

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

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RAIN: PM/Haze Rural “Transport Supersites” in MANE-VU Haze RPO Domain

- Multiple sites 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:
 - source characterization
 - factors that drive short-term visibility
 - aerosol model performance and evaluation
- Tech Transfer of new measurement methods into routine SLT use
 - Sunset EC/OC
 - Thermo sulfate

RAIN and Friends (● = Summer 2004 Sulfate)



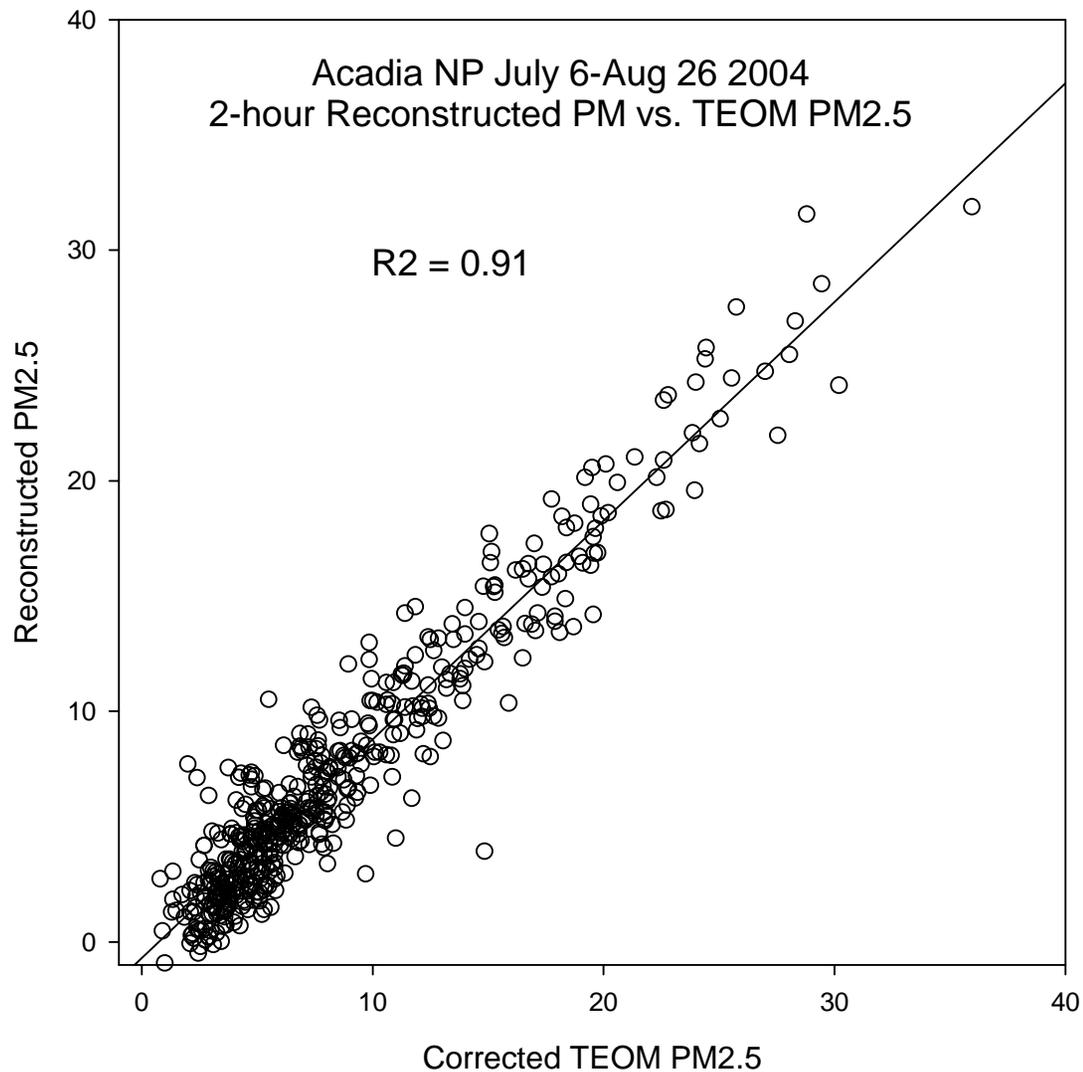
RAIN Parameters

- Core components
 - Continuous [hourly] PM_{2.5}, trace SO₂, O₃
 - Surface Met [wind, temp, RH or dew point,]
 - IMPROVE measurements for carbon, ions and PM_{2.5}
 - Continuous sulfate (Thermo 5020 method)
 - 2-hour EC/OC (Sunset Lab Model 3 method)
 - NGN-2 (wet) nephelometer
 - Hazecam automated digital scene photos

