

Status Update and Early Data from the MANE-VU Rural Aerosol Intensive Network (RAIN)

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MANE-VU Modeling & Data Analysis/Monitoring Meeting

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PM/Haze Rural “Transport Supersites” in MANE-VU domain

The network has a name: RAIN

- Multiple sites (3 or more) with detailed PM and visibility-related measurements
 - high-elevation (500 - 2500 ft), rural, transport characterization
 - ==> contrast “Fresh” vs. Aged secondary aerosols
 - highly time-resolved (1-2 h) aerosol composition measurements
- Hourly aerosol composition data provide enhanced insight into:
 - regional aerosol generation and source characterization
 - factors that drive short-term visibility
 - aerosol model performance and evaluation
- 1Q 2004 IMPROVE newsletter Feature Article on RAIN:
<http://vista.cira.colostate.edu/improve/Publications/NewsLetters/IMPNews1stQtr2004.pdf>

Status of RAIN Site Implementation

- Core year-round components are in place at all 3 sites as of July 1:
 - Continuous [hourly] PM2.5, Ozone
 - Surface Met [wind, temp, RH or dew point,]
 - IMPROVE measurements for carbon, ions and PM2.5

Still needed: HazeCam for CT and MD

- New real-time methods in place at all 3 sites as of July 1:
 - Continuous sulfate (Thermo 5020 method): all sites
 - 2-hour EC/OC (Sunset Lab NDIR method): all sites
 - NGN-2 (wet) nephelometer [not MD?], trace SO₂, ozone

Notes: MD Sulfate starts July 10.

MD carbon and PM data quality uncertain for some of summer

Additional Measurements

- The following non-core measurements are operational:
 - NO/NO_y, trace level CO at Acadia NP
 - NO_y at Frostburg
- Still to come:
 - Trace CO, wet neph, and Profiler at Frostburg MD
 - Solar Rad and Rain, dry neph at CT
- Still on the wish-list:
 - trace CO, NO_y at CT
 - ASOS [CT?]
 - NH₃, continuous NO₃, strong aerosol acidity [MD and/or CT?]

- **Current Issues**

- RAIN QA Project Plan [NESCAUM]

- RAIN SOPs for carbon, sulfate, and wet neph
[States and NESCAUM]

- Data Quality Issues [carbon, trace SO₂/CO/NO_y, neph]
Not your mother's compliance network anymore...
[States and NESCAUM]

- Realtime reporting of carbon, sulfate, neph, etc. to AIRNow/
FASTNET [State data logger issues; AIRNow is ready]

- Plans for routine ongoing data reduction and validation
[States]

- Plans for common database construction, future data analysis
[NESCAUM]

Methods Update

- Continuous Sulfate: Thermo Electron model 5020
 - reasonably simple method; working well
 - 2 extra sites summer 2004 (Miller SP NH, Pinnacle SP NY)
enhanced spatial resolution late July-October
 - Miller SP moves to AIRMAP Thomson Farm winter 2004/5
[CT DEP and EPA-01 resources]
- Semi-continuous Carbon: Sunset NIOSH Method (2-hour cycle)
 - “Improve-like” method configuration not yet implemented
 - method is more complex; some problems in MD
 - “appears” to be working well at CT and Acadia
 - How do we know it’s working??
- Must have a way to assess performance in near real-time
 - can not wait for IMPROVE samples 9 months later
 - IMPROVE C and S can be used for final validation

- Mass reconstruction to continuous PM approach
 - use EC/OC and sulfate
 - subtract $0.5 \mu\text{g}/\text{m}^3$ for OC blank; then assume $\text{OC} \times 1.8$ or 2.0
 - sulfate $\times 1.3$ (for ammonium) $\times 1.2$ (for water in measured PM)
 - add generic 10% for nitrate and crustal PM components
- “Dynamic” blanks for both methods
 - detects many but not all problems
 - “one tool in the kit”
- Aethalometer for EC?
 - simple method that should be well correlated with Sunset optical and thermal EC (not OC or TC)
 - can also provide a wood smoke signature signal

AWMA October Haze Conference Proceedings Paper #18:

Real-time Carbon and Sulfate Measurements from the MANE-VU Rural Aerosol Intensive Network (RAIN): Design, Methods and Early Data

[G. Allen, B. Goodwin, J. Turner]

Covers the material presented here, and will be finalized this week.

