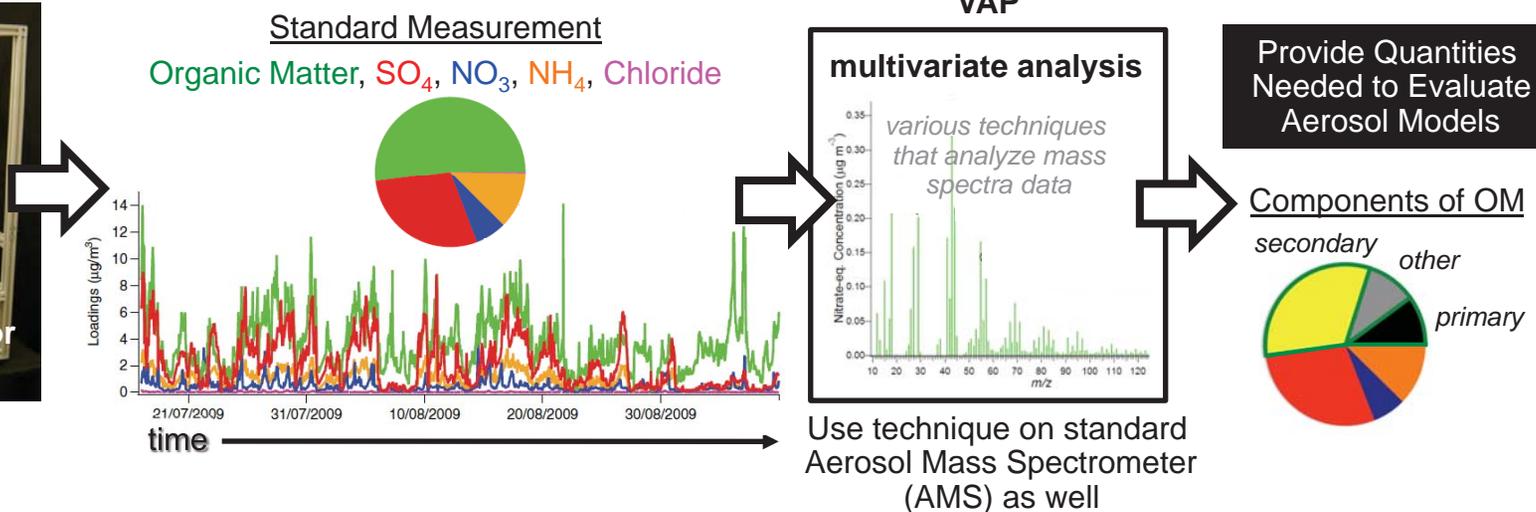


Organic Aerosol Components VAP

Qi Zhang and Jerome Fast
VAP Breakout Session

ARRA Instrumentation



- OM typically underestimated by all models and since OM is a large fraction of the total aerosol burden, this error contributes to uncertainties aerosol radiative forcing in climate models
- Components of organic matter (OM) measurements needed to better understand sources of OM and parameterize the evolution of primary and secondary OM

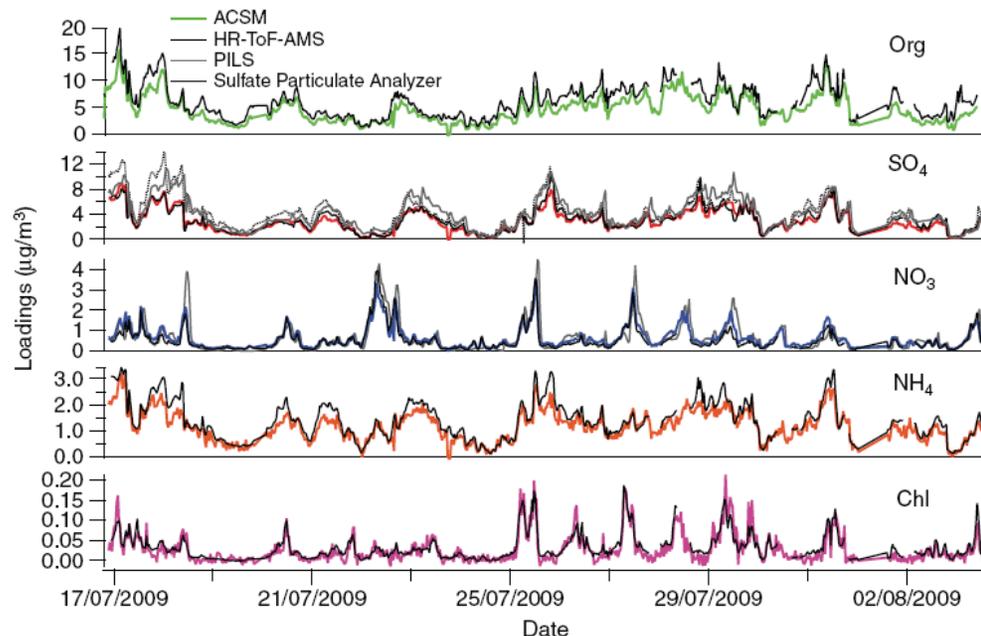
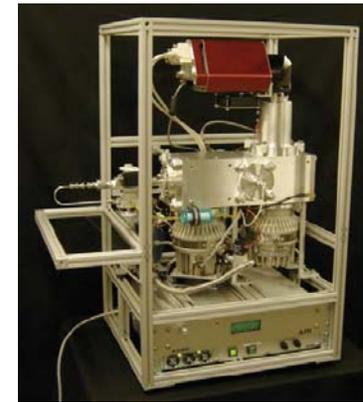
Goals