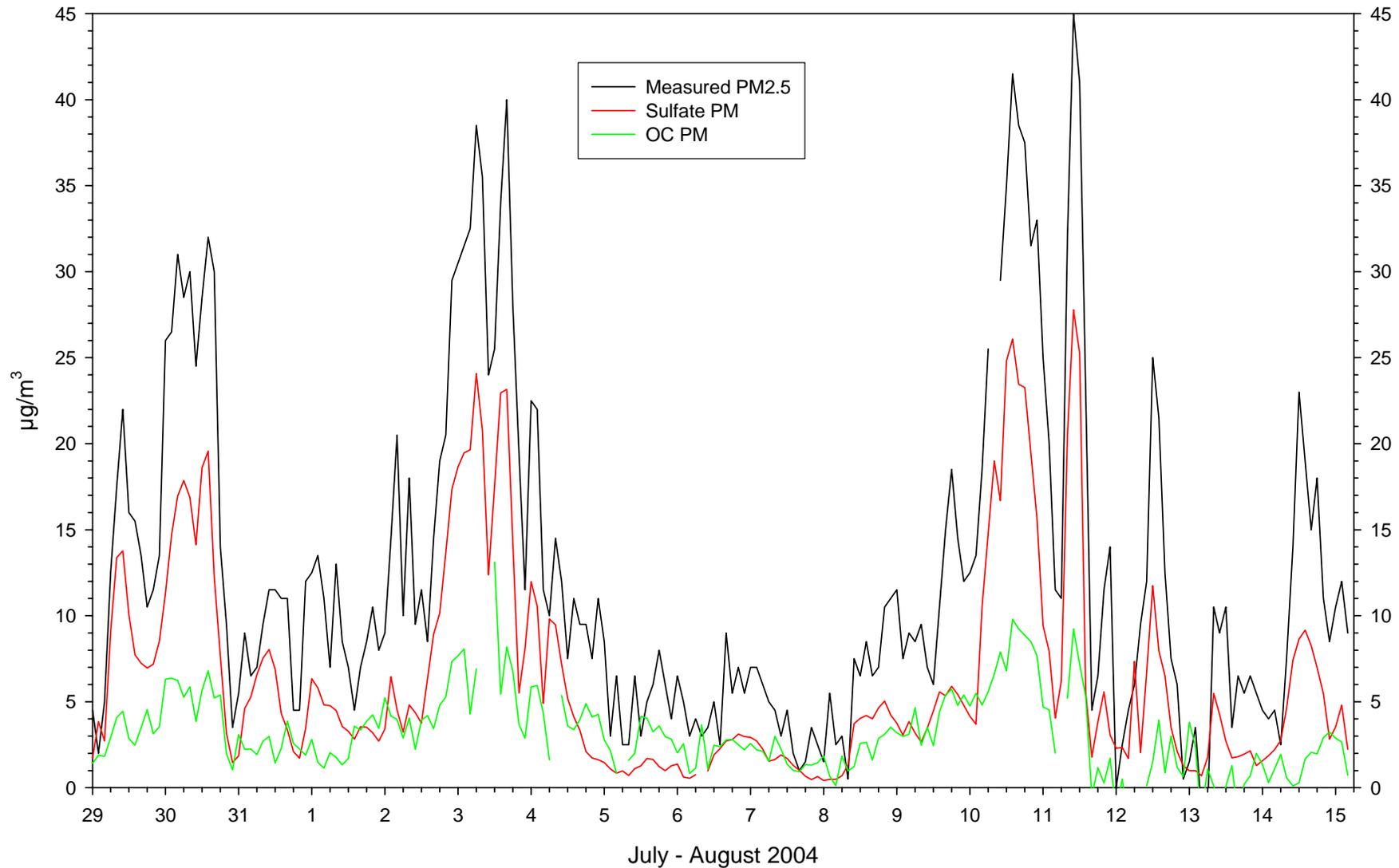
- Additional Measurements at some sites:
 - NO/NO_y, “true” trace level CO, Profiler