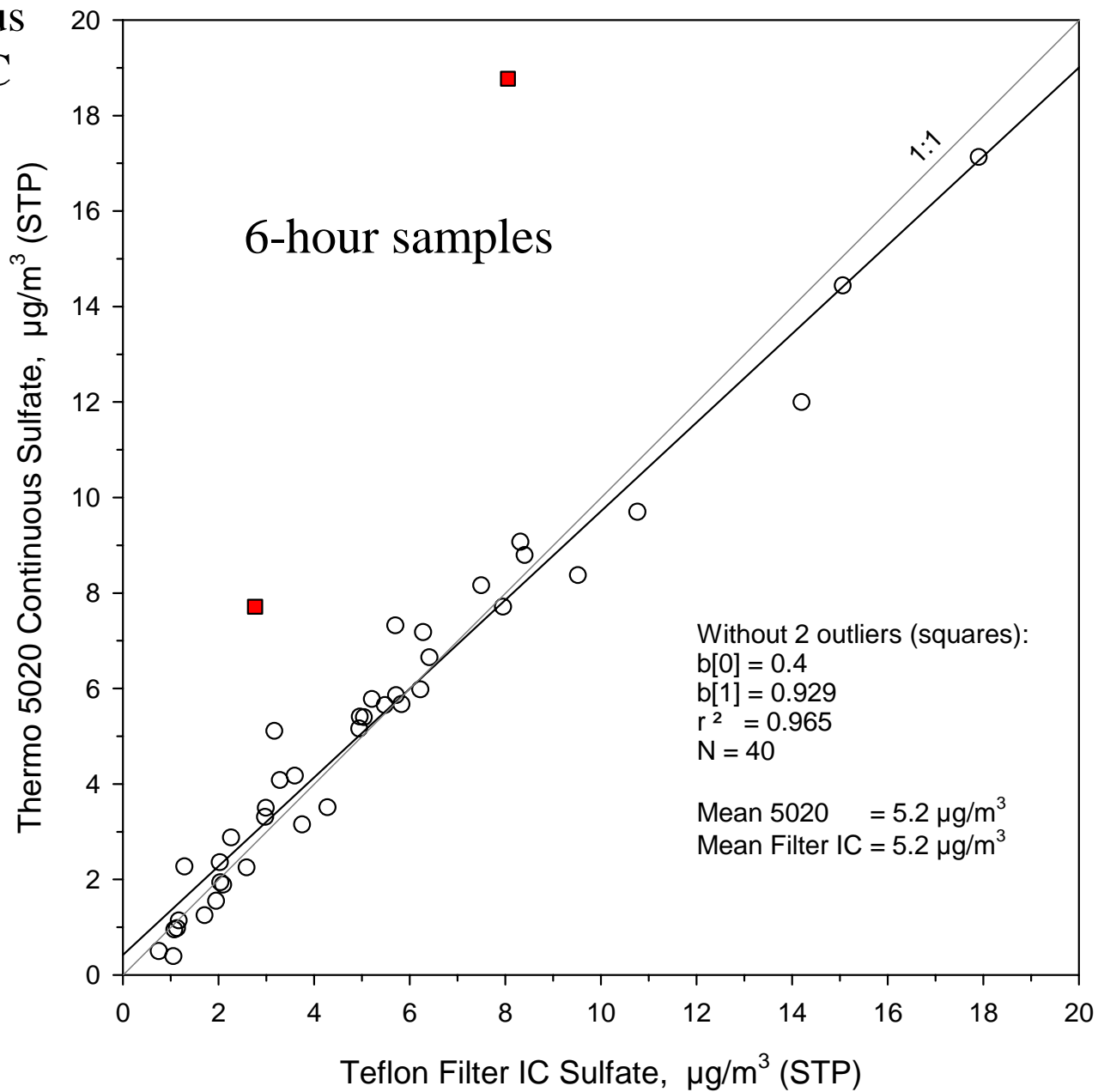
Available on request.

RAIN and Friends (● = Summer 2004 Sulfate)