- Perform multivariate statistical analysis of the organic aerosol data from aerosol mass spectrometers.
- Represent the enormously complex atmospheric organic aerosol system as **lumped descriptions of a limited number of components** that may be related to distinct sources, physicochemical properties, and atmospheric processes

ACSM

Aerosol Chemical Speciation Monitor (ACSM)

- Measures real-time, non-refractory aerosol particle mass and chemical composition
- Long term, continuous data from 3 systems
 - *Tropical Western Pacific in Darwin, Australia*
 - *The Southern Great Plains, Oklahoma*
 - *MAOS mobile facility*



ACSM shown to give similar results to HR-ToF-AMS and other means of measuring composition
Ng et al., AST, [2011]

OA Components

OA Components from HR-ToF-AMS

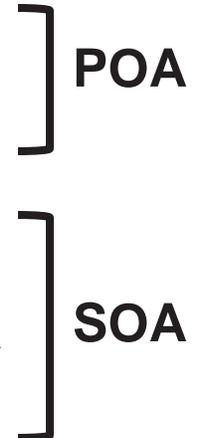
Hydrocarbon-like (HOA) ~ Traffic, combustion POA

Cooking related (COA) ~ POA from cooking emissions

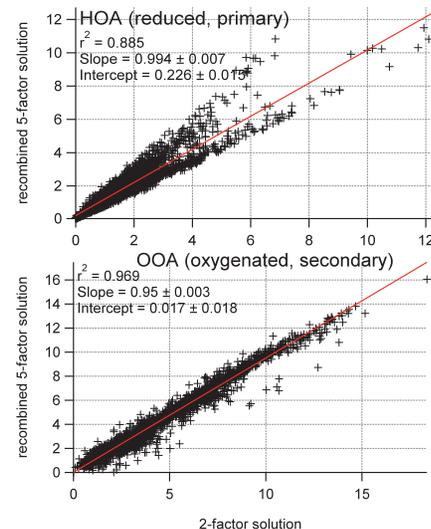
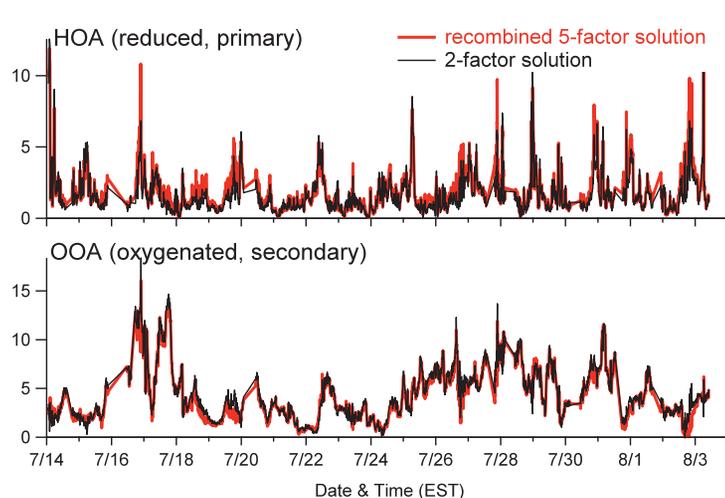
Low Volatility Oxygenated (LV-OOA) ~ Aged, regional SOA

