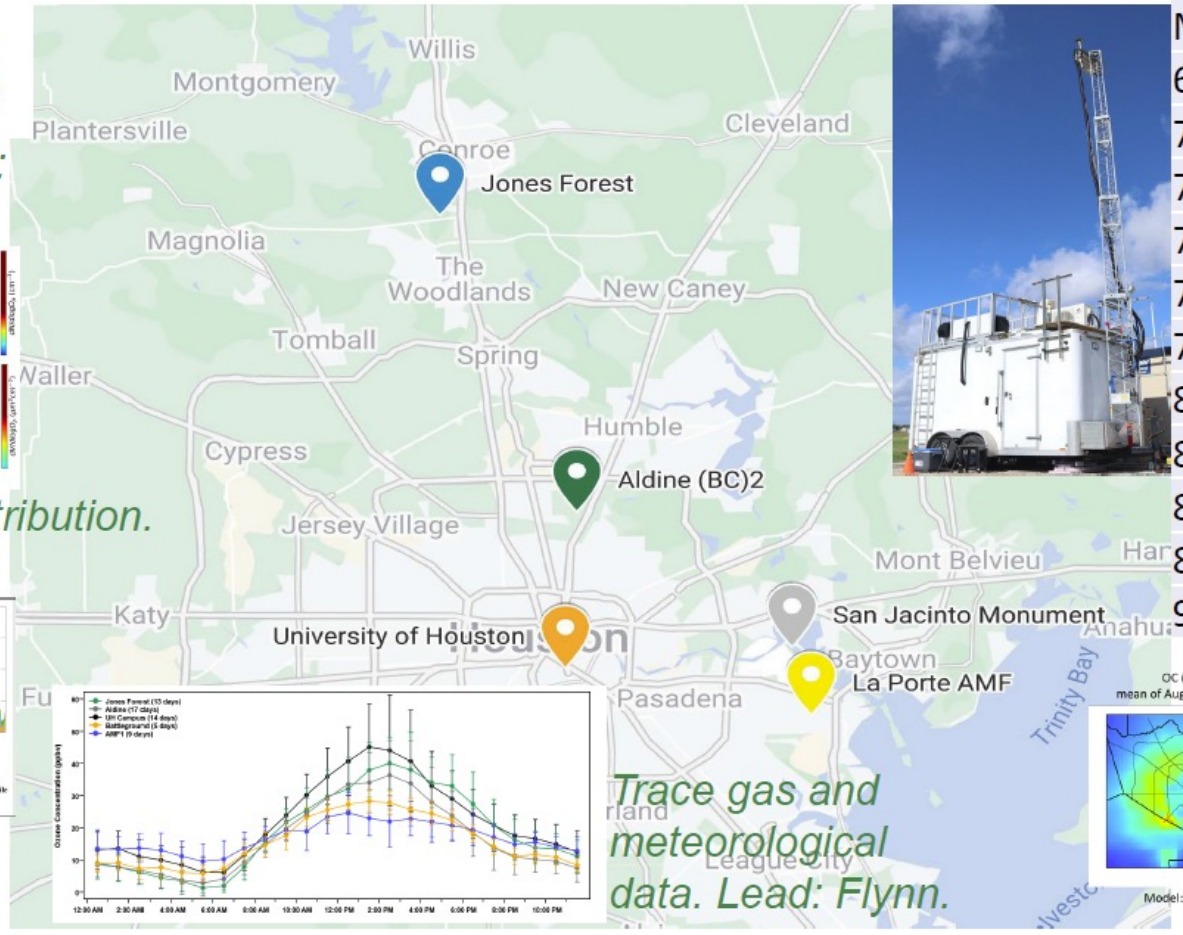
Aerosol composition. Lead: Griffin



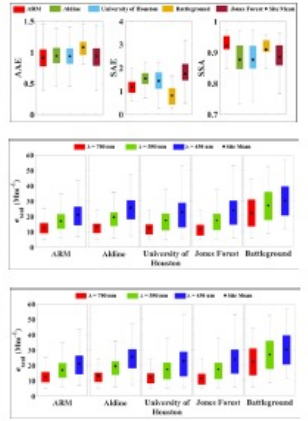
CCN, number and size distribution. Lead: Collins