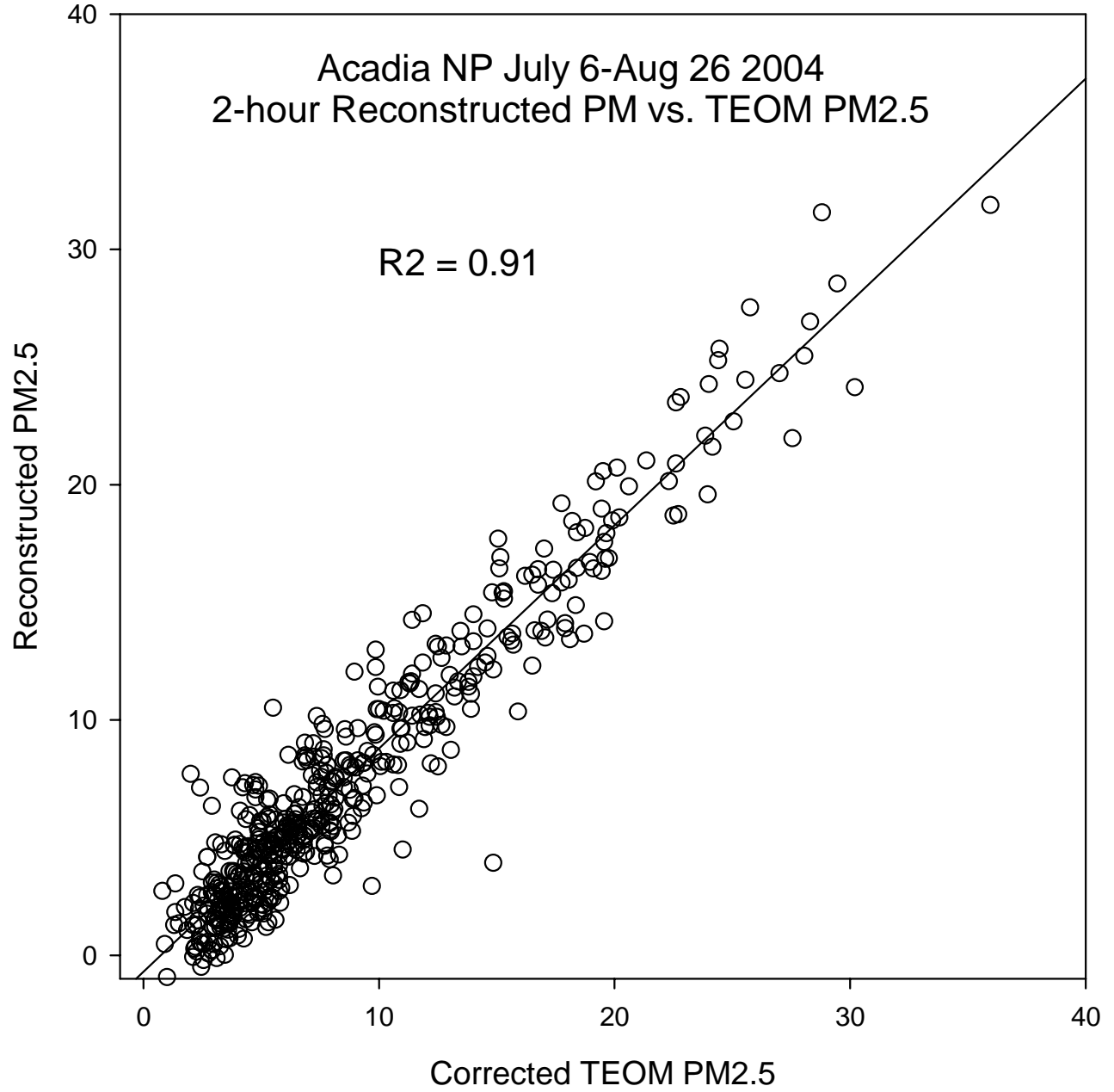


? Delaware Water Gap, Kejimikujik NP NS, Athens OH, Shenandoah NP

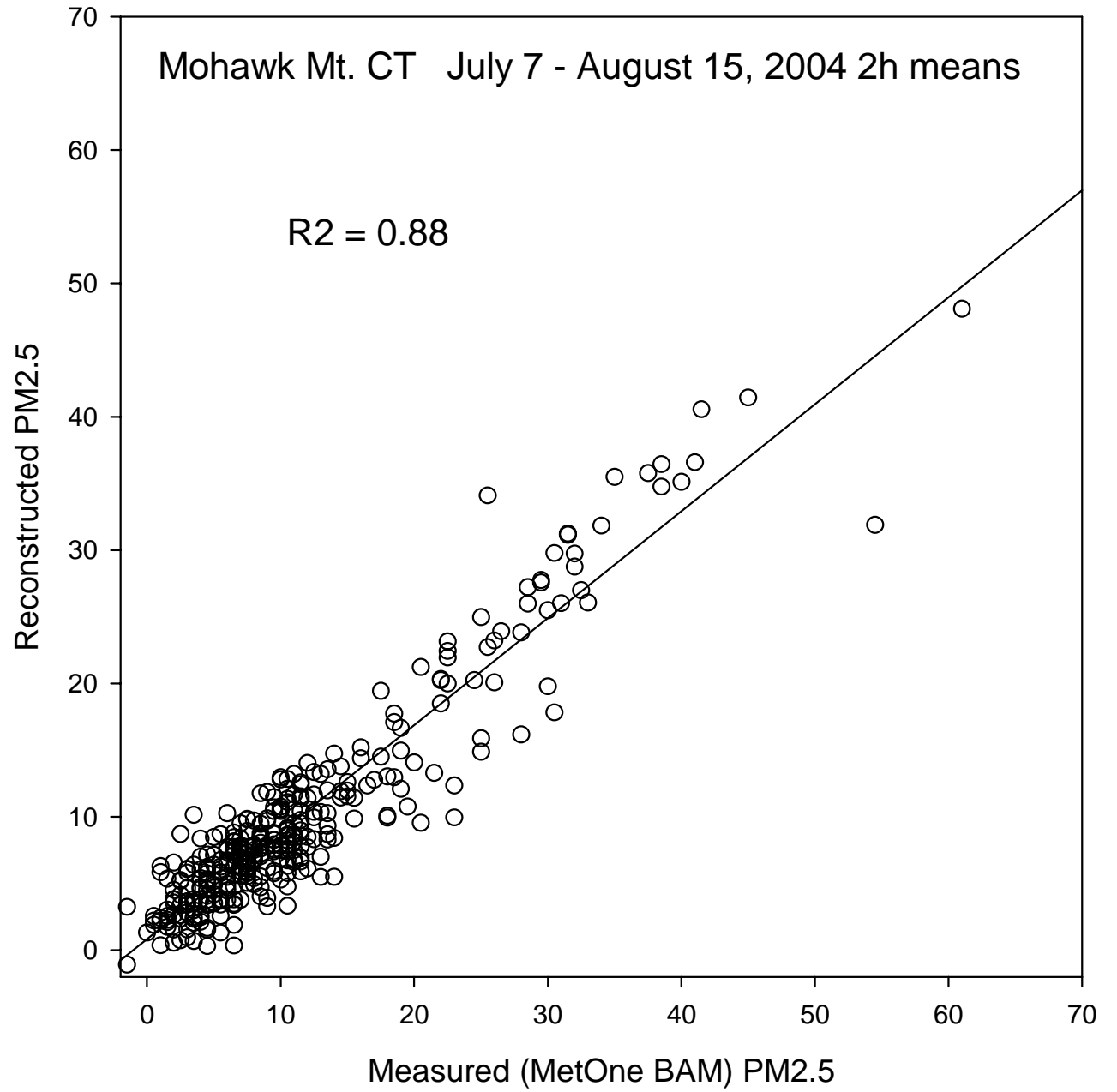
Thermo continuous
sulfate vs. filter IC
sulfate, St. Louis
Supersite,
July-Sept 2004



