ACSM Update 2011
11:20 – 11:40

20 instruments delivered to date
Aerodyne Research, Inc.
Aerosol Chemical Speciation Monitor

Size: 19”D x 21”W x 32”H
Weight: 140 lbs
Power: 300W
universal AC power; 85-264 VAC, 47-63 Hz

Shown with Pfeiffer Pumps and Integrated Power Supply
17U 19” Rack Mount Version – 2 units delivered and operating in DoE MAOS containers

17” W x 21” D x 29” H
Instruments operating all over the world

Several systems at true ‘monitoring sites’ e.g. SEARCH in Atlanta, DoE ARM SGP Oklahoma (almost 1yr continuous data)
Aerosol Chemical Speciation Monitor

Particle Beam Generation

Commercial grade Mass Spectrometer
Pfeiffer Prisma

Aerodynamic Lens 40-1000 nm

Particle Inlet (1 atm)

No Sizing

Particle Composition

RGA

Laptop Computer

Thermal Vaporization & Electron Impact Ionization

Pumps (x3)

Slow scan rates, 1 sec/amu
Automated Valve System for Instrument Zero

3-way Valve

Sample mode

Filter mode

Filter

Filter mode

Aerosol mass is determined from difference of ‘Sample – Filter’
Internal Standard
Naphthalene Effusive Source

- \( m/z \) marker
- Ion transmission
- Ionization efficiency reference

EI spectra from NIST for Naphthalene

1 \( \mu \)m pin hole

10\(^{11}\) s\(^{-1}\)
Naphthalene provides an in-situ measure of IT
Naphthalene as IE reference

IE/Nap seems to be constant (after temperature correction)
Switch over to Pfeiffer Pumps
An Aerosol Chemical Speciation Monitor (ACSM) for Routine Monitoring of the Composition and Mass Concentrations of Ambient Aerosol

N. L. Ng\textsuperscript{a}; S. C. Herndon\textsuperscript{a}; A. Trimborn\textsuperscript{a}; M. R. Canagaratna\textsuperscript{a}; P. L. Croteau\textsuperscript{a}; T. B. Onasch\textsuperscript{a}; D. Sueper\textsuperscript{ab}; D. R. Worsnop\textsuperscript{a}; Q. Zhang\textsuperscript{a}; Y. L. Sun\textsuperscript{a}; J. T. Jayne\textsuperscript{a}

\textsuperscript{a} Aerodyne Research, Inc., Billerica, Massachusetts, USA \textsuperscript{b} CIRES, University of Colorado, Boulder, Colorado, USA \textsuperscript{c} Department of Environmental Toxicology, University of California, Davis, California, USA

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FIG. 9. Speciated ACSM time trends observed during the Queens study. These trends agree well with data from collocated instruments (PILS-IC, Thermo Scientific Sulfate Particulate Analyzer Model 5020i, and HR-ToF-AMS). Note: Color traces are ACSM data.
PMF Results from ACSM in South Africa
TEOM Comparison – IAP Beijing (Yele Sun)
ACSM Users Site
http://sites.google.com/site/ariacsm

• Purpose:
  – Have discussions
  – Share publications
  – Get software updates
  – Download support documents
ACSM “Old” Packaging

First remove top cover and unpack components. Then remove the top shelf (should be 4 screws).

Next remove the front cover. The “front” should be identified by red marks on the screws. You can then lift the instrument out of the crate.
ACSM New Shipping Crates

25” x 34” x 50”

~250 lbs shipping weight
Most Recent Software Versions

- ACSM DAQ V1.4.0.8
  - First version that works on 64bit Windows

- ACSM Local v1.4.4.3
ACSM Software and Data Path

**DAQ**
- VB.Net

**Raw Data**

**Viewing**
- QA, frag processing
- Conc. matrices
- PMF matrices

**Post-processing**

**Species**
- µg m\(^{-3}\)

**Poor-mans PMF**

**PMF Matrices**

**Ingrids PMF Tool**

**Archived QA’d Data**

**Real time or off-line**

**Igor - ACSM_Local.ipf**

**PMF Factors**
- OOA/HOA/BBOA
ACSM Local Improvements – New Corrections Tools
ACSM Local Improvements – New ‘click of a button’ graphs

Pie chart:
- Org: 67.53%
- NH4: 15.87%
- SO4: 12.94%
- NO3: 3.47%
- Chl: 0.16%

Graphs:
- Loading (ug m⁻³)
  - roughHOA
  - roughOOA

Scatter plot:
- f44 vs. f43
- Data points
- Dashed line
Sample Flow Controller Accessory

• Active flow control to pull major flow for ACSM
• Comes with cyclone, tubing, fittings…
• Analog output for flow rate incorporated into ACSM data stream
Development Topics

• PM2.5 lens into system – Leah will discuss status…
• Capture style vaporizer for bounce
• Continued software improvements
• Nafion Dryer Accessory (ACSM/AMS anything else)
Dryer Setup

- Multitube nafion dryer
- RH and T sensors
  - Before drying
  - After drying
  - Counterflow
- Pressure sensors
  - Before
  - Drop
  - Counterflow
- Computer logging via USB
Dryer Setup