mini-AMS
(still evolving...)

Anita Johnson and Peter DeCarlo
Drexel University

Mike Cubison, Urs Rohner, Christian Tanner, Marc Gonin
Tofwerk

Thorston Hohaus, Ed Fortner, Joel Kimmel, John Jayne, Doug Worsnop
Aerodyne
mini AMS

- Current Iteration
- c-ToF (with MCP)
- Chopper (sizing)
mini AMS

- Current Iteration
- c-ToF (with MCP)
- Chopper (sizing)
Field Deployment in NE PA

Date and Time

Intercept = -0.22 ± 0.16
Slope = 0.88 ± 0.04
SPAMS Data from E. Fortner

Intercept = 0.35 ± 0.03
Slope = 0.83 ± 0.02
SPAMS Data from E. Fortner

Org
NO3
SO4
NH4
Chl
Darker Colors are Mobile Lab SPAMS

Saturday, October 13, 12
Mass Spectra

Nitrate equivalent mass (µg m\(^{-3}\) s\(^{-1}\))

Saturday, October 13, 12
Nitrate equivalent mass (µg m$^{-3}$ s$^{-1}$)

**MSSD all**: 1903.5626

**MSSD Org**: +3.0303

**MSSD NO3**: +0.1812

**MSSD SO4**: +1.4344

**MSSD NH4**: +0.5108

**MSSD Chl**: -0.0469

Saturday, October 13, 12
Nitrate equivalent mass ($\mu g m^{-3} s^{-1}$)

MSSD all +1903.5626
MSSD Org +3.0303
MSSD NO3 +0.1812
MSSD SO4 +1.4344
MSSD NH4 +0.5108
MSSD Chl -0.0469
Saturday, October 13, 12
m/z 45 in background?
Size selected AN particles
70 nm = 96 nm $d_{va}$
PToF distribution

Size selected AN particles
70 nm = 96 nm $d_{va}$
PToF distribution

Why Change Skimmers?

Size selected AN particles
70 nm = 96 nm d_{va}
Detection Limits...

1-minute Detection Limits ng/m$^3$
- NO3 - DL=0.108
- SO4 - DL=0.056
- Chl - DL=0.066
- Org - DL=0.393
- Org29 - DL=0.296
- Org43 - DL=0.067
- Org44 - DL=0.125

1 minute Detection limits (ng/m$^3$)
- NO3 - DL=0.108
- SO4 - DL=0.056
- Chl - DL=0.066

Saturday, October 13, 12
Detection Limits...

In current set-up, high AB limiting our detection limits

1-minute Detection Limits ng/m$^3$
- Org - DL=0.393
- Org29 - DL=0.296
- Org43 - DL=0.067
- Org44 - DL=0.125

1 minute Detection limits (ng/m$^3$)
- NO3 - DL=0.108
- SO4 DL=0.056
- Chl  DL=0.066
Detection limit comparison

1 minute det. limits
3-sigma filter data

DeCarlo et al. 2006
Ng. et al. 2011
Cubison (ToF-ACSM)
Detection limit comparison

Not quite a fair comparison, m/z 29 included in mini-Data, not in ACSM or ToF-ACSM (same with Ammonium)

1 minute det. limits
3-sigma filter data

DeCarlo et al. 2006
Ng. et al. 2011
Cubison (ToF-ACSM)
Detection limit comparison

Not quite a fair comparison, m/z 29 included in mini-Data, not in ACSM or ToF-ACSM (same with Ammonium)

1 minute det. limits
3-sigma filter data

DeCarlo et al. 2006
Ng. et al. 2011
Cubison (ToF-ACSM)
Conclusions - future work

• IT WORKS! (best with accumulation mode...)
• Although, there are some kinks to work out still
  • high AB (impacts org detection limit, ammonium)
  • low particle transmission for smaller particles
• Vacuum system tweaking
• Interlock issue (gauge sensitivity)
• GOAL: minimize AB, maximize (small) particle transmission