- Wish-list
 - ASOS, NH₃, continuous NO₃, HNO₃, strong aerosol acidity

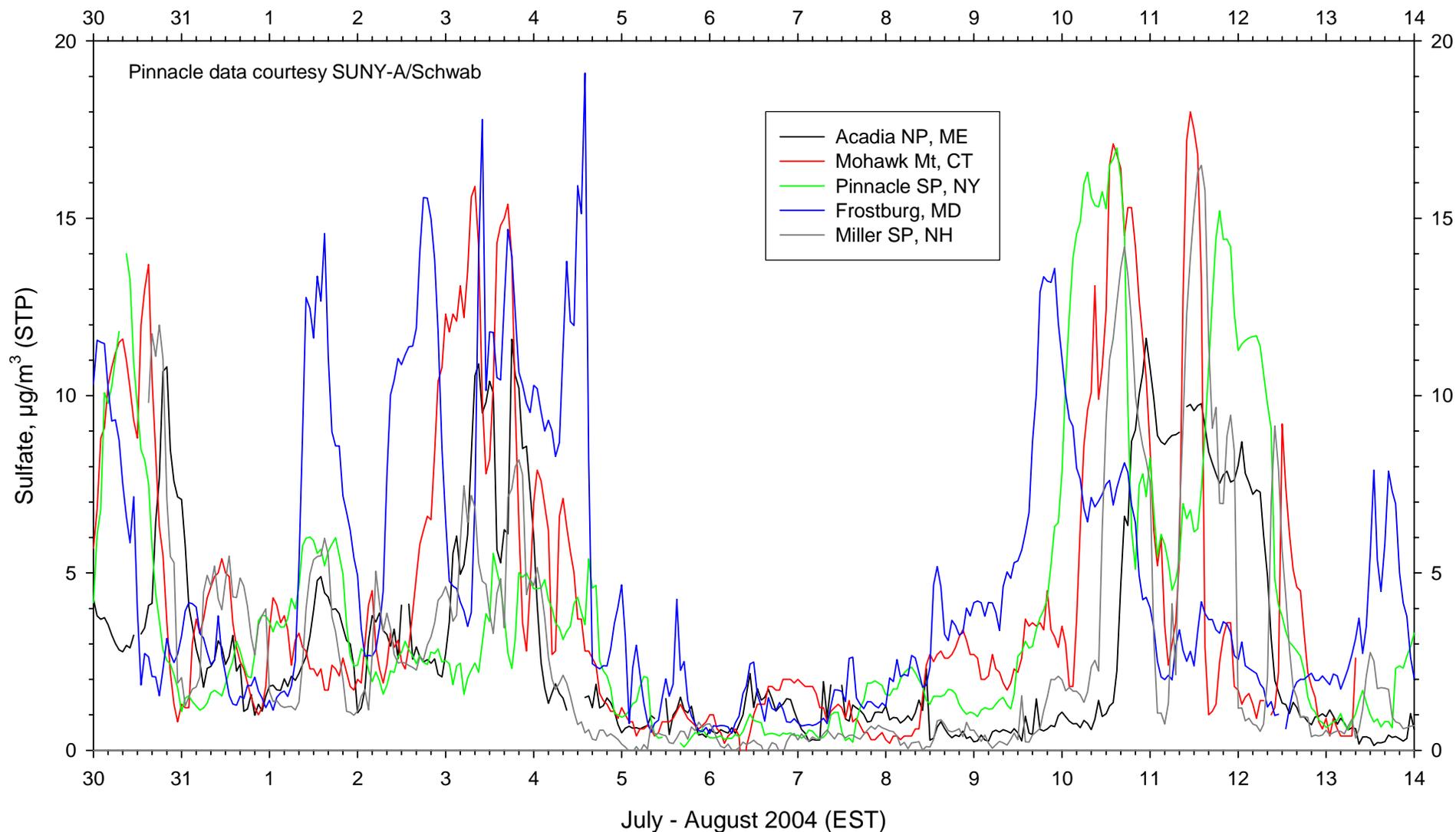
- How do we know it's working? ==> Mass reconstruction to continuous PM
 - use only EC/OC and sulfate 2-hour data
 - subtract $0.5 \mu\text{g}/\text{m}^3$ for OC blank; then assume $\text{OC} \times 1.8$
 - sulfate $\times 1.3$ (for ammonium) $\times 1.2$ (for water in measured PM)
 - add generic 10% for nitrate and crustal PM components



Mohawk Mt. CT PM reconstruction components:
2-hour sulfate and organic carbon-related PM, and measured PM_{2.5}
=> note the relatively small dynamic range of OC compared to SO₄