VOC composition. Lead: Sheesley/Usenko

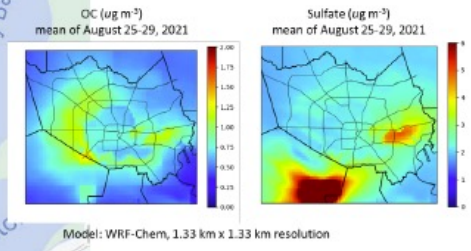


Move date	End location
6/28/2022	AMF
7/3/2022	Aldine
7/8/2022	UH
7/16/2022	Battleground
7/21/2022	Aldine
7/26/2022	Jones Forest
8/1/2022	AMF
8/8/2022	UH
8/15/2022	Aldine
8/24/2022	Jones Forest
9/3/2022	Battleground



Aerosol optical properties. Lead: Sheesley/Usenko

Trace gas and meteorological data. Lead: Flynn.



WRF-Chem. Lead: Wang

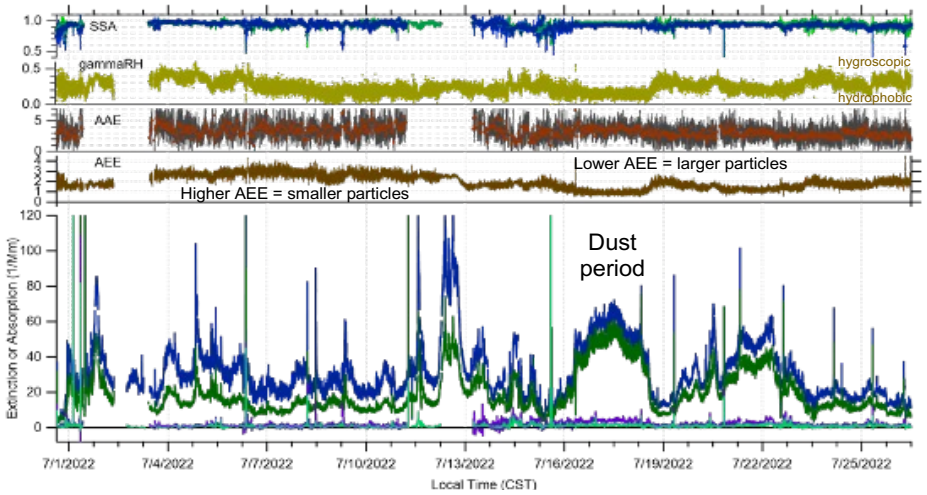
TRACER-MAP sites across the Houston metropolitan area. See poster for more science!

ASR TRACER-CAT

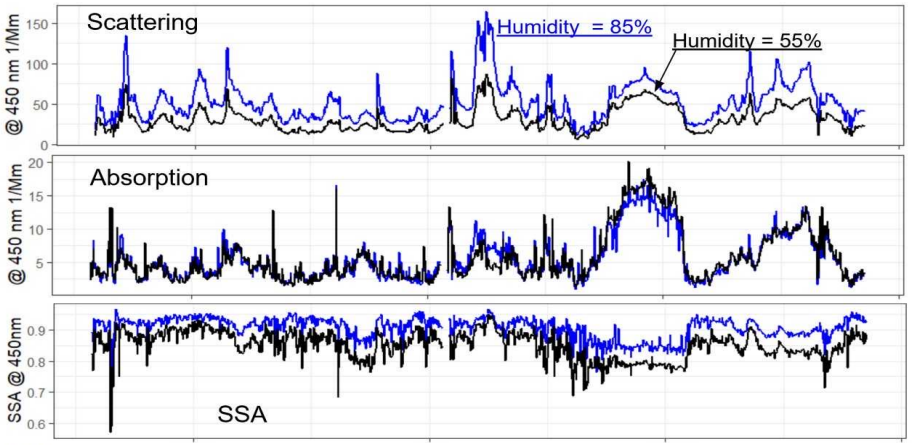
Atmospheric System Research

- Elucidate how Absorbing Aerosols (AA = BC, BrC, Dust) mix and age to increase their hygroscopicity.
- Establish how water uptake affects their light absorption
- Discover and explain effects of chemical composition, morphology, and phase of mixed AAs on absorption as a function of RH.