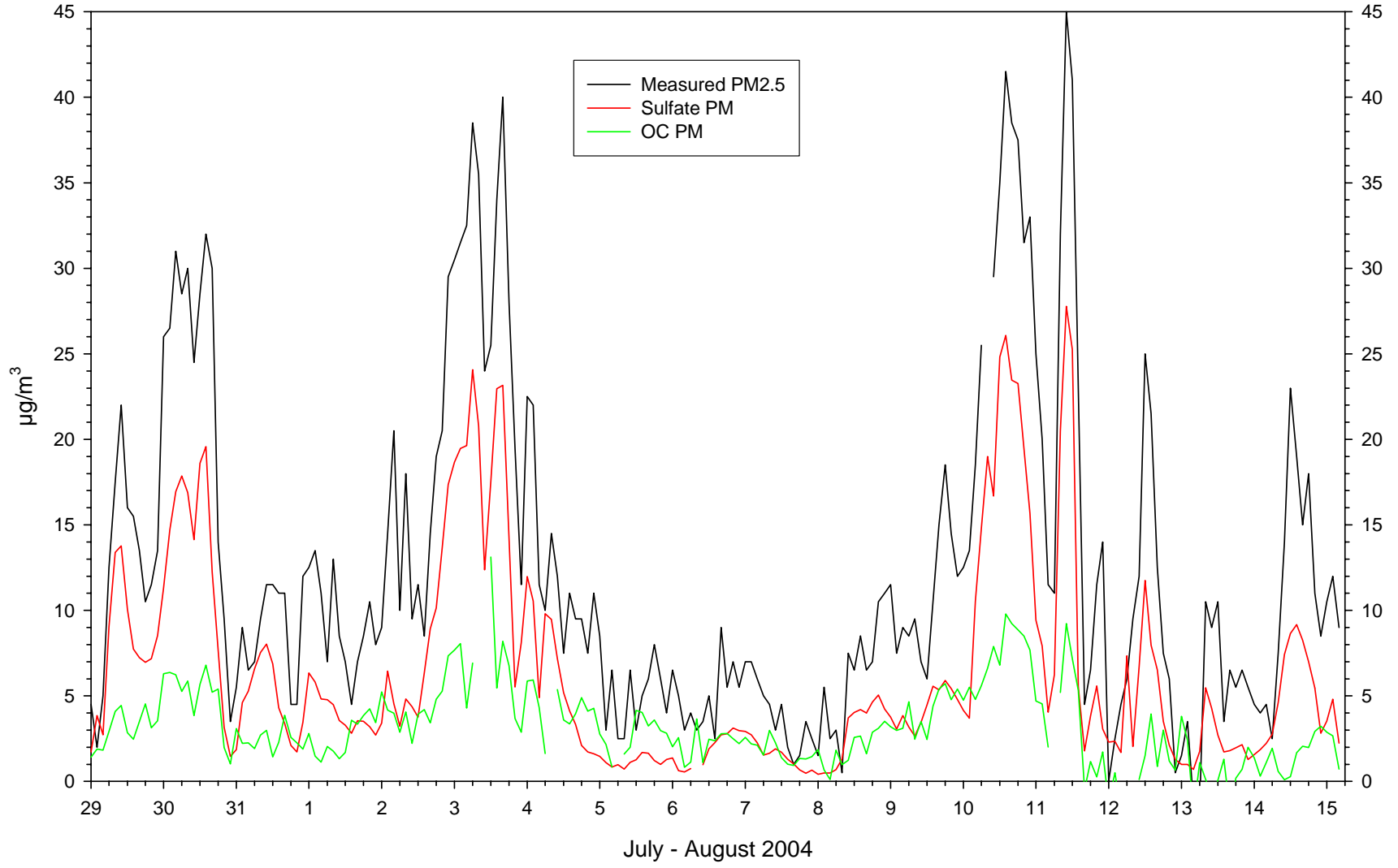
Reconstructed
and measured
PM, Acadia NP



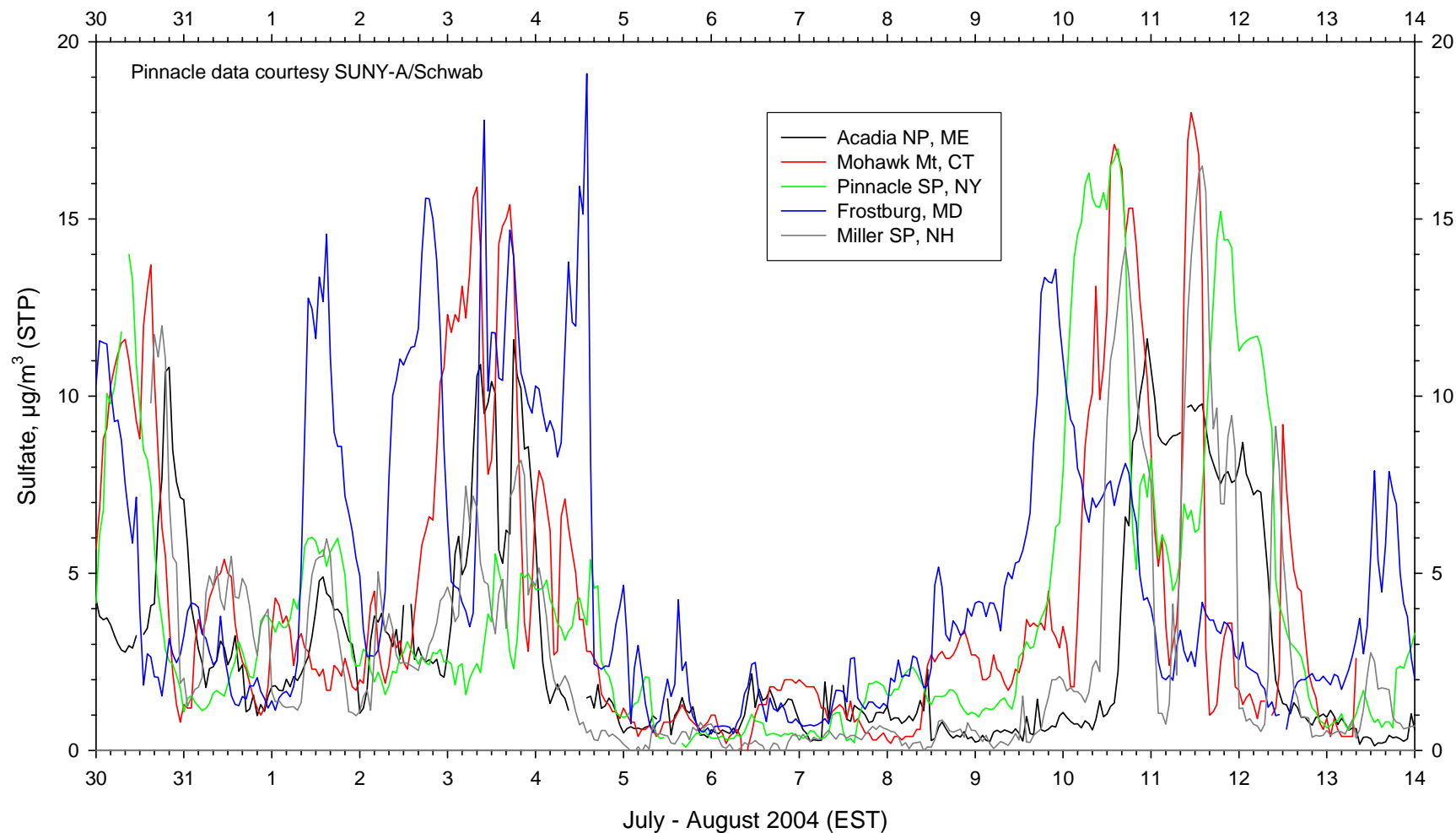
Reconstructed and
measured PM,
Mohawk Mt.