Semi-volatile Oxygenated (SV-OOA) ~ Fresher, semi-volatile SOA

Nitrogen-enriched (NOA) ~ Amine type, likely SOA



OA Components from ACSM

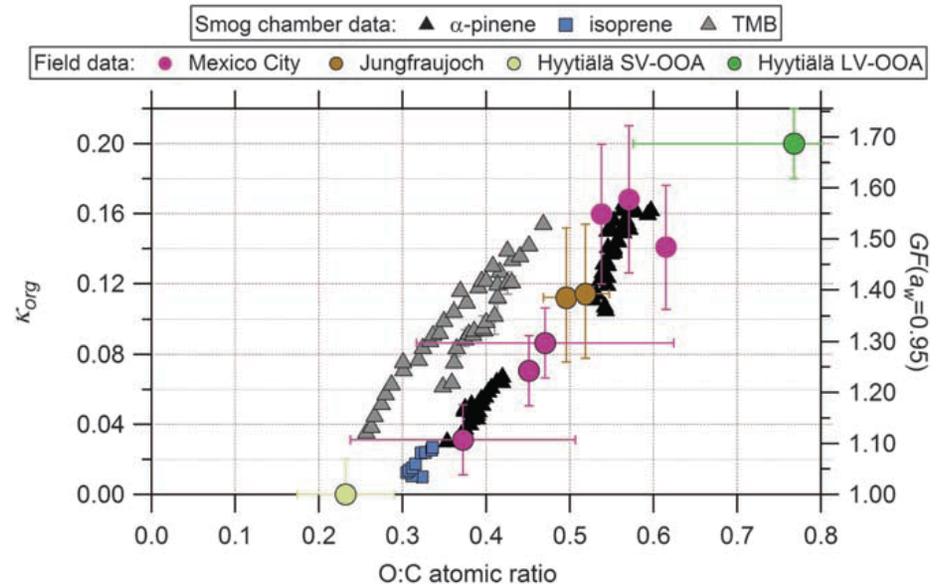
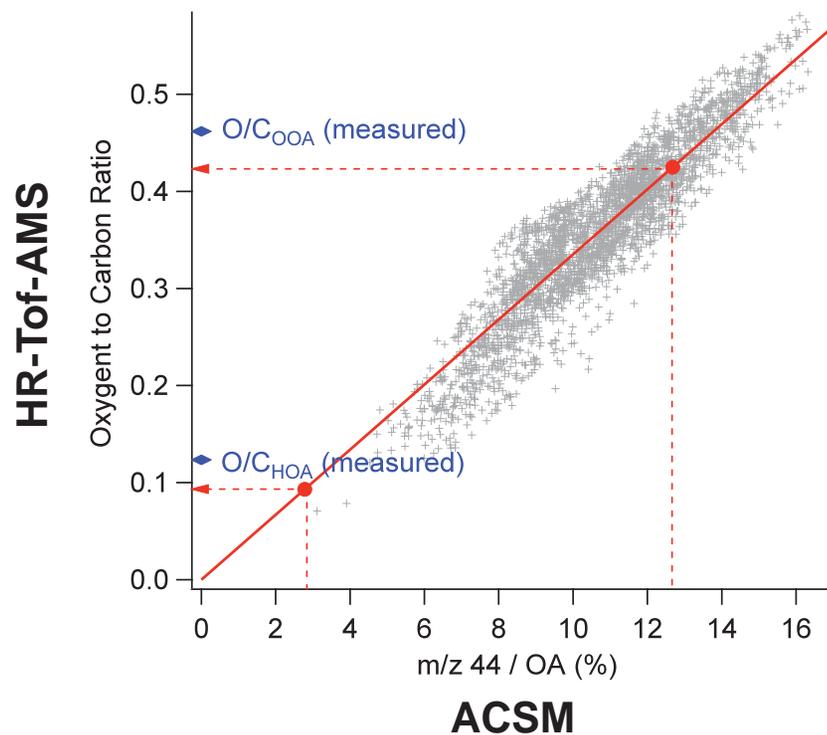


POA

SOA

O:C Ratio

- O:C ratio indicates aging: higher O:C implies more oxygenated material (SOA), lower O:C implies primary emission
- O:C ratio is related to the water soluble fraction of OA, k



From *Jimenez et al.*, Science, [2009]

Timeline

- Implemented organic component algorithm at the ARM Data Management Facility (DMF)
 - *Tim Shippert working with Qi Zhang to test and verify algorithm using DMF computing facilities*
 - *Once testing is complete, run operationally with ACSM data*
 - *Implement plotting tools*
 - *Run in parallel with algorithm development by Qi Zhang*
- Finished simultaneous and collocated HR-AMS and ACSM measurements as part of BNL IOP
- Basic analysis and QA/QC of the ACMS and HR-AMS data from BNL IOP
- VAP analysis to the BNL ACSM data
- PMF analysis to the BNL IOP HR-AMS
- Evaluate and compare ACMS and HR-AMS VAPs – examine correlations and create plots and analyze data

August 2011



August 2011

March 2012

June 2011

September 2011

October 2011