

Aerosol composition and processing Surface-Atmosphere Integrated Laboratory (SAIL) campaign

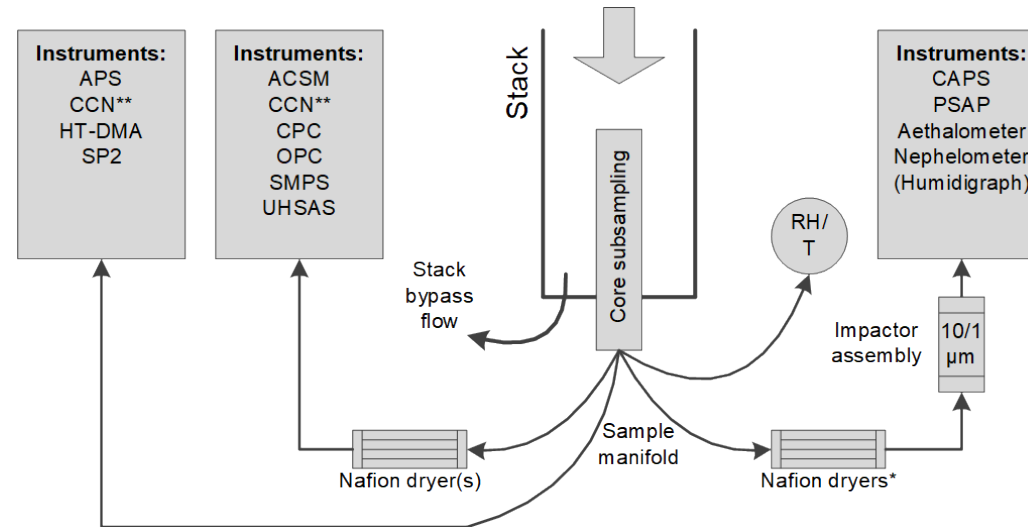
Maria A. Zawadowicz, Brookhaven National Laboratory

with contributions from: Chongai Kuang, Ashish Singh, Janek Uin, Rebecca Trojanowski, Arthur J. Sedlacek III and Olga Mayol-Bracero

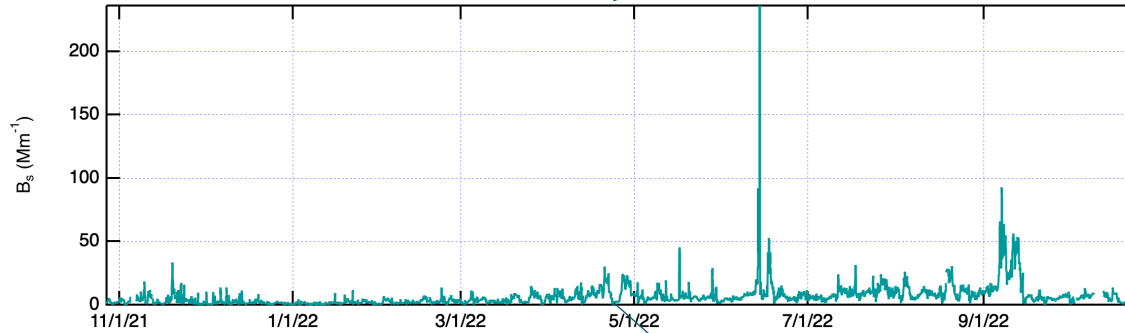
October 26, 2022

ARM Aerosol Observing System (AOS)