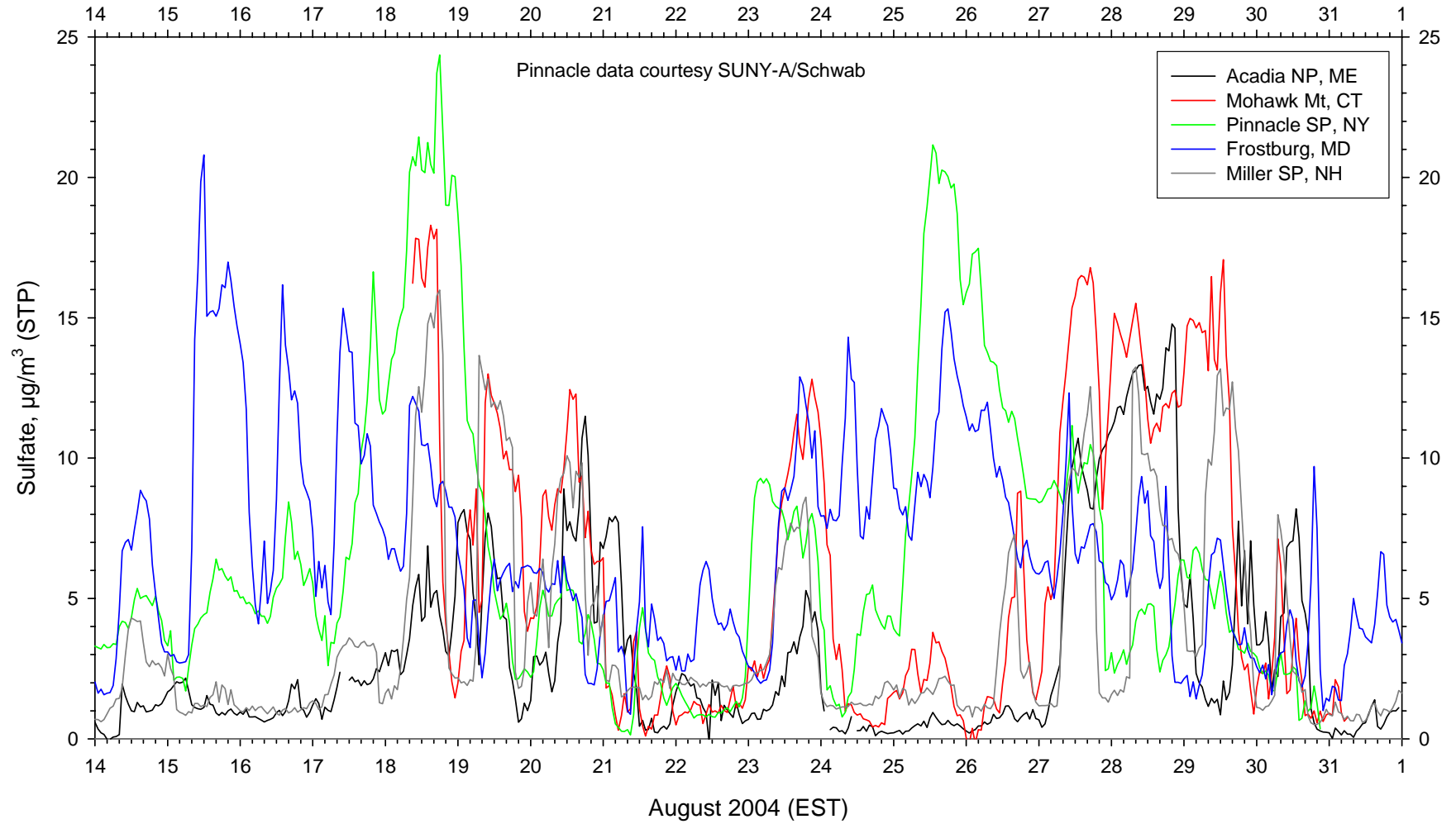
Mohawk Mt. CT PM reconstruction components: 2-hour sulfate and organic carbon-related PM, and measured PM2.5



