Ground-based (Size-segregated and time-resolved) Aerosol Sampling and Elemental Analysis during ICARTT

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Thanks to: Support from NOAA, IMPROVE NPS and help from Betsy Andrews and NPS Staff (Emily Seger)
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This is NOVA SCOTIA
Canada’s Seacoast
Sampling and Analysis

- 8 Stage Rotating “DRUM” Impactor aerosol sampler
- Elemental analysis via (synchrotron source) x-ray fluorescence
- 10 to 5.0 µm
- 5.0 to 2.5 µm
- 2.5 to 1.15 µm
- 1.15 to 0.75 µm
- 0.75 to 0.56 µm
- 0.56 to 0.34 µm
- 0.24 to 0.26 µm
- 0.26 to 0.09 µm
- 16.7 l/min, critical orifice control, 1/3 hp pump
- 6.5 x 168 mm Mylar strips (for 42 day run, 4 mm/day)
U.S. Pollution Event?
The Site...
Chebogue Point

- Chebogue Point
- July 30-August 12
- 3-hour data (ca. 43 days)
- 8-Stage Rotating DRUM Impactor
- 55% RH (heated inlet)
- Chebogue means “big marshes” in Mi’kmaq
Acadia National Park

- July 29-August 10
- 8-Stage Rotating DRUM Impactor
- Ambient RH
- 3-hour data (ca. 41 days)
- Coincident with IMPROVE network sampling
PM2.5 SO4 (S*3)

ng/m^3

Chebogue Point SO4
Acadia SO4
Transport Event?

UTC

Chebogue Point SO4  Acadia SO4
Transport Event?

The graph shows the concentration of SO4 in <0.75 micron ng/m^3 over the period from 8/6/04 to 8/13/04. The data is represented for Chebogue Point and Acadia locations, with peaks indicating potential transport events. The graph includes markers for Chebogue Point SO4 and Acadia SO4, and the concentrations are highlighted for Chebogue 0.75 and Acadia 0.75.
Lagrangian event?
July 30 Event?

PM2.5 ng/m³

Chebogue Point SO4  Acadia SO4  Chebogue Point Soil  Acadia Soil
CP Mass %/particle size

![Graph showing CP Mass %/particle size across different stages.](image)
Chebogue Point Reconstructed Mass

- CHEB PM10 Mass
- CHEB PM2.5 Mass
Acadia NP Mass%/particle size
Acadia NP Mass/Size

Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Stage 8

ng/m^3

0
1000
2000
3000
4000
5000
6000
7000
8000

1 14 27 40 53 66 79 92 105 118 131 144 157 170 183 196 209 222 235 248 261 274 287 300 313 326
Mass comparison with IMPROVE

Acadia DRUM PM10 Mass
Acadia Improve PM10 Mass
Acadia DRUM PM2.5 Mass
Acadia IMPROVE PM2.5 Mass
AMS/DRUM submicron sulfate

![Graph showing AMS and DRUM sulfate concentrations over DOY (days of the year).]
AMS/DRUM submicron sulfate

AMS Sulfate < 1 micron
DRUM Sulfate (S*3) < 1.1 micron
## Elements used in PCA

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<th>ELEM</th>
<th>TRINIDAD MEAN S/N</th>
<th>TRINITY MEAN S/N</th>
<th>LASSEN MEAN S/N</th>
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PCA in ITCT-2K2
What’s next?

• PC Analysis of elemental data
• Further analysis of samples
  – Organics (PESA, other analyses)
  – RBS? (N, C, and O)
  – Mass (STIM or $\beta$− Gauge)
• Comparison with filter and AMS data
• Couple with isotope data (UCSD)
How to find your house in the fog