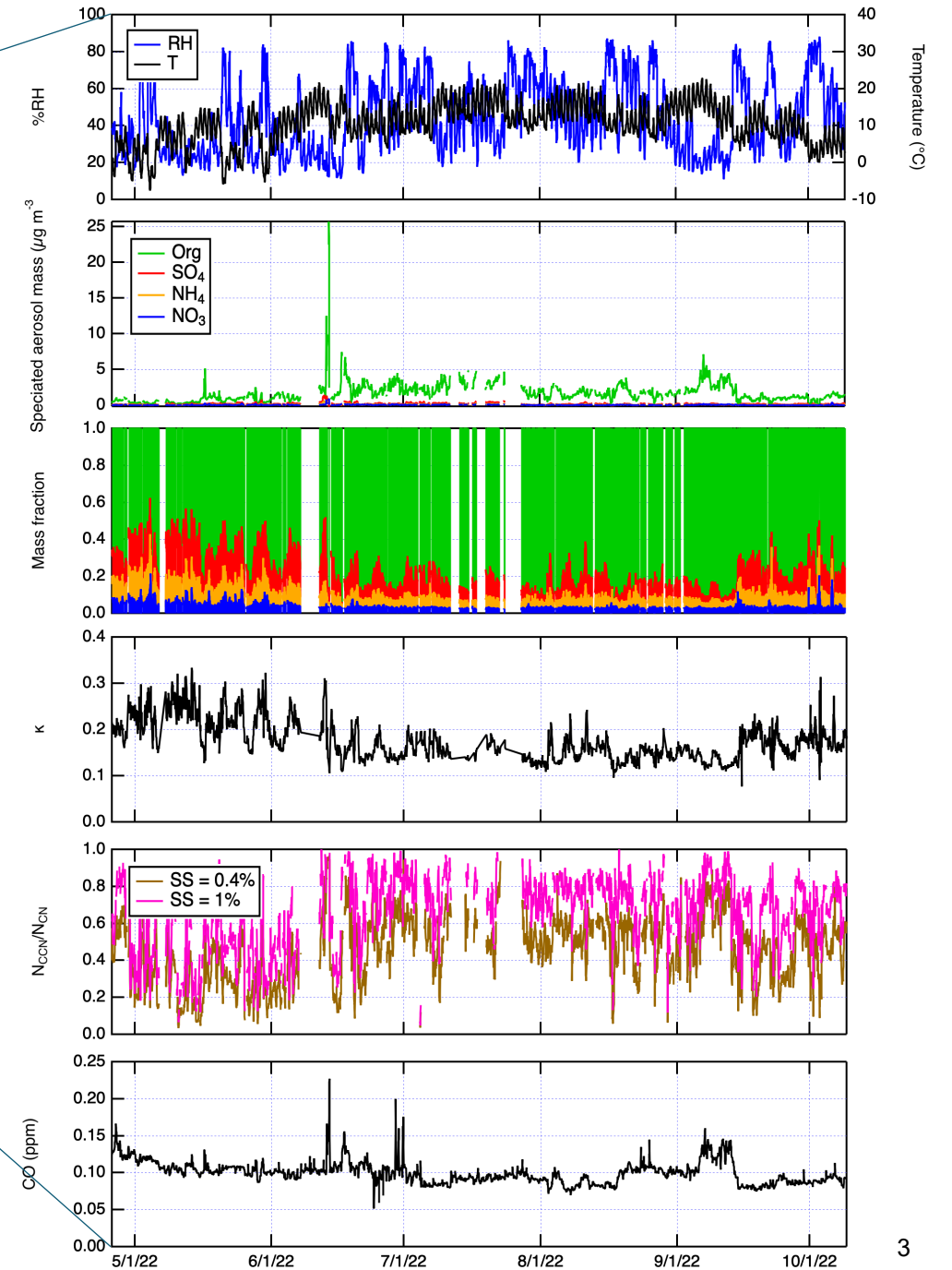
- Self-contained platform (20-ft shipping container) for **ground-based aerosol (and trace gas) measurements**
- Part of larger ARM sites, 5 AOSes (fixed sites and mobile facilities)
- Stack (aerosol inlet) height – ca. 30 feet (10-m) above ground level.
- Inlet particle size cut (0.016 – 6.2 μm)
- Deployed in diverse locations and climate regimes since 1996.



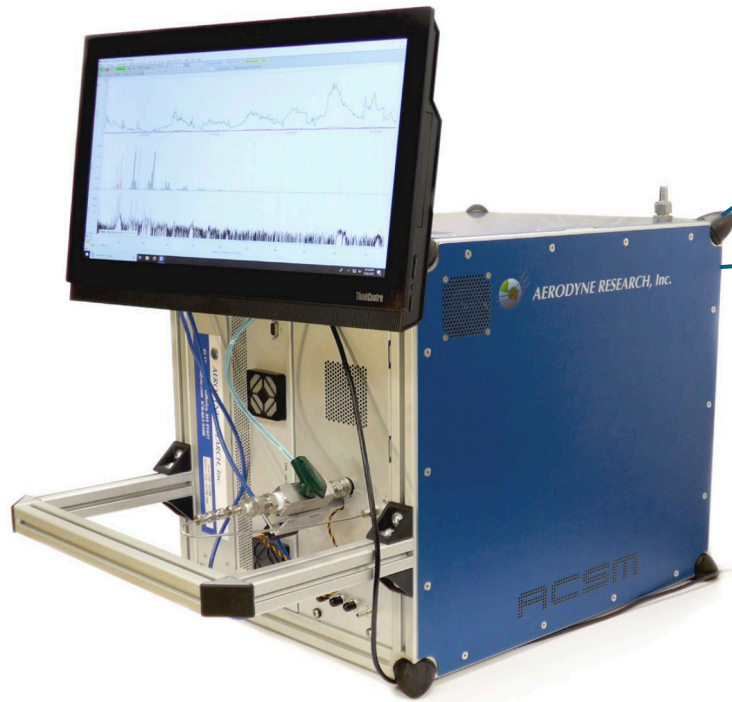
AOS Measurements during SAIL



- AOS installed on Crested Butte Mountain
- *In-situ* measurements of aerosol number, composition, optical properties, size distributions and hygroscopicity
- Weather station on top of the container

