

**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

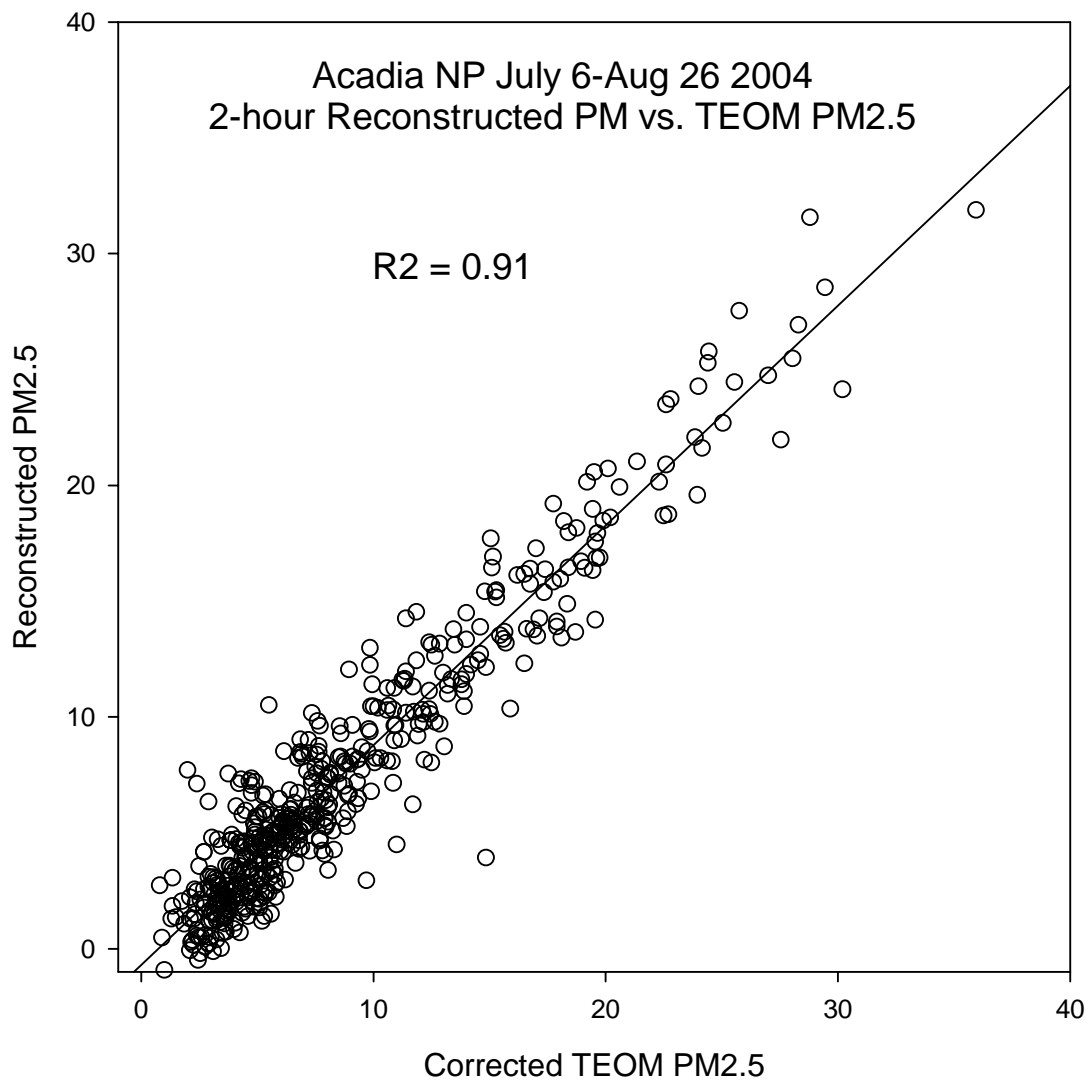
RAIN and Friends (● = Summer 2004 Sulfate)