Five-site Thermo 5020 Hourly Sulfate, July 30 - August 13, 2004



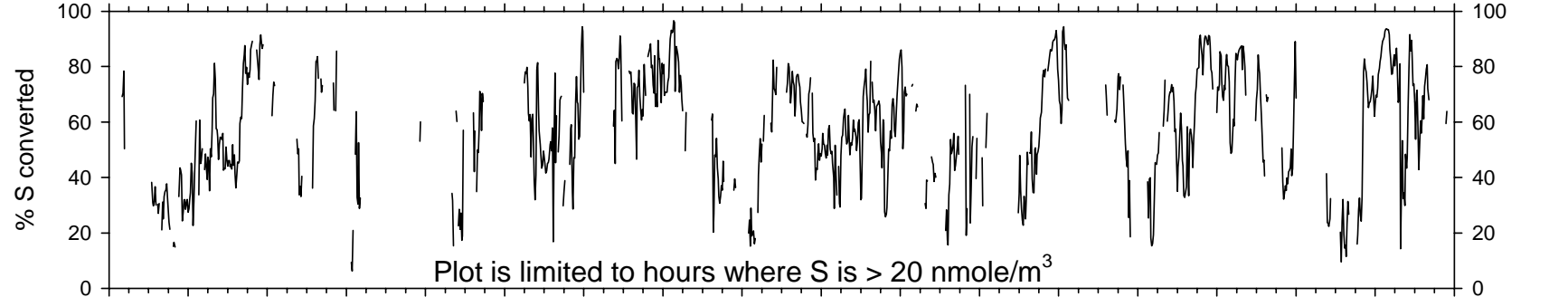
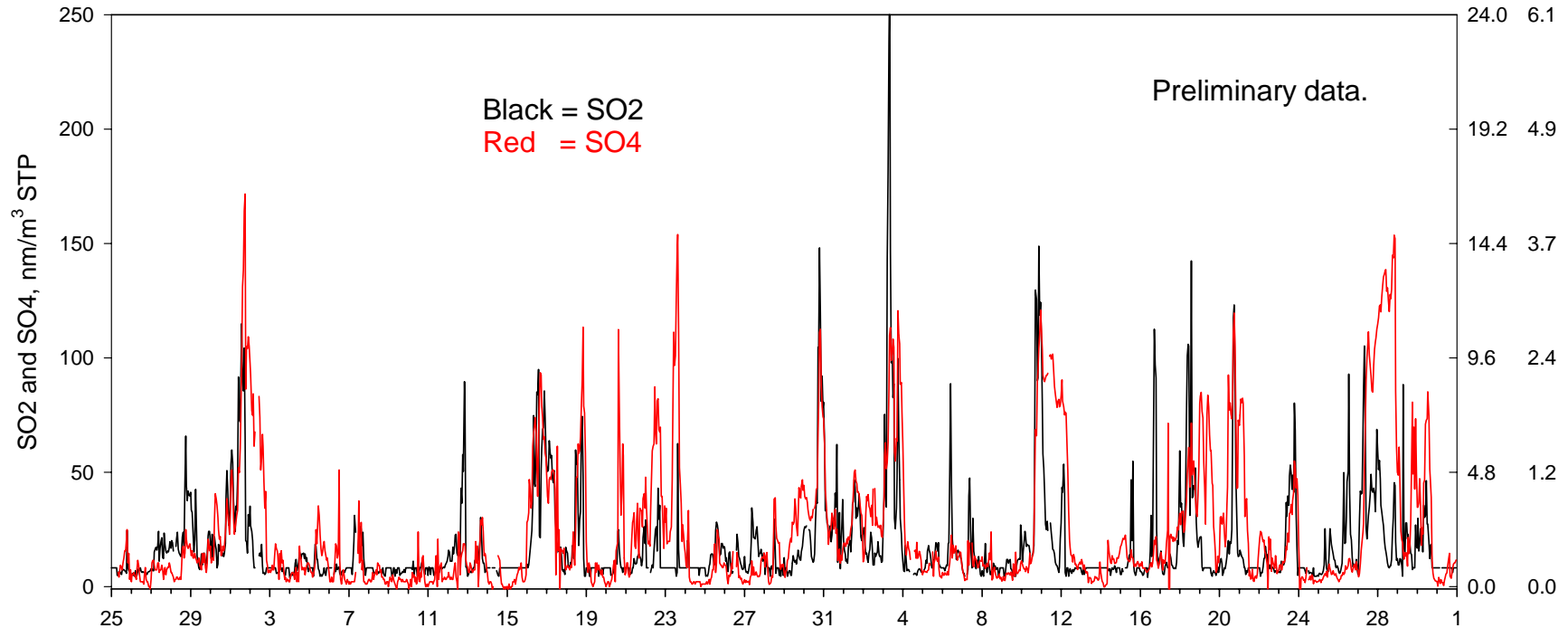
Five-Site Thermo 5020 Hourly Sulfate, August 14-31 2004.