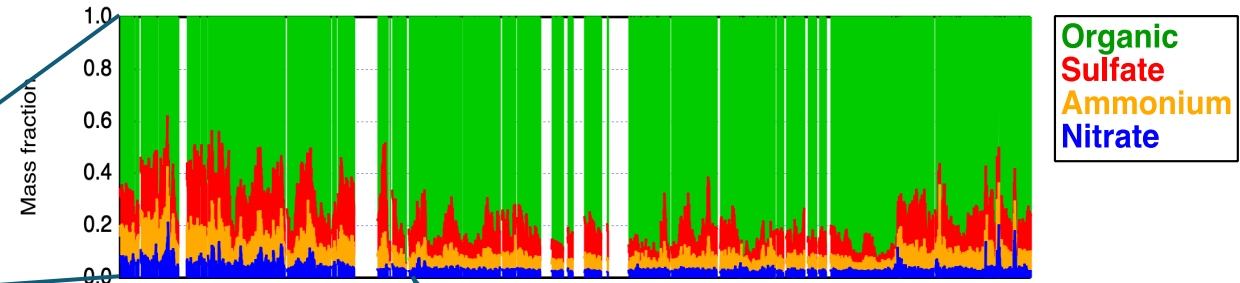


Aerosol chemistry measurements during SAIL

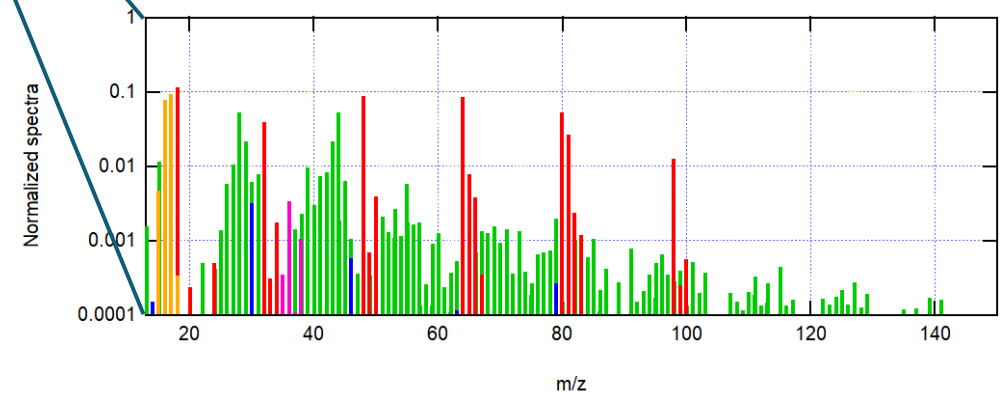


Aerosol chemical speciation monitor

10-minute average measurements of non-refractory submicron aerosol composition



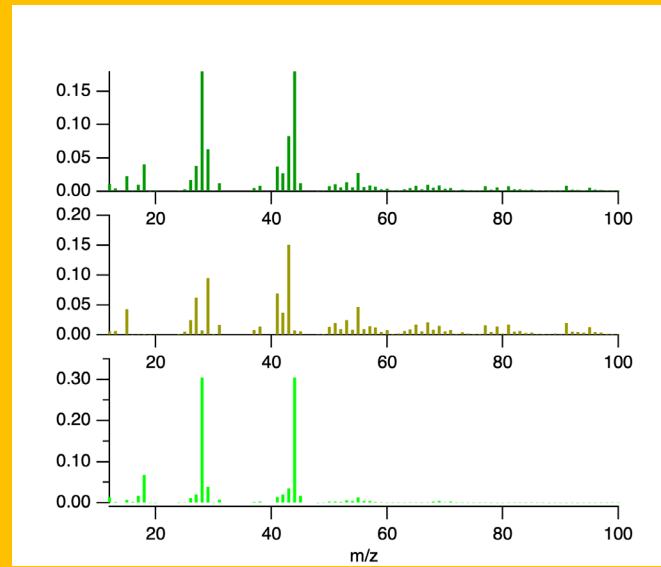
Mass spectrum



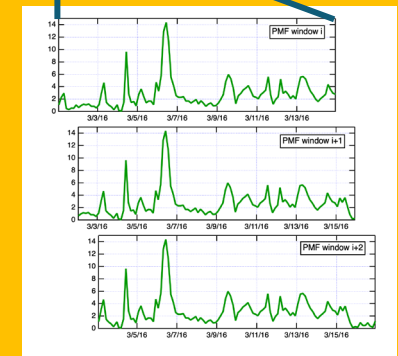
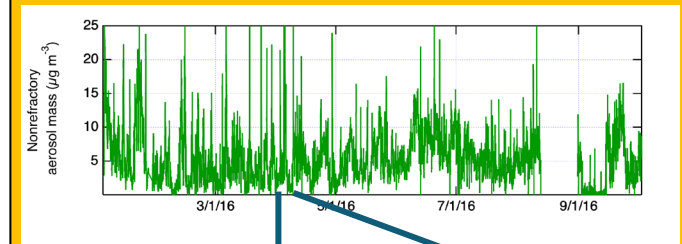
PMF PI product procedure