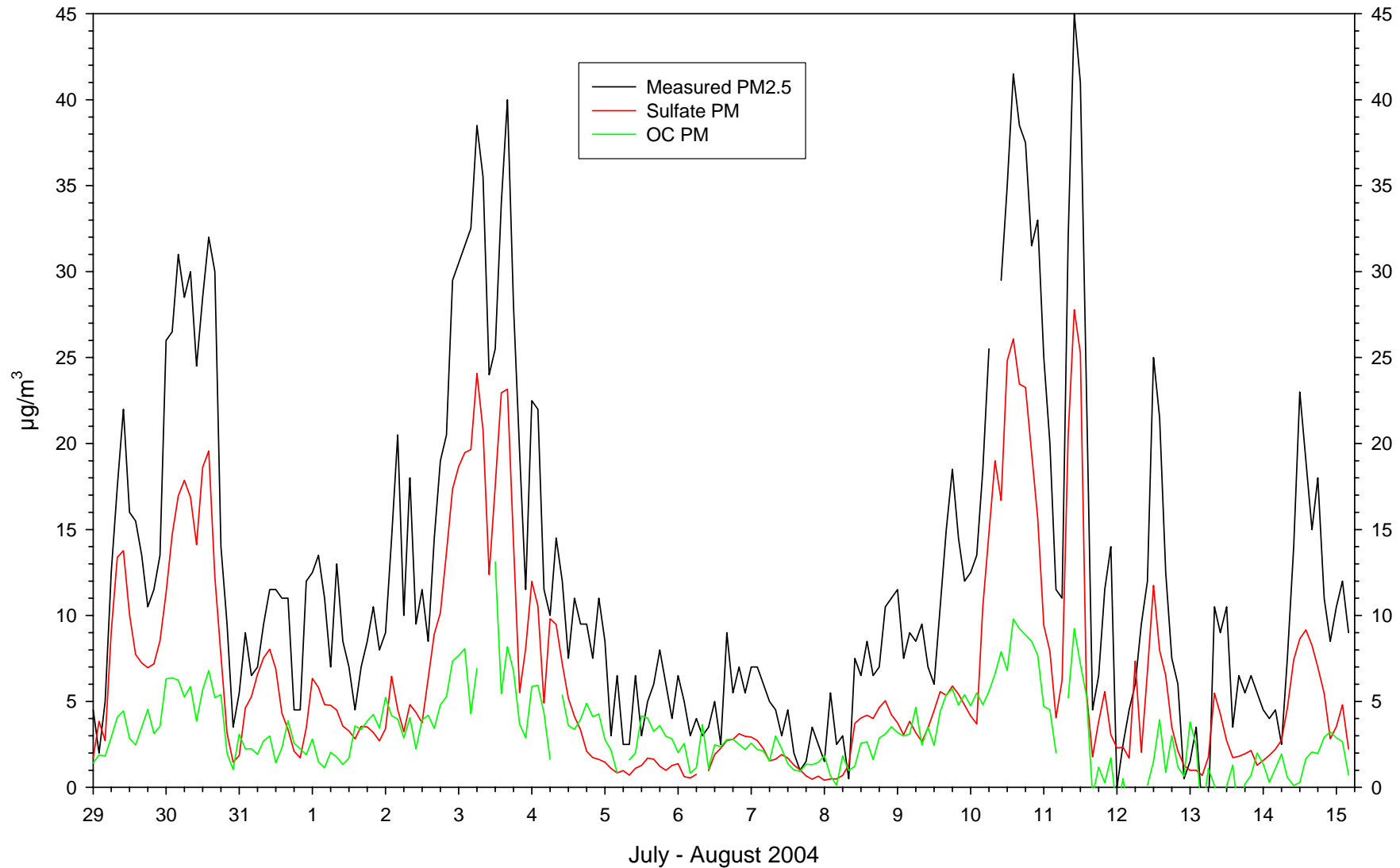
# RAIN Parameters

- Core components
  - Continuous [hourly] PM<sub>2.5</sub>, trace SO<sub>2</sub>, O<sub>3</sub>
  - Surface Met [wind, temp, RH or dew point,]
  - IMPROVE measurements for carbon, ions and PM<sub>2.5</sub>
  - 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<sub>y</sub>, “true” trace level CO, Profiler
  
- Wish-list
  - ASOS, NH<sub>3</sub>, continuous NO<sub>3</sub>, HNO<sub>3</sub>, strong aerosol acidity