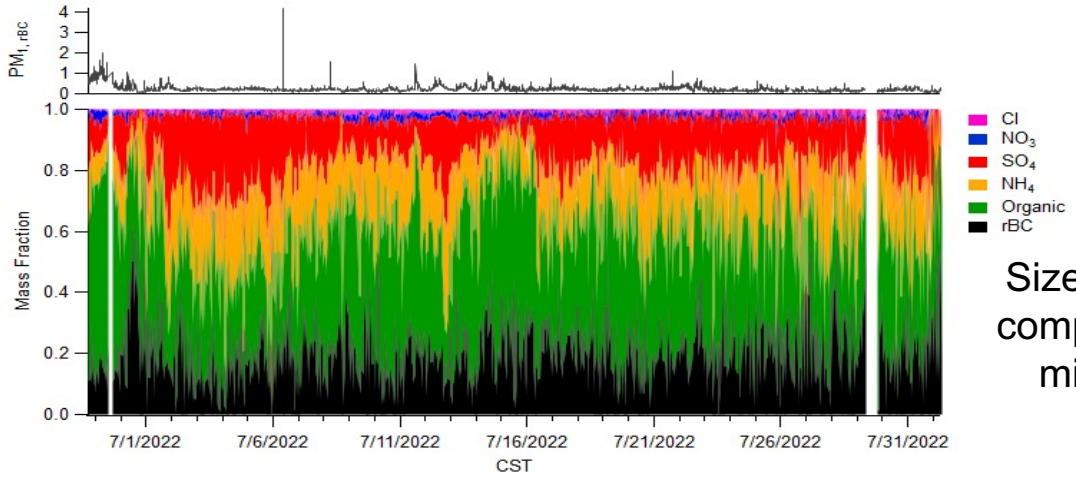
DUBEY ET AL. ASR POSTER (1-WED)



Variability of intensive optical properties



Humidity dependence of optical properties

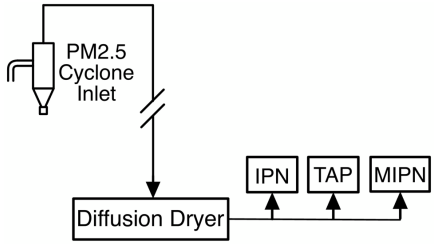


Size resolved composition of mixed BC

Establishing Robust Correction Schemes for Improved and Reliable ARM-AOS Aerosol Optical Data Products

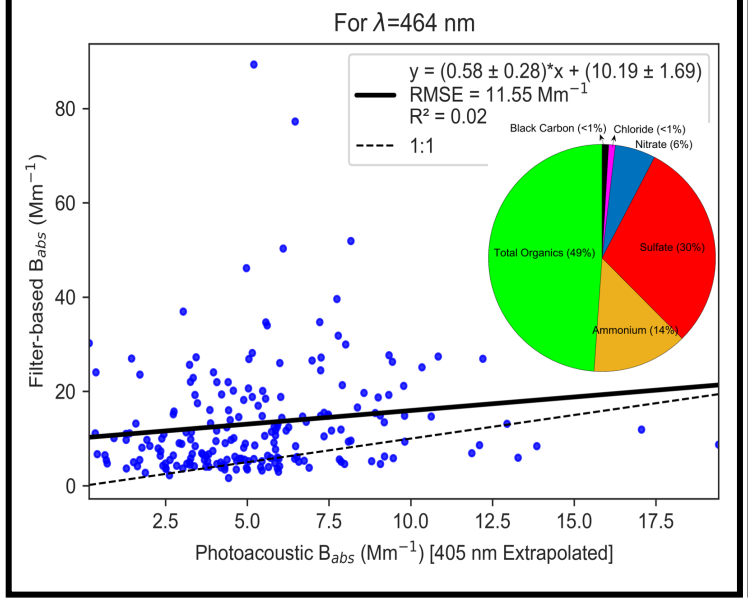
Instruments and Setup

- Single-Wavelength Integrated Photoacoustic Nephelometer (IPN) – 405, 721, 1047 nm
- Multi-Wavelength Integrated Photoacoustic Nephelometer (MIPN) – 405, 488, 561, 670 nm
- Tricolor Absorption Photometer (TAP) – 467, 528, 652 nm