Unconstrained PMF algorithm performed 350 times

Derive a set of reference profiles using clustering



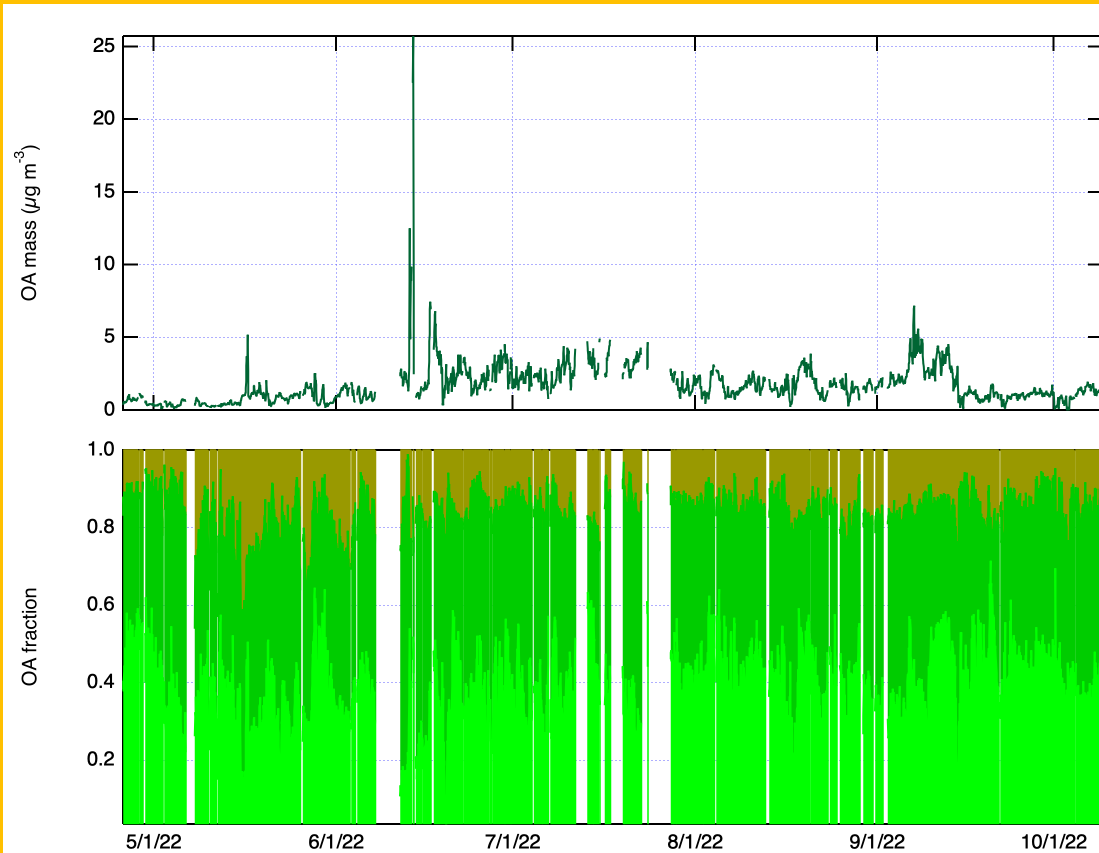
Rolling PMF of the whole ACSM SAIL dataset using the ME-2 algorithm with biogenic SVOOA constrained and two free factors



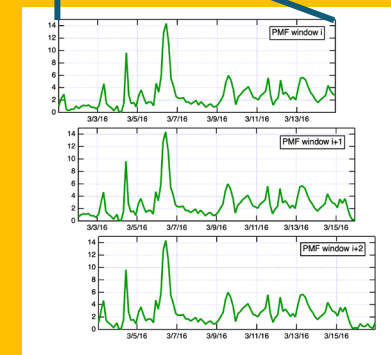
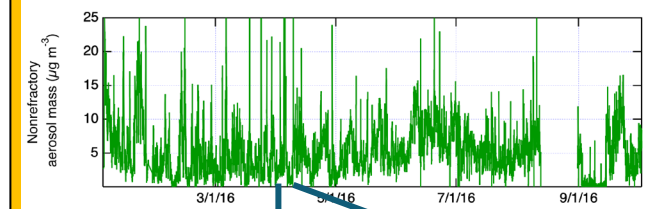
- ACSM mass spectra were factorized into source profiles using positive matrix factorization (PMF)

PMF PI product procedure

Results:



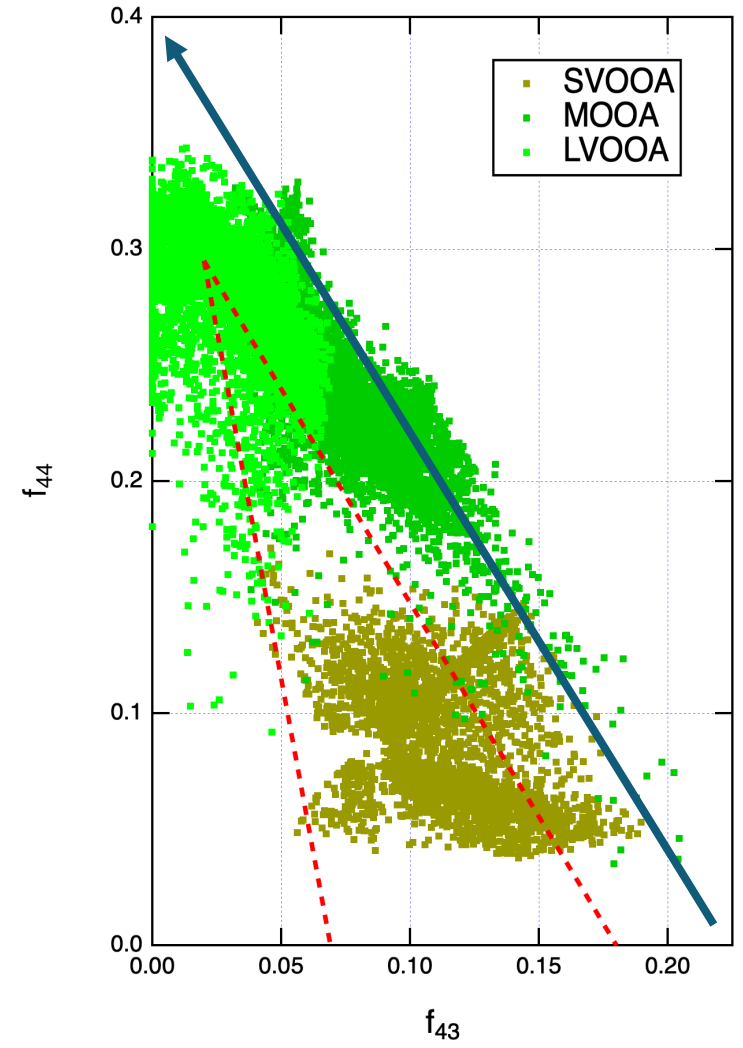
Rolling PMF of the whole ACSM SAIL dataset using the ME-2 algorithm with biogenic SVOOA constrained and two free factors