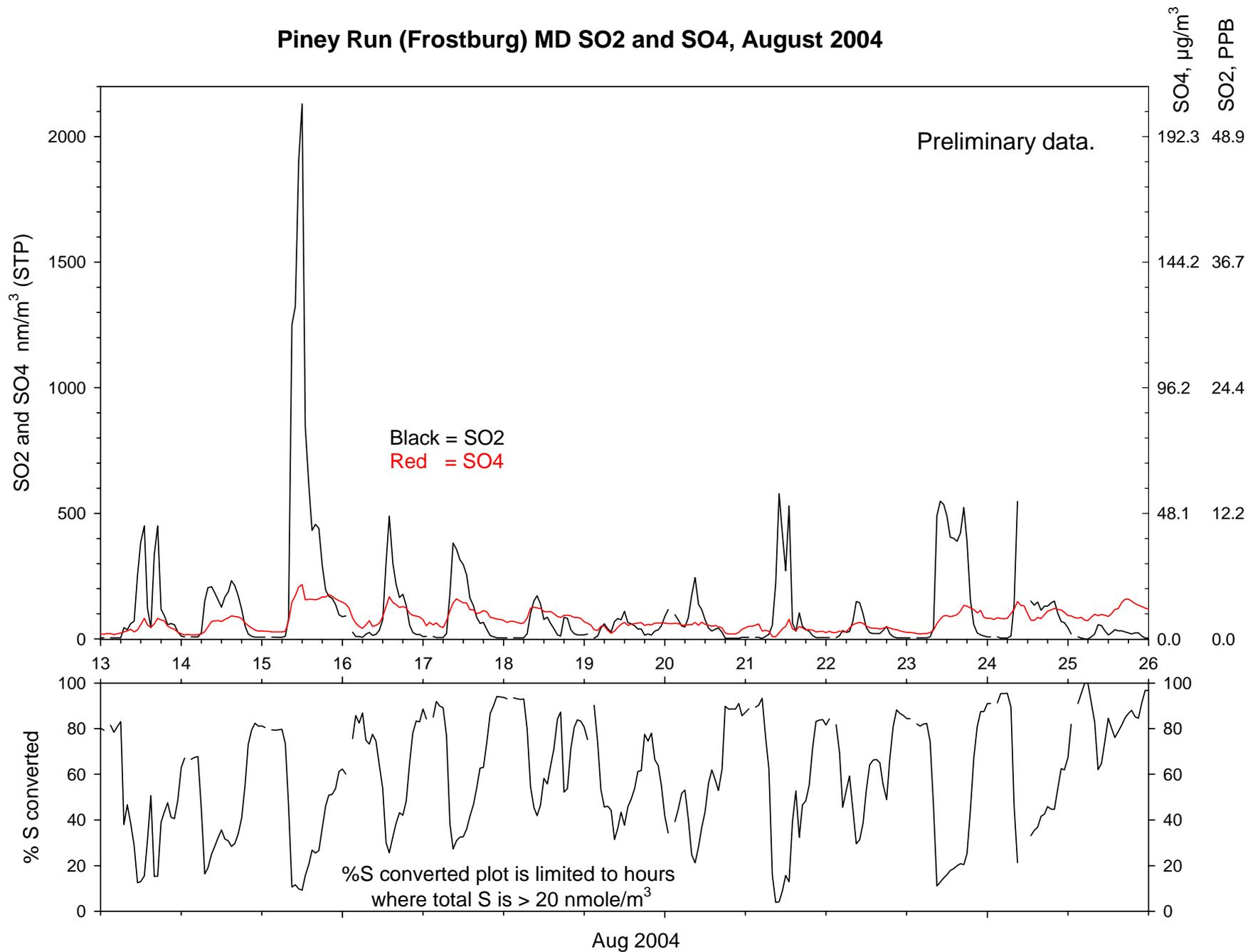


Five-site Thermo 5020 Hourly Sulfate, July 30 - August 13, 2004

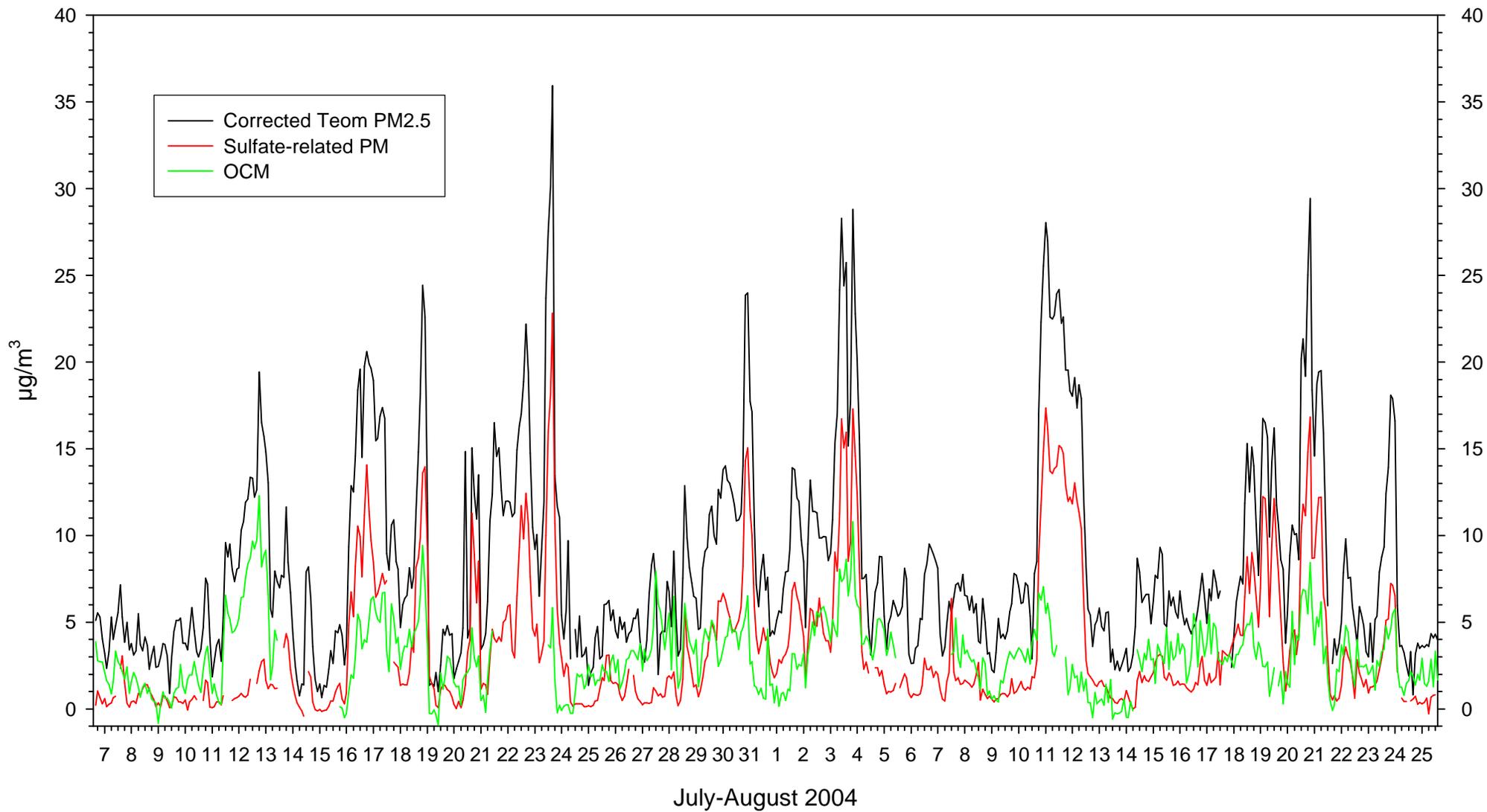


Frostburg MD SO2 and sulfate detail, August 13-25, 2004

