Light Scattering Update
LS-C-ToF-AMS != ATOFMS

Eben S. Cross
AMS User's Meeting
September 29, 2007
Reno, NV

AMS-Patience Plot

“Your job is awesome”
∞

“Your job is neat”
1.0

“I hate your job”
0.0

Patience toward working “AMS”

Days

Eben System
Eben’s Previous Relationship System
Doug System
Shane System
Allison System
Jay System

AMS-SUPER BABY
12,853 optically-triggered single particle mass spectra
• 5,542 (43%) particles were vaporized and ionized during the saving interval.
Coincident Particles: Evidence of External Mixing

<table>
<thead>
<tr>
<th>PARTICLE PROPERTY</th>
<th>Velocity (m/s)</th>
<th>Vacuum Aerodynamic Diameter (mm)</th>
<th>Optical Diameter (nm)</th>
<th>Predicted Physical Diameter (nm)</th>
<th>Chemical Density (g/cc)</th>
<th>Optical Density (g/cc) [dva/dopt]</th>
<th>Measured Total Mass (fg)</th>
<th>Predicted Total Mass (fg) [Chemical Density]</th>
<th>Predicted Total Mass (fg) [Optical Density]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle #1</td>
<td>18.2</td>
<td>26.3</td>
<td>29.0</td>
<td>13.0</td>
<td>8.8</td>
<td>15.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Coincident Particles: Evidence of External Mixing

- Organic
- Nitrate
- Sulfate
- Ammonium
- Chloride

Chemical Signal (arbitrary units)

m/z
60 Minute Average Single Particle & PToF Mass Fractions

Single Particle Mass Fractions Measured on March 28
Single Particle Mass Fractions Measured on March 28

Mass Fraction Correlations

12:00 AM – 03:30 AM LST

Low Boundary Layer
Low Boundary Layer

Mass Fraction Correlations

12:00 AM – 03:30 AM LST

Low Boundary Layer

Mass Fraction Correlations

04:21 AM – 08:45 AM LST
Mass Fraction Correlations

07:45 PM – 10:45 PM LST

Conclusions

• Successfully integrated LS system into ToF-AMS
  – Average single particle and bulk ensemble mass fractions are highly correlated

• Identified externally mixed particles
  – HOA type traffic mode particles
  – High chloride particles

• The significant fraction of particles observed within the urban environment are internally mixed
  – During the mid-morning period all single particles sampled contained at least some nitrate – indicating that photochemistry is resulting in the condensation of gas to particle compounds onto all pre-existing particles
  – Source specific sulfate plumes show that sulfate is condensing onto all particle types within the plume
  – Chemical gradients within the internally mixed accumulation mode were observed
    • How long does it take a primary traffic particle to become an internally mixed accumulation particle?
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