PMF PI product procedure

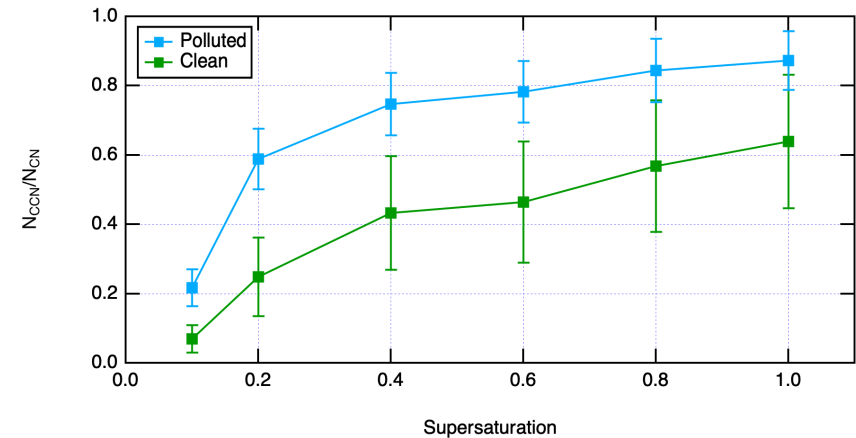
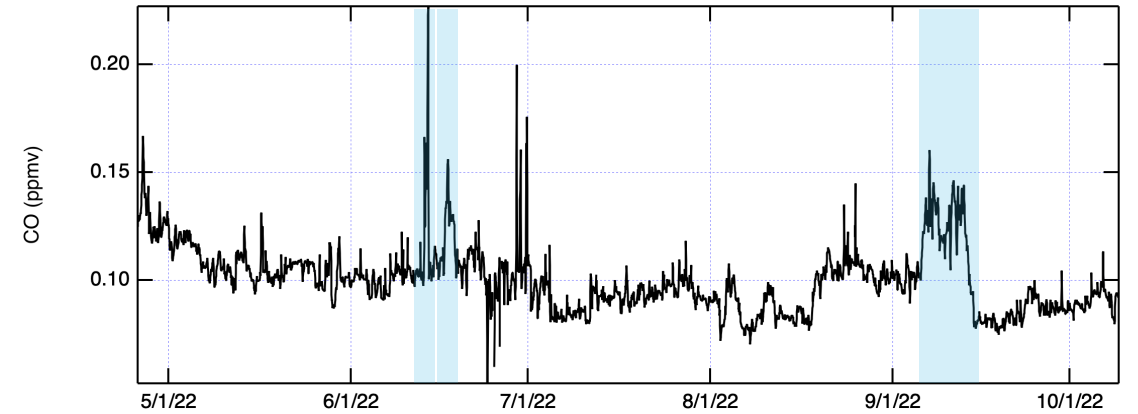
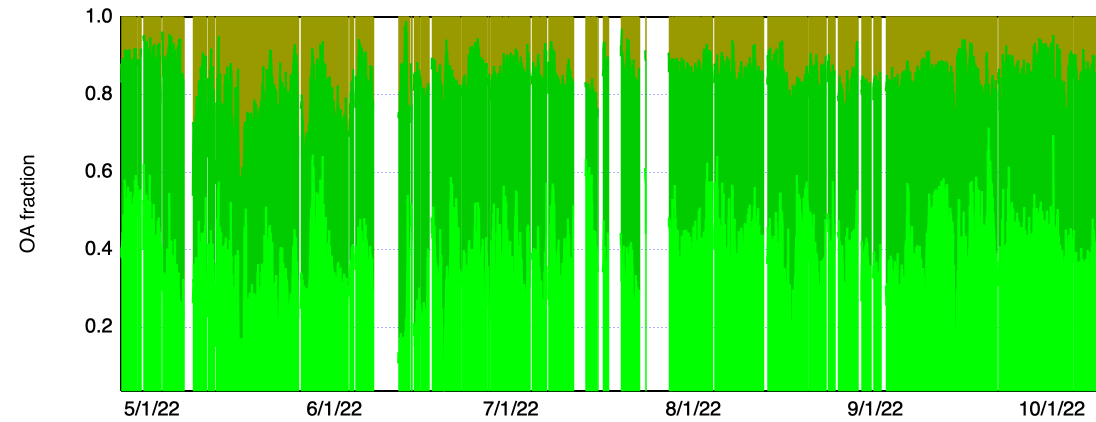
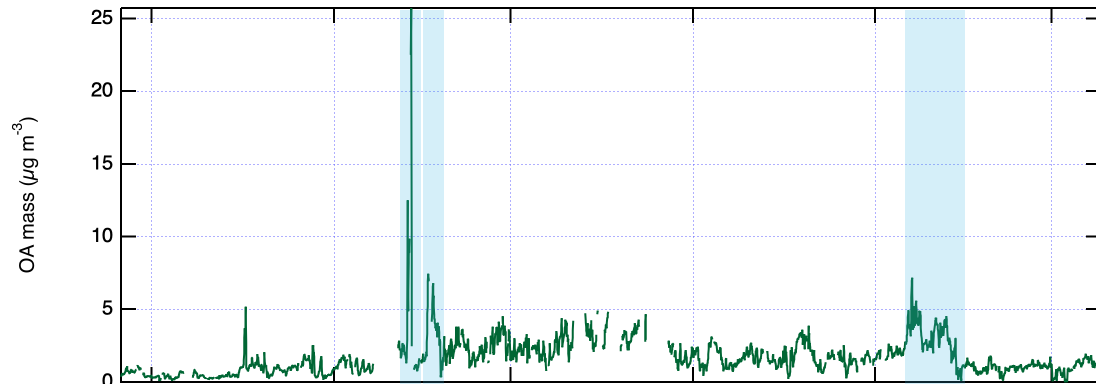
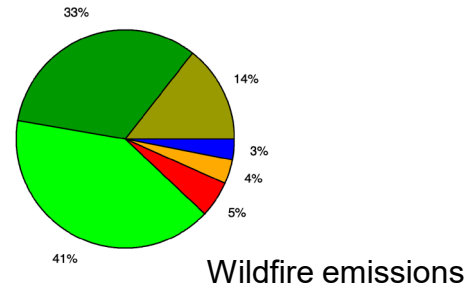
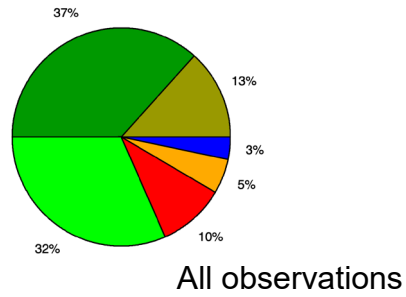