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

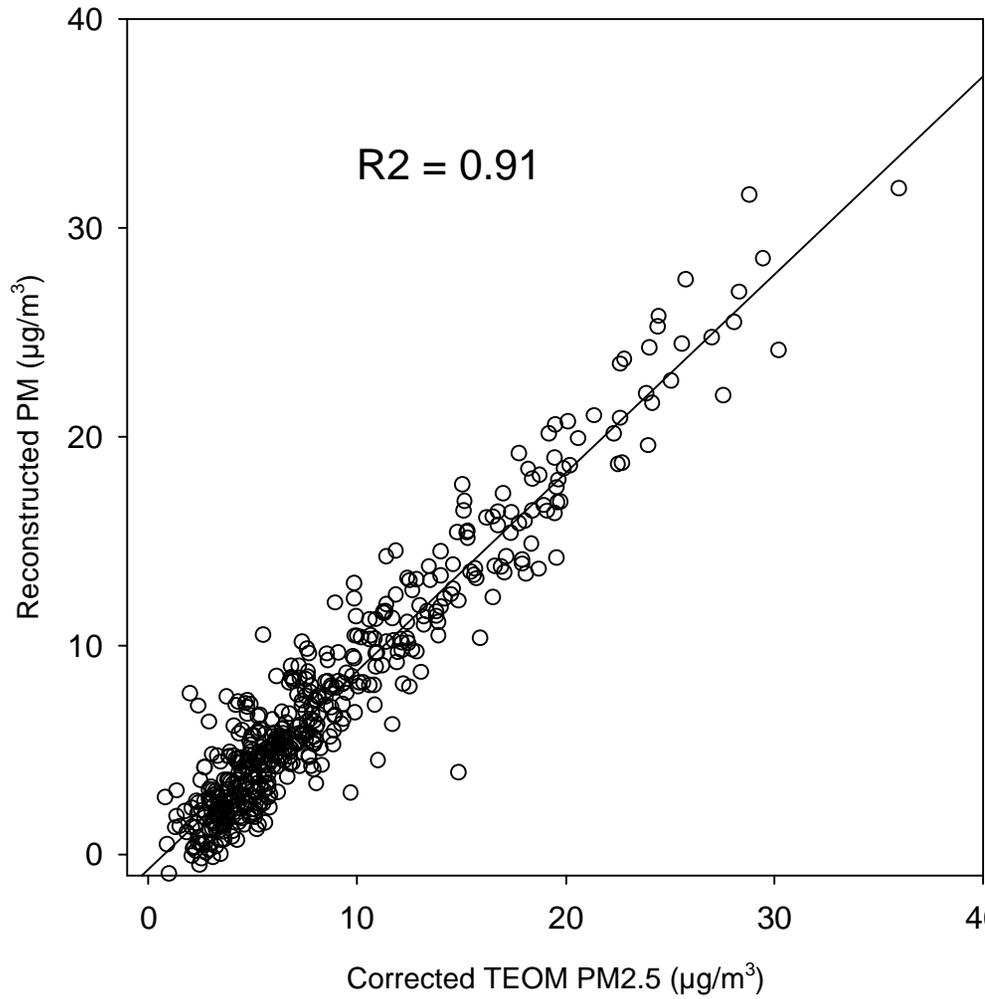


Acadia NP 2-hour averages

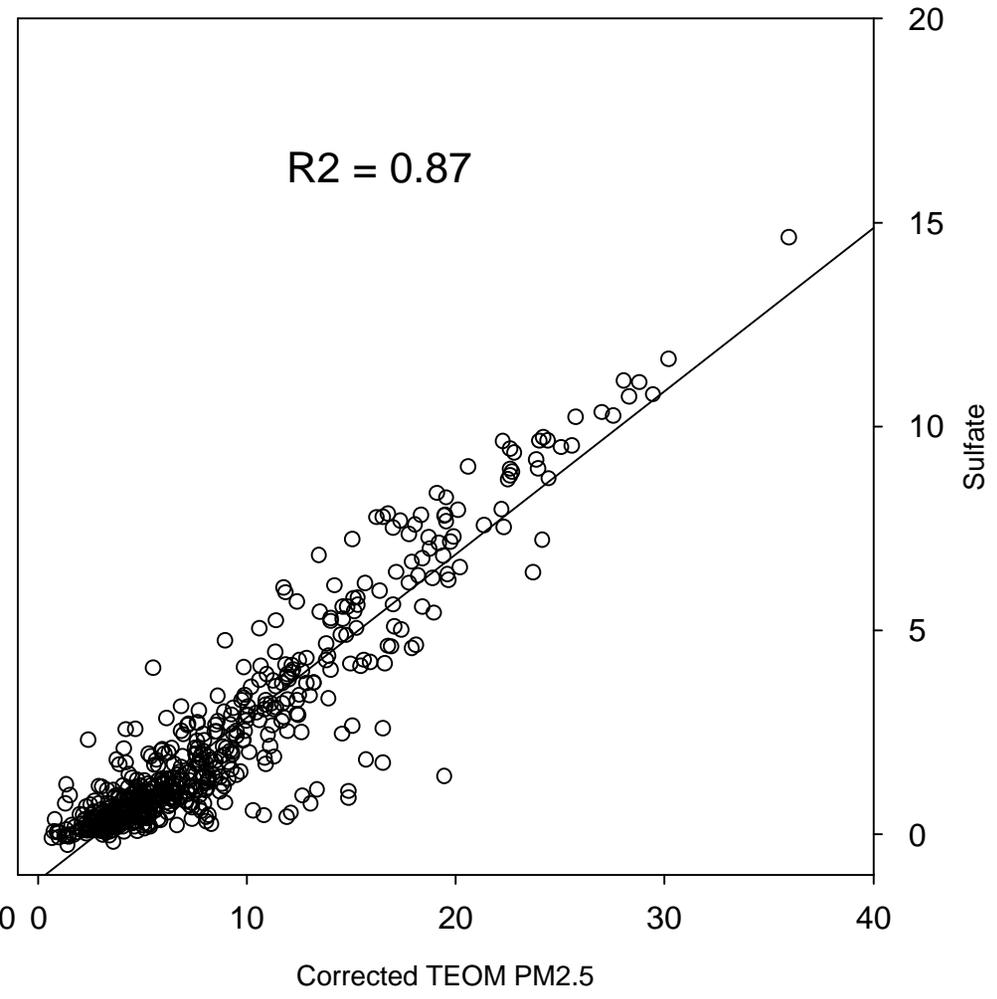


Acadia NP July 6-Aug 26 2004

2-hour Reconstructed PM vs. TEOM PM2.5