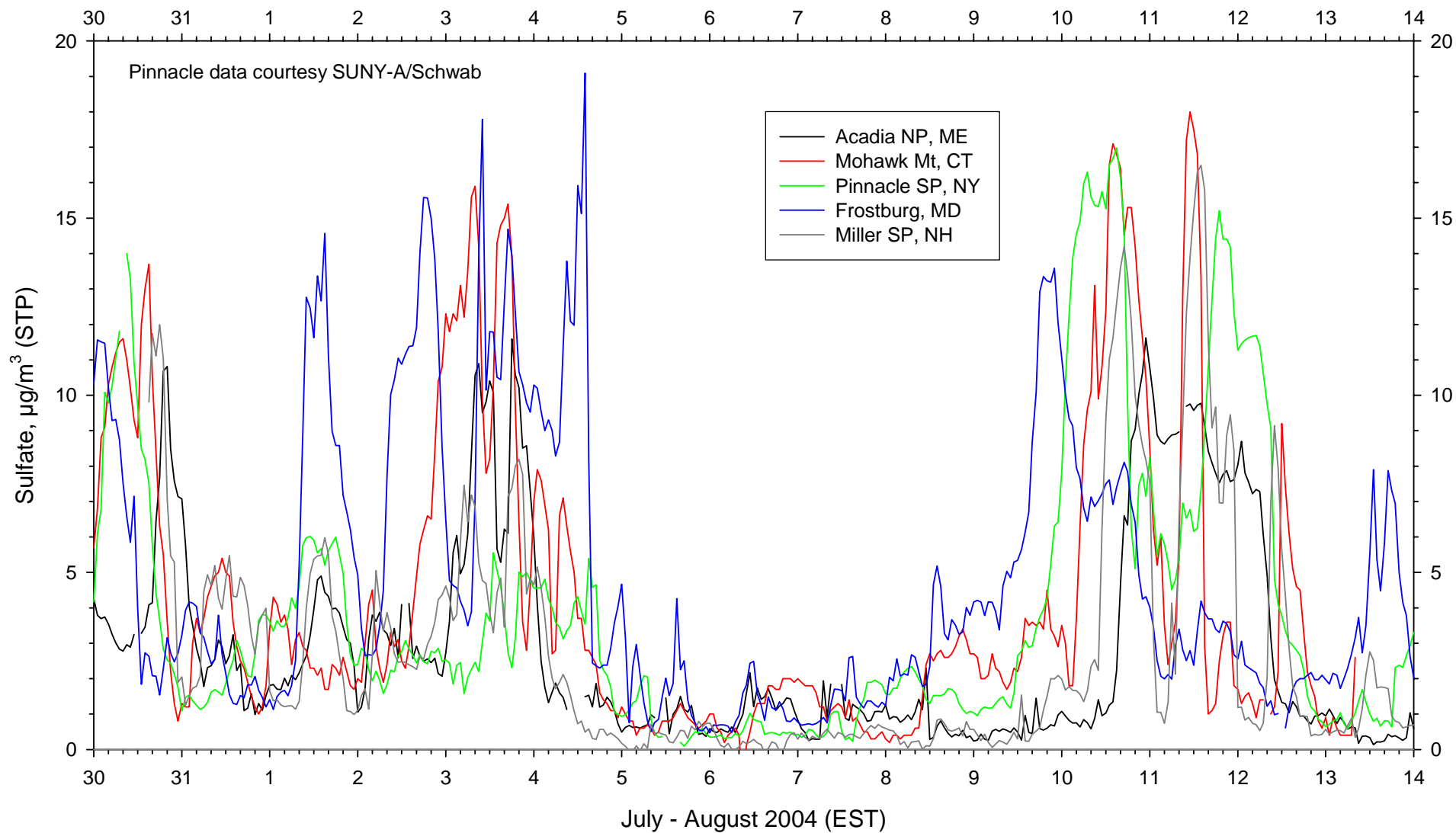
- How do we know it's working? ==> Mass reconstruction to continuous PM
  - use only EC/OC and sulfate 2-hour data
  - subtract  $0.5 \mu\text{g}/\text{m}^3$  for OC blank; then assume  $\text{OC} * 1.8$
  - sulfate \* 1.3 (for ammonium) \* 1.2 (for water in measured PM)
  - add generic 10% for nitrate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