aged

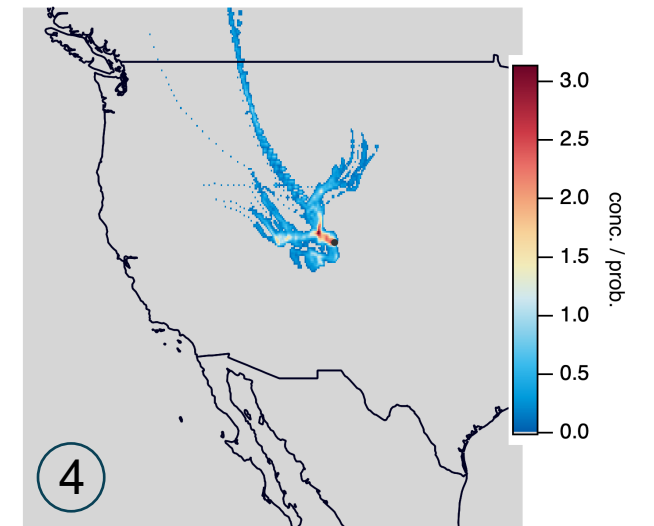
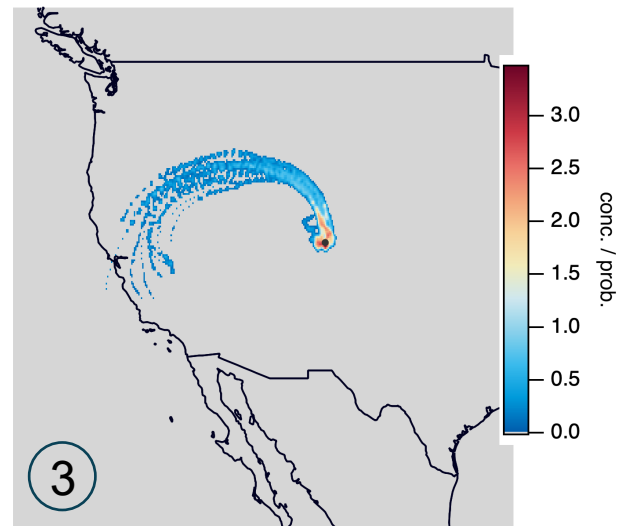
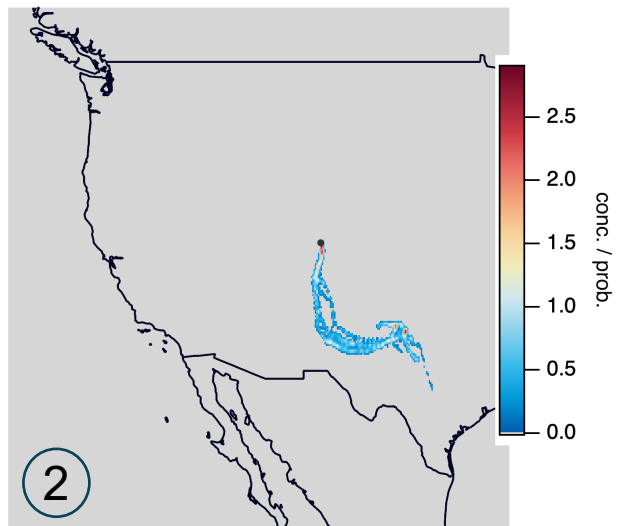
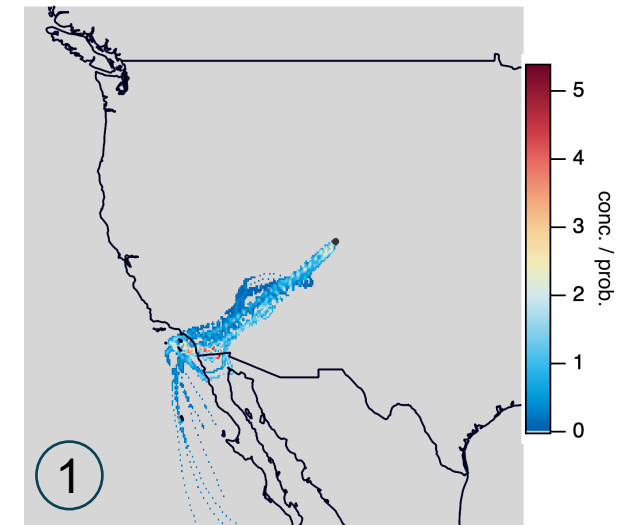
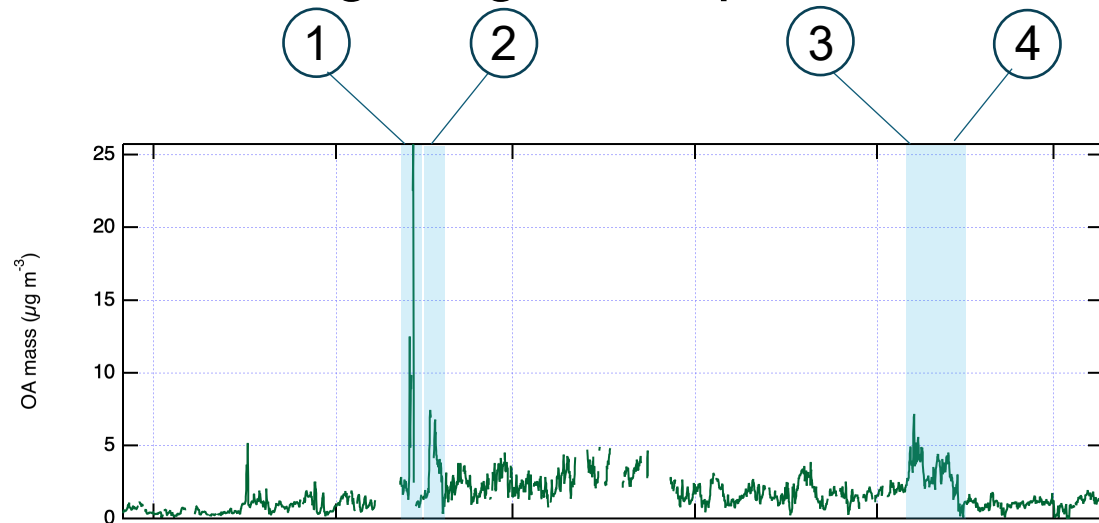