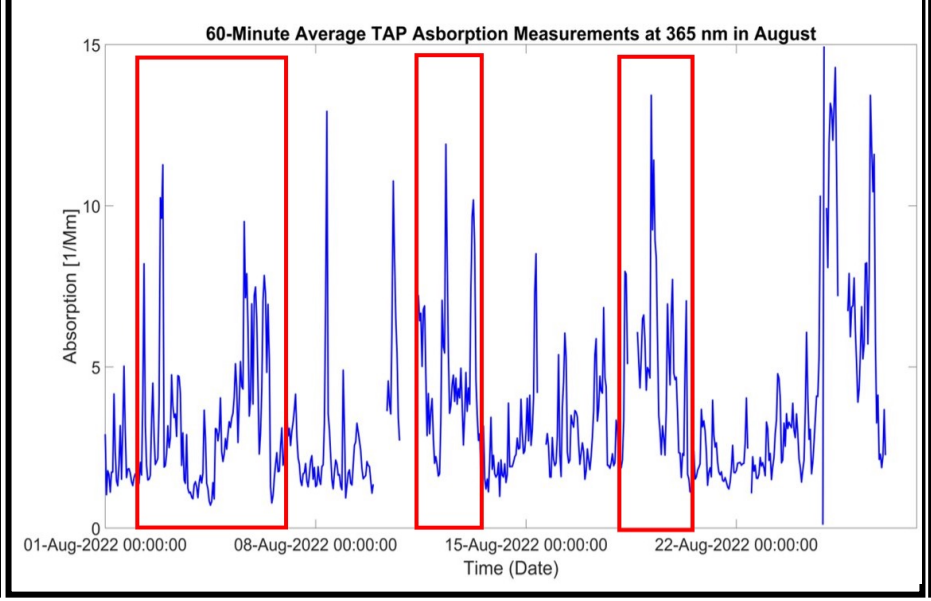


Preliminary Findings

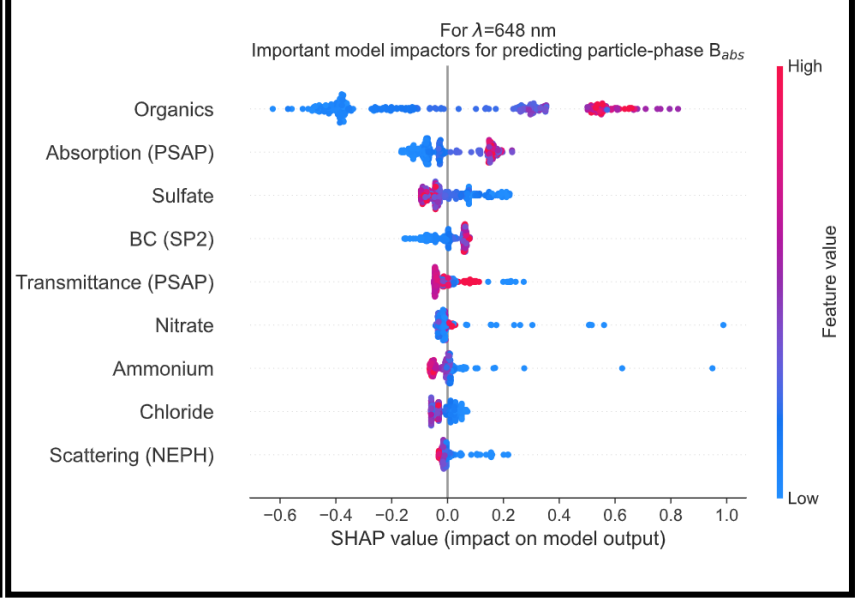
High organics and sulfates concentrations possibly associate with higher biases in filter-based absorption measurements and low linearity between filter- and particle-based absorption measurements.



Local flaring and fire events contribute to peaks in aerosol light absorption measurements.



Applying machine learning-based algorithms, we identified critical aerosol properties to predict particle-based absorption and to correct filter-based measurement biases.