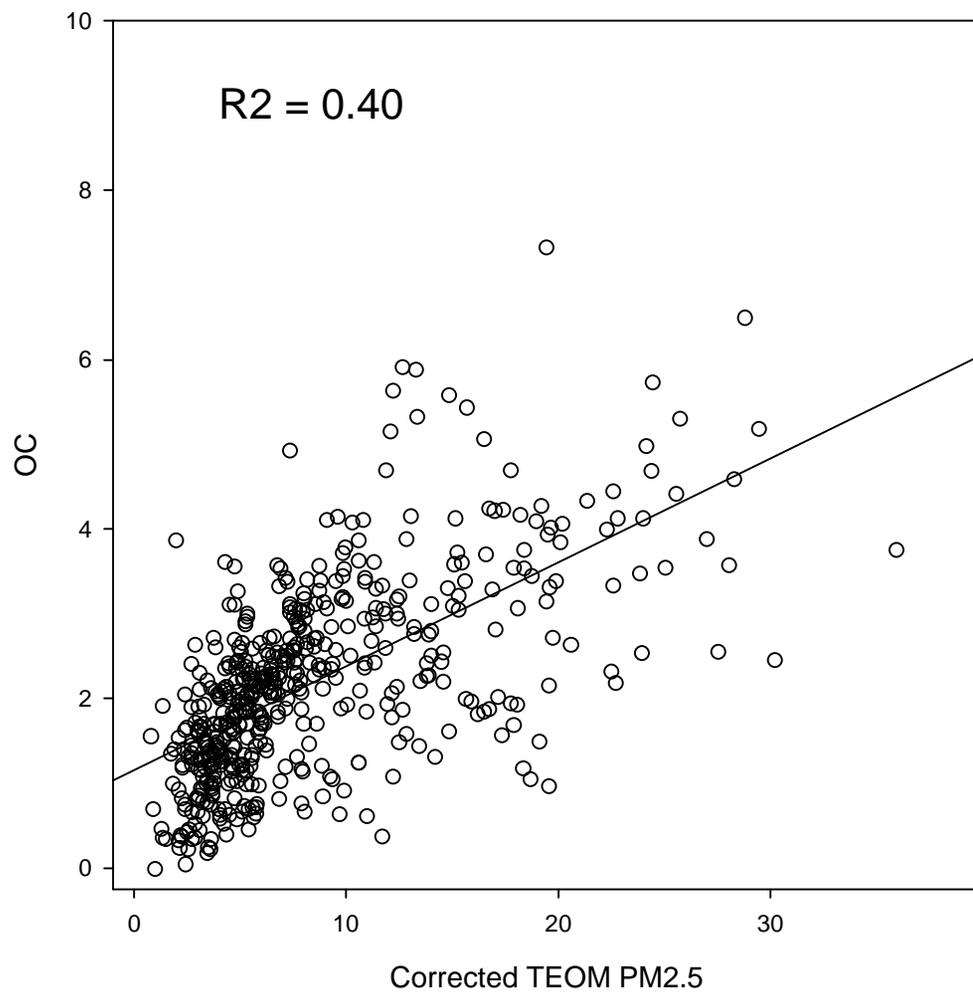


2-hour Sulfate vs. TEOM PM2.5

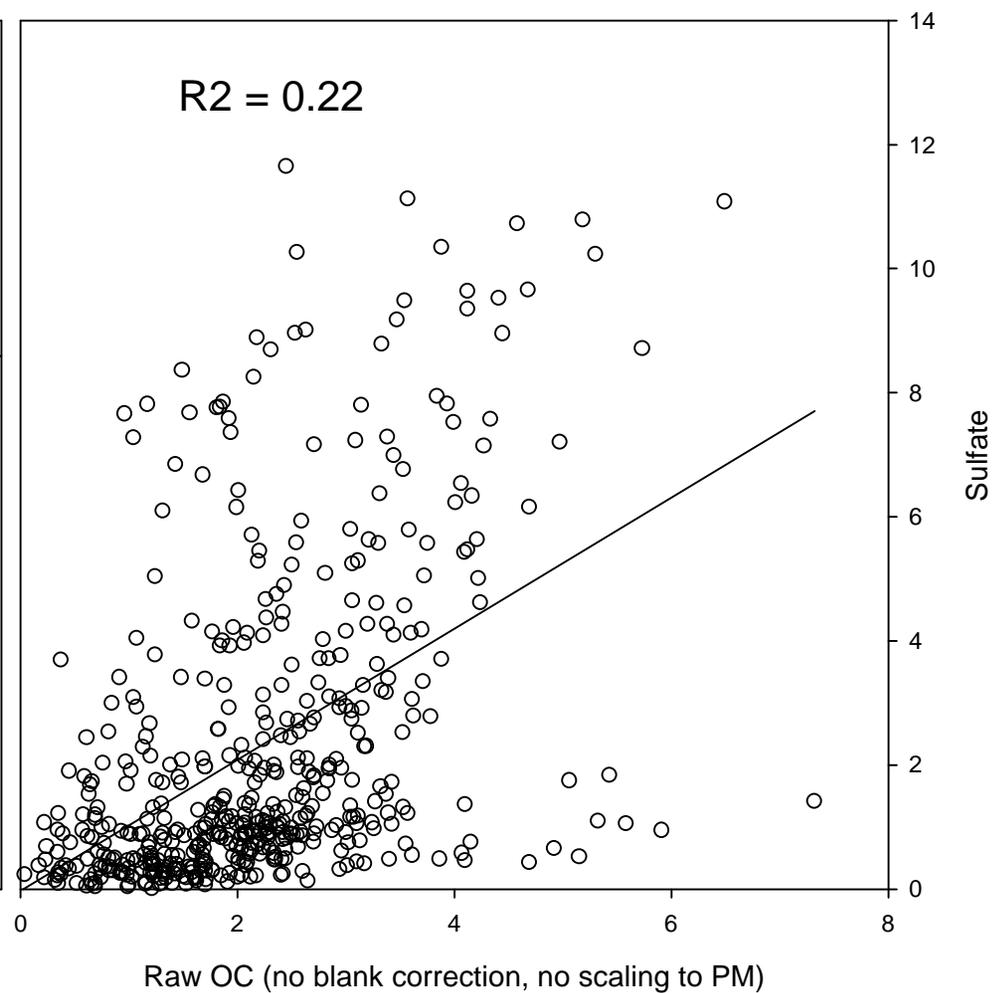


Acadia NP July 6-Aug 26 2004

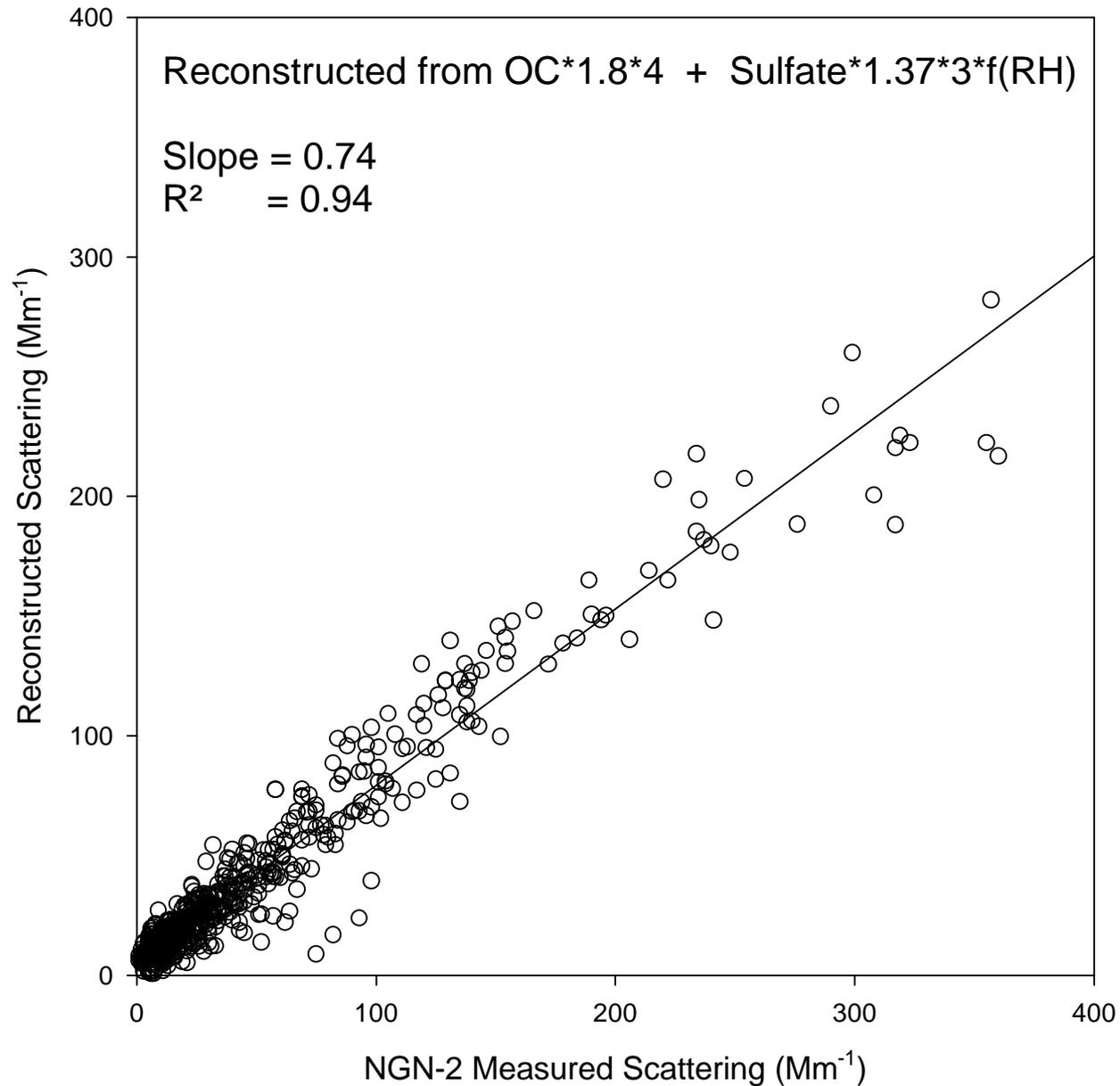