fresh

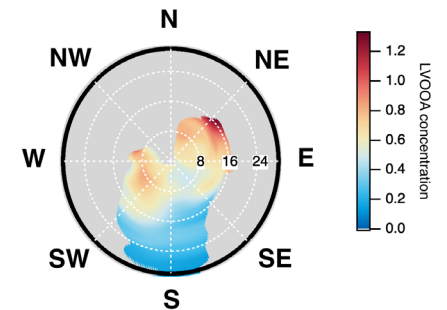
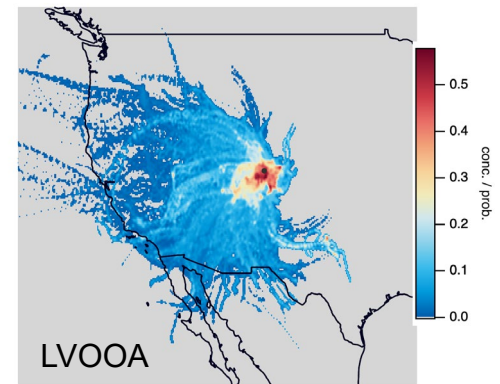
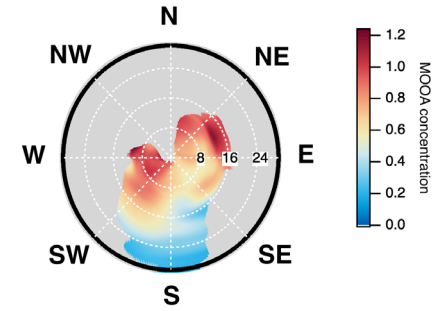
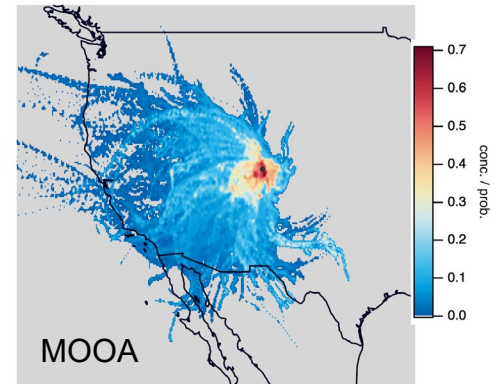
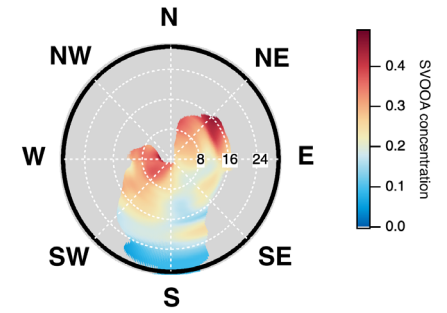
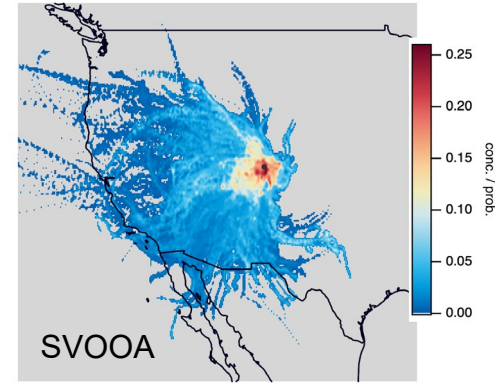
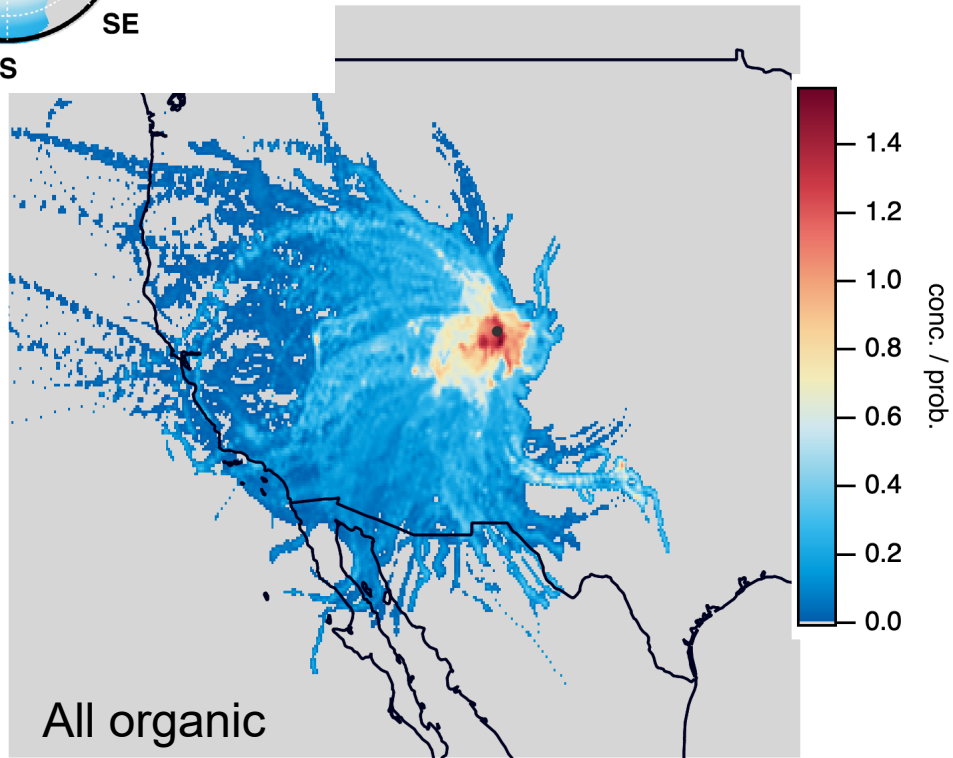
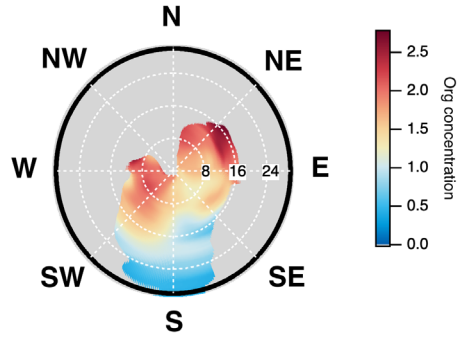
Periodic long-range transport of wildfire emissions



Periodic long-range transport of wildfire emissions



“Clean” regime emissions are a mixture of regional and local processed aerosol



Funded FICUS proposal: Characterization of the Aerobiome During ARM SAIL Campaign

• | FY23 FICUS Awardee



Maria Zawadowicz

Characterization of the Aerobiome During ARM Surface-Atmosphere Integrated Laboratory (SAIL) Campaign
Brookhaven National Laboratory

FICUS
Facilities Integrated
Collaborations for Our Science

EMSL

ARM

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- “Simultaneous vertically resolved profiles of fluorescent aerosol concentrations, accumulation and coarse-mode size distributions, and samples of aerosol for subsequent analysis with high-resolution mass spectrometry and microscopy at the Environmental Molecular Sciences Laboratory (EMSL) for identification of specific particle morphologies, chemical compositions, and biomarkers.”