Size-Resolved Particle Flux Measurements during TRACER

Motivation

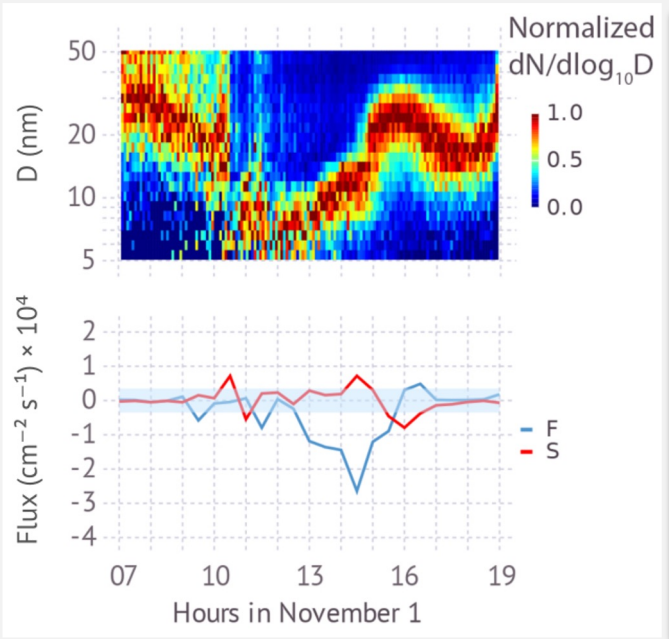
- Small particle events at SGP have shown to often coincide with the downward flux of 3-10 nm size particles, suggesting that formation occurs aloft

Approach

- Perform size-resolved eddy-covariance particle flux measurements at the LaPorte site during TRACER using an array of particle counters
- Test a new remote sensing technique for particle mass flux retrieval using a Doppler LIDAR

Impact

- New dataset during IOP from June 1 through September 29, 2022
- Nano size-distributions and hygroscopic growth data for 15-50 nm available to supplement AOS measurements
- Analysis of data is ongoing. Come and see the poster!



Flux measurements at SGP

Flux Tower during TRACER

[Islam, M. M., Meskhidze, N., Rasheeda Satheesh, A., and Petters, M. D. (2022). Turbulent flux measurements of the near-surface and residual-layer small particle events. Journal of Geophysical Research: Atmospheres, 127, e2021JD036289. https://doi.org/10.1029/2021JD036289]