Acadia NP Sulfur Phase, Summer 2004

Acadia NP, Maine: SO₂ and SO₄, June 25 - August 31, 2004

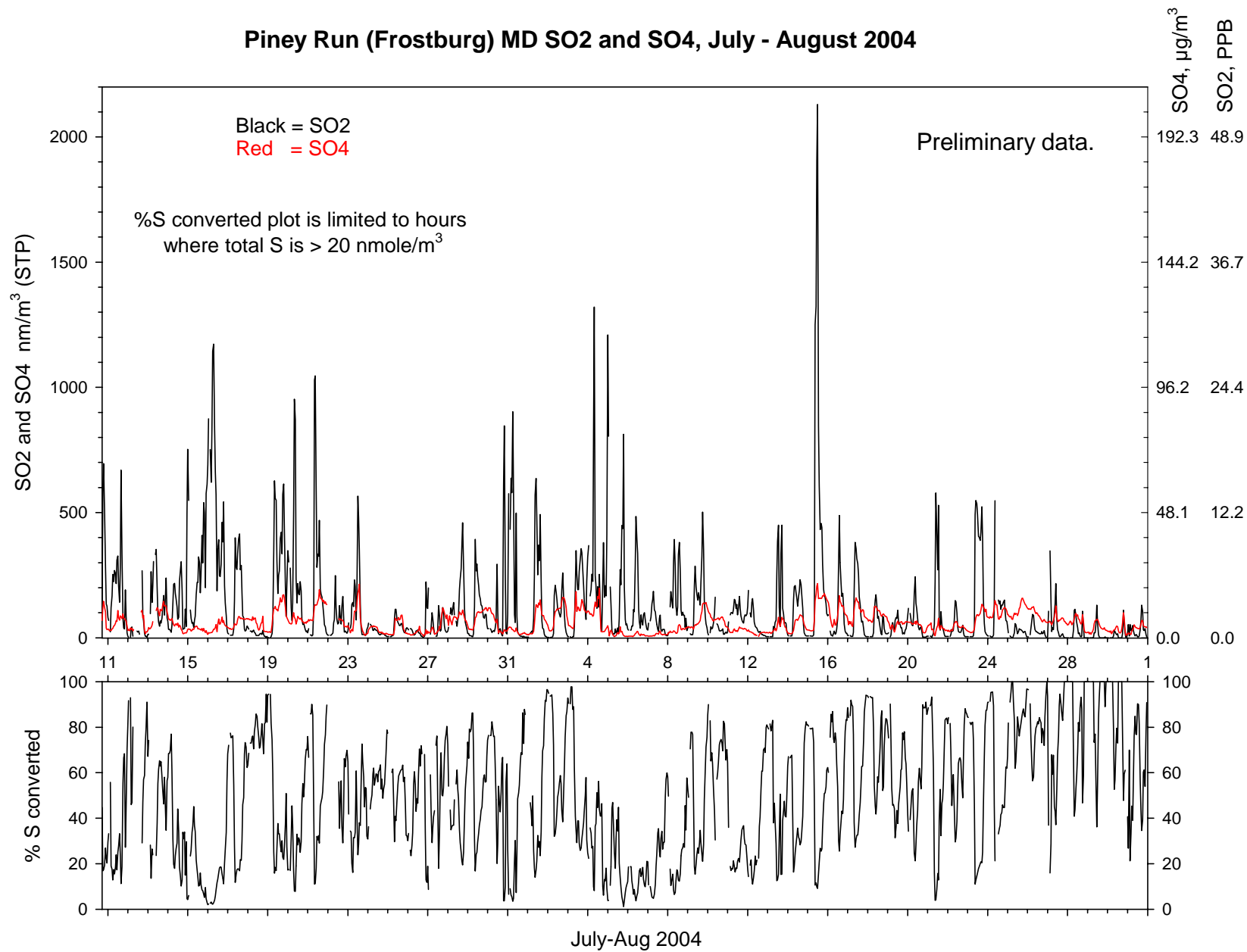
SO₄, $\mu\text{g}/\text{m}^3$
SO₂, PPB



June-Aug 2004

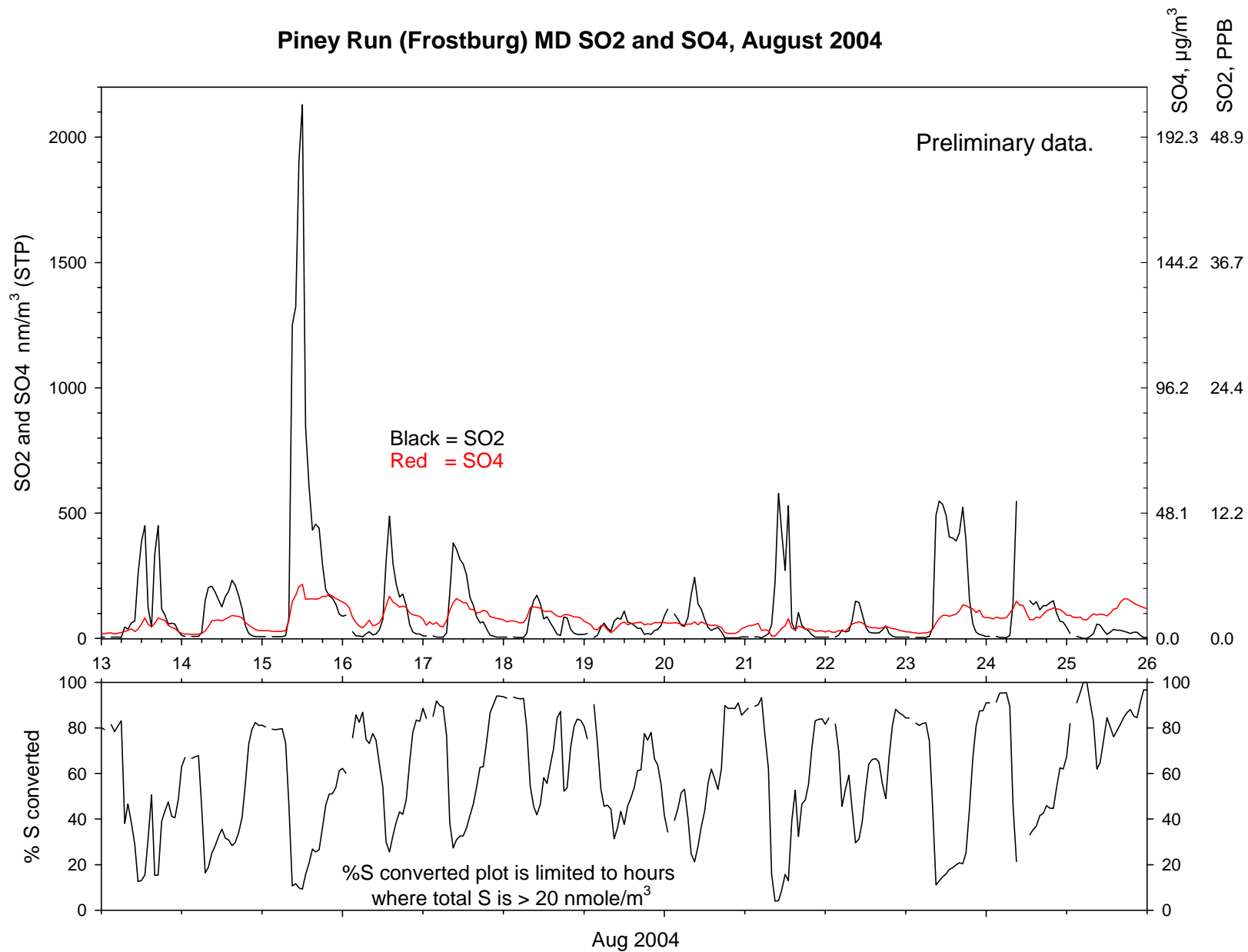
Frostburg MD SO2 and Sulfate hourly means, Summer 2004.