2-hour Raw Sunset OC vs. TEOM PM2.5



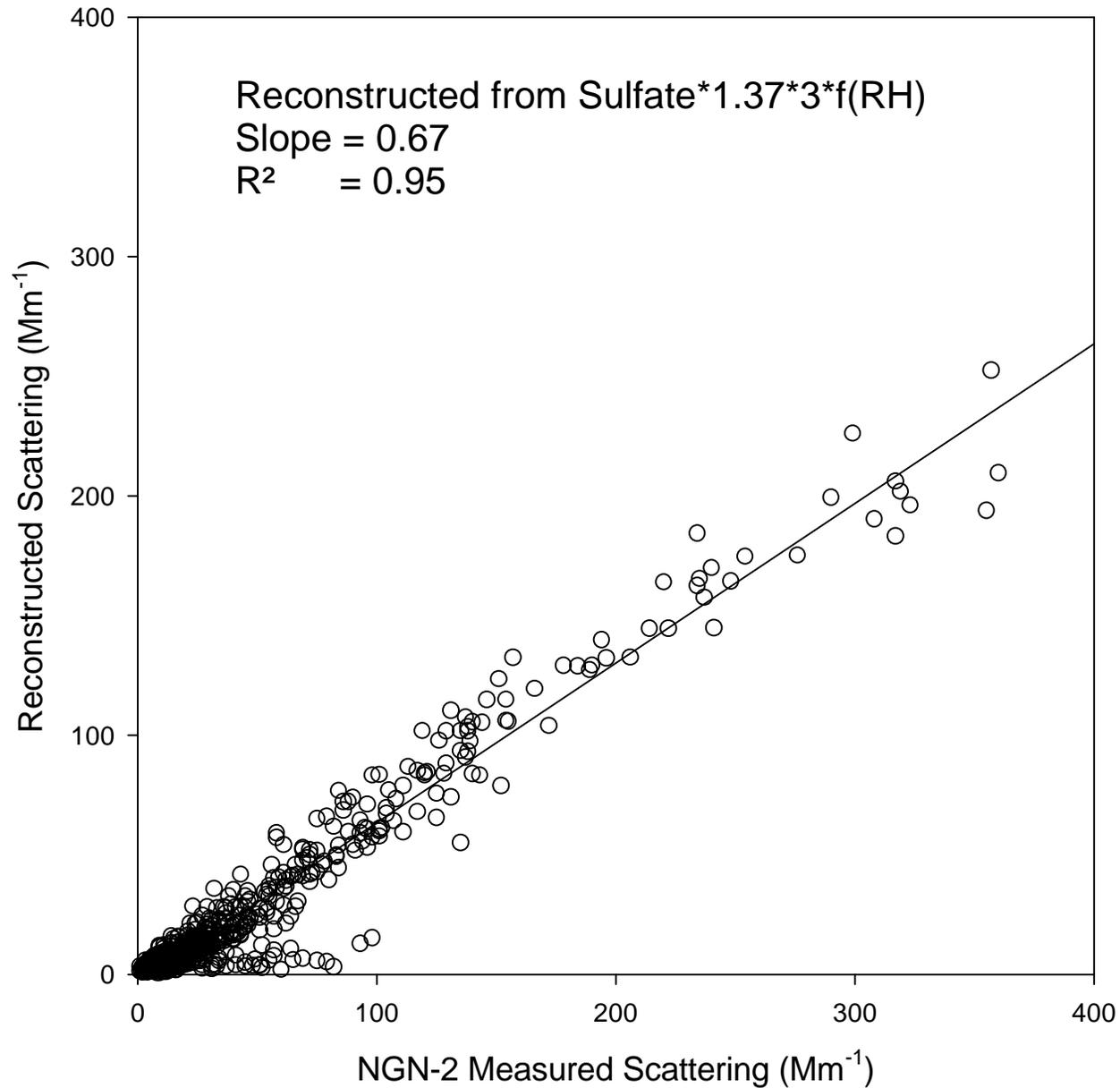
2-hour Sulfate vs. Raw Sunset OC



Acadia NP, Maine -- July-Sept. 2004
Reconstructed vs. Measured (wet) 2-hour Scattering
(using OC and Sulfate)



Acadia NP, Maine -- July-Sept. 2004
Reconstructed vs. Measured (wet) 2-hour Scattering
(using Sulfate only)



Acadia NP, Maine -- July-Sept. 2004
Reconstructed vs. Measured (wet) 2-hour Scattering
(using OC only)