Ice nucleating particles (INPs): Collections during TRACER

Tom Hill*, Carson Hume and Jessie Creamean*

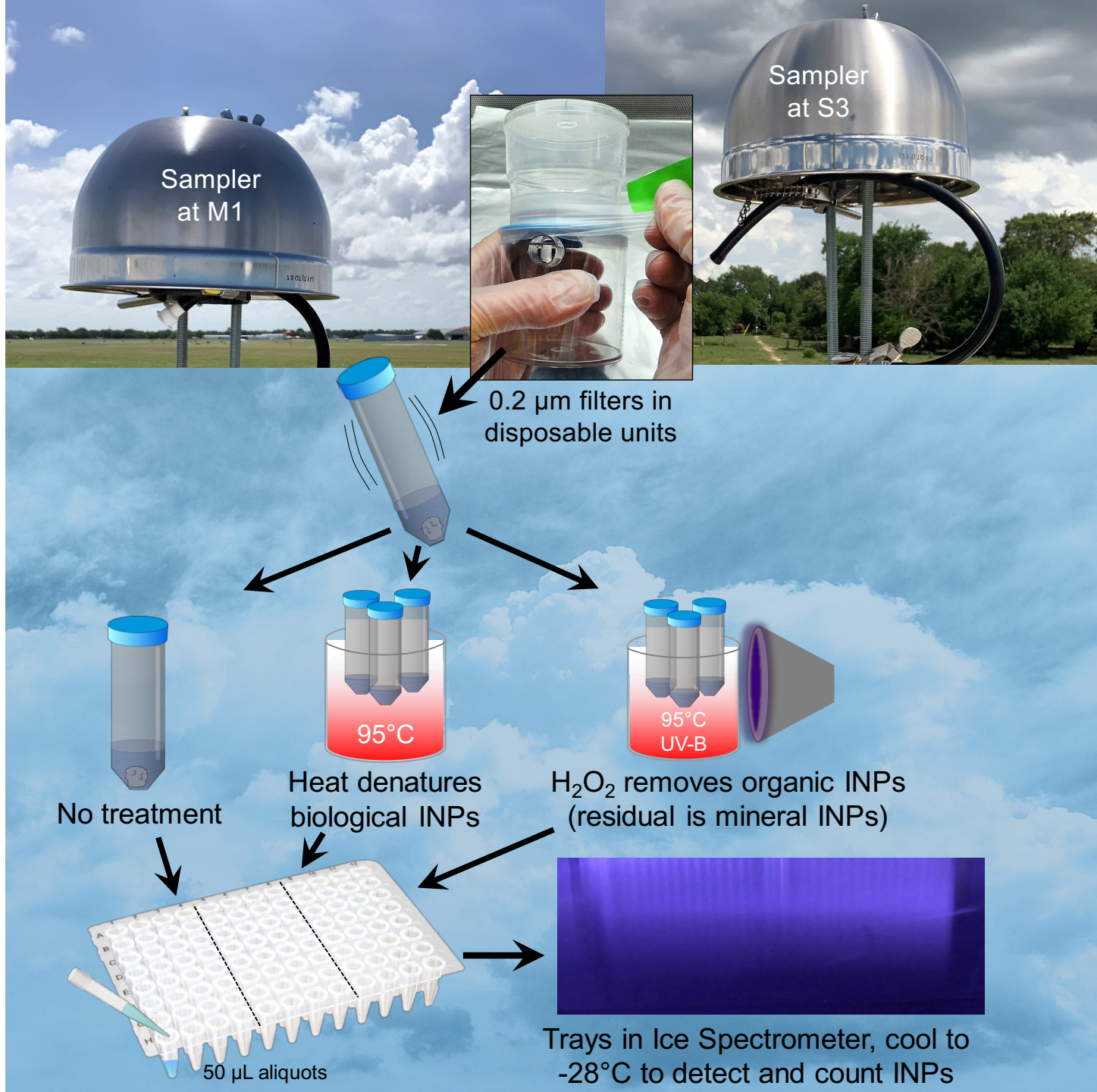
*Co-mentors

INPs catalyze the formation of ice in supercooled clouds. INPs influence: precipitation, latent heat release, cloud electrification, cloud albedo and cloud lifetime.

- INPs sampled using 0.2 µm pore polycarbonate filters
- Run every 3-4 days at M1 and S3 (also synchronized with ESCAPE flights)

- Run for 24 h, filtering ~20,000 L air
- Will measure INPs active from 0 to ~-28°C
- Detection limit will be 0.0002 INPs L^{-1} air
- We will re-test selected samples after heating (95°C) and H_2O_2 digestions to estimate the relative abundance of heat-labile (biological) INPs, heat stable organic INPs, and inorganic INPs (i.e., minerals)

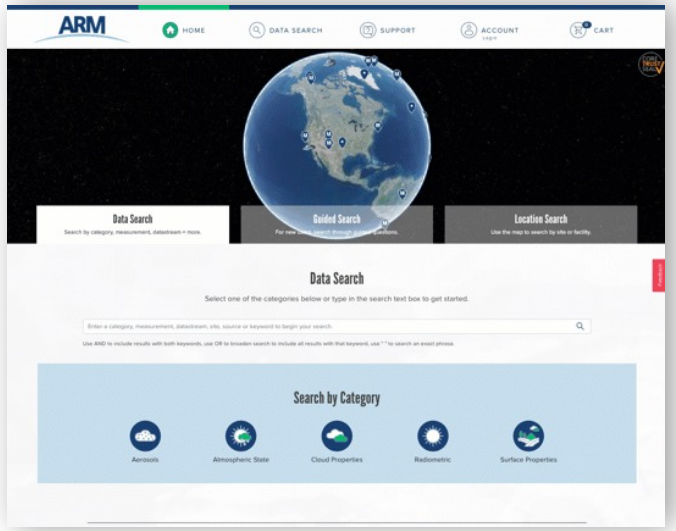
Sincere thanks to **David Oaks**, Mark Spychala, Ana Pessoa and Daniel Bahrt