Piney Run (Frostburg) MD SO2 and SO4, July - August 2004

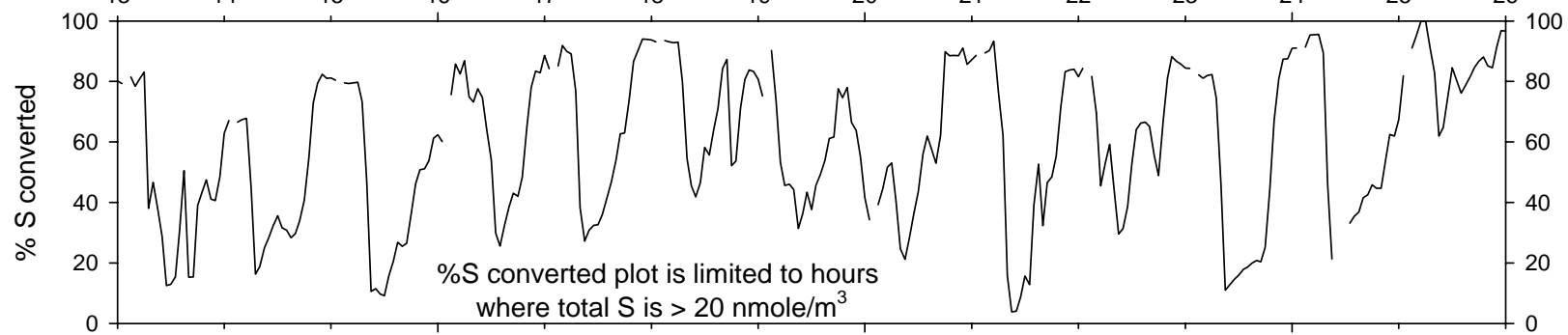
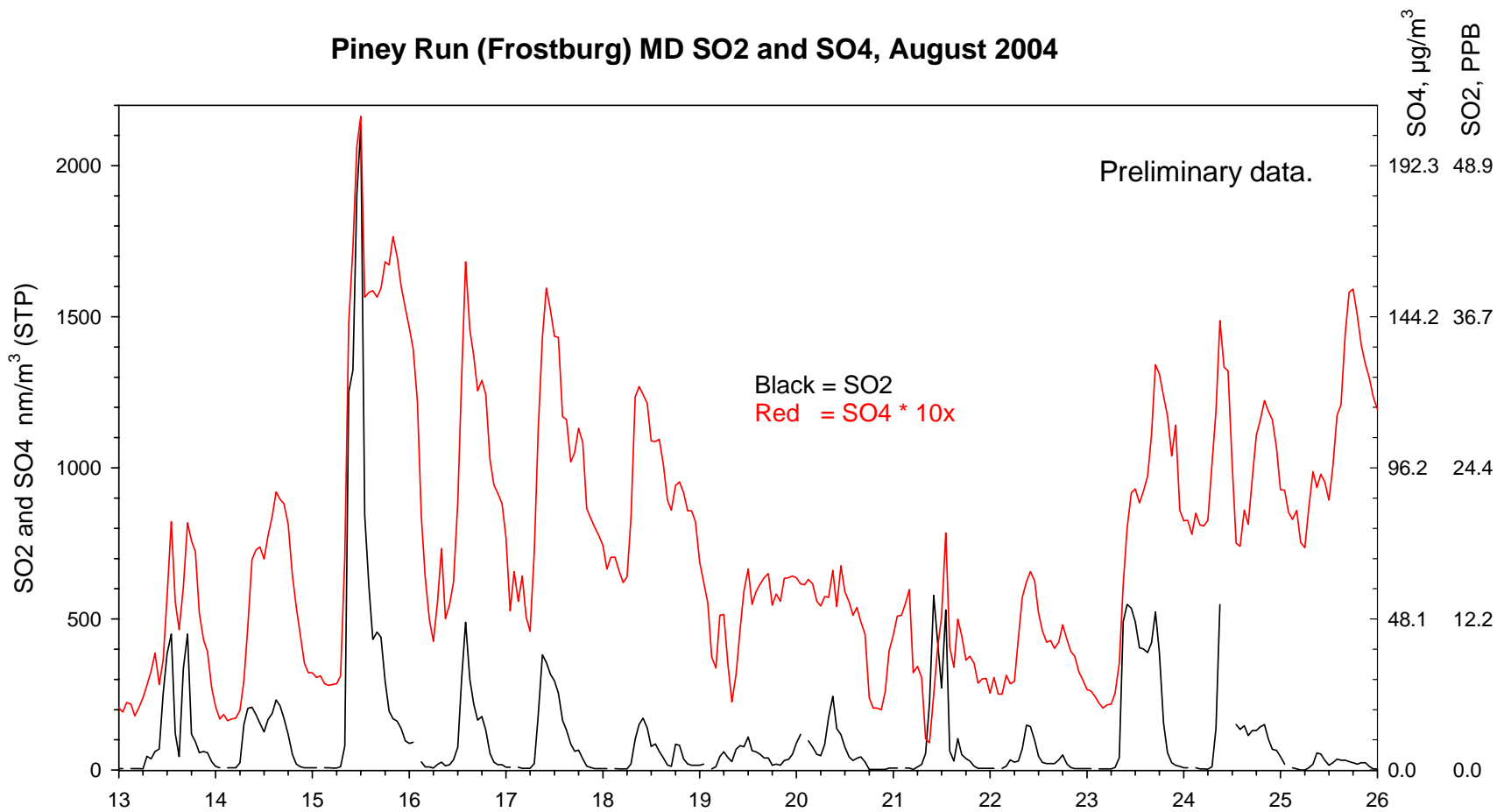


Frostburg MD SO2 and sulfate detail, August 13-25, 2004

Piney Run (Frostburg) MD SO2 and SO4, August 2004



Piney Run (Frostburg) MD SO2 and SO4, August 2004



Aug 2004