ARM Data Center - Data and Computing Resources

- TRACER Data Availability
  - 38 TB of data from 188 data streams containing 130 primary measurements
  - https://adc.arm.gov/discovery/#/results/s::tracer
- Computing resources:
  - ADC research systems for data processing and data generation
  - Cumulus Cluster for large-scale data analysis
  - Jupyter Notebook with playbooks for developing data visualization and analysis
  - Citation guidelines using citation generators
- Seeking input for defining data epoch, user contributed Jupyter notebooks, and the Data Workbench concept
  - Please stop by the **Data Booth** to discuss the above

188 TRACER datastreams
- 80 a1 level datastreams
- 77 b1 level datastreams
- 2 b2 level datastreams
- 27 c1 level Value Added Products
- 2 c2 level Value Added Products



2022 Joint ARM User Facility and ASR PI Meeting (1)

~32 TRACER Posters

Ahmed et al. "Thermodynamic and dynamic controls on deep convection in ARM measurements"
Bruning et al. "Radar polarimetry and flash rate variability in varying thermodynamic and aerosol environments…"
Collis et al. "Forecasting For Operations And Science: The TRACER+ Experience"
Dubey et al. "Predicting Mixing & Humidity Effects on Absorbing Aerosol Optics…"
Feng et al. "Radar updates of the TRACER and SAIL field experiments"
Grover et al. "The Python ARM Toolkit (PyART) – Impact and future"
Jackson et al. "Open Classification of Regimes in the Southeast USA: An open-source machine learning classifier…"
Jensen et al., "An Overview of the TRacking Aerosol Convection interactions ExpeRiment (TRACER)"
Hill et al. "New long-term measurements of ice nucleating particles at diverse ARM sites"
Kasparoglu et al. "Size-resolved eddy-covariance particle flux measurements during the TRACER campaign"
Klein et al. "Boundary layer profile observations during TRACER-CUBIC"
Kollias et al. "Preliminary Analysis of Agile Adaptive Polarimetric Doppler Radar Observations of Isolated…"
Li et al., "Size-resolved aerosol hygroscopicities under both supersaturated and subsaturated conditions…"
Luke et al. "Convective cell tracking during the TRACER IOP using Multi-sensor agile adaptive sampling"
Matsui et al. "NUWRF-EPIC TRACER IOP forecasting and validation results using polarimetric radar simulator…"
Muradyan and Coulter "The use of wide field receivers at ARM for in-field MPL overlap calibration"
Oue et al., "Examining convective cell evolution and aerosol impacts using cloud resolving model simulations…"

2022 Joint ARM User Facility and ASR PI Meeting (2)

~32 TRACER Posters

Pillar-Little et al. "Initial perspectives on the lower atmosphere during the TRACER-IOP from UAS"
Qian et al. "Precipitation features and corresponded circulation and synoptic environment over the Texas…"
Rapp et al. "TAMU TRACER: A First Look"
Rivera-Adorno et al. "Chemical composition and morphological analysis of atmospheric particles collected…"
Saleeby et al., "Aerosol influence on microphysical processes in simulated deep convection."
Senum et al. "Inter-comparison of the AE33 and PSAP for measuring ambient aerosols"
Sheesley et al. "TRACER-MAP: preliminary looks at the Jul – Aug 2022 measurements across the Houston…"
Sheesley et al. "Preliminary results from TRACER- Black and brown carbon – SP2"
Singh et al. "Characterizing the urban-rural contrast in atmospheric aerosol during TRACER"
Smith et al. "Ultrafine aerosol particle formation and impacts in Houston during TRACER"
Subba et al. "Characterization of new particle formation events during the TRACER campaign"
Thieman et al. "SatCORPS Satellite-derived cloud and radiative properties: ARM site coverage updates"
Walter et al. "Preliminary results from TRACER-TetherSonde"
Wang et al. "Lifecycel of deep convective clouds in the Houston, TX region"
Zawadowicz et al. "Chemistry of nonrefractory submicron aerosol in urban industrialized Texas…"

Thanks to Site Technicians

David

Mark

Gabby

Daniel

An Overview of TRACER (+) Science and Operations

Michael P. Jensen, Chongai Kuang
Brookhaven National Laboratory
TRACER Science and Operations Team
TRACER breakout, ARM/ASR Meeting
24 October 2022

ARM CLIMATE RESEARCH FACILITY

ASR Atmospheric System Research