Mohawk Mt. CT PM reconstruction components:  
2-hour sulfate and organic carbon-related PM, and measured PM<sub>2.5</sub>  
=> note the relatively small dynamic range of OC compared to SO<sub>4</sub>

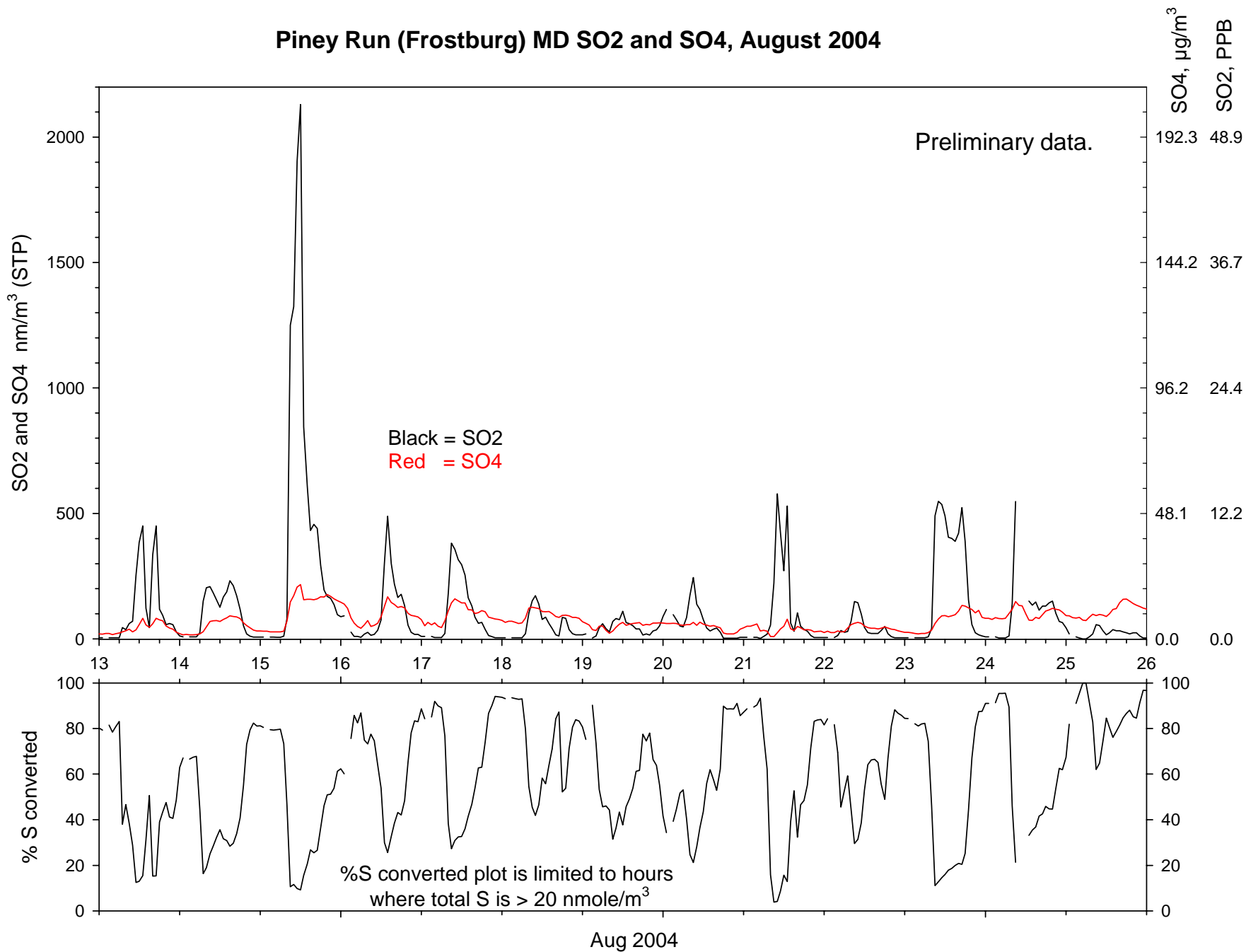


# Five-site Thermo 5020 Hourly Sulfate, July 30 - August 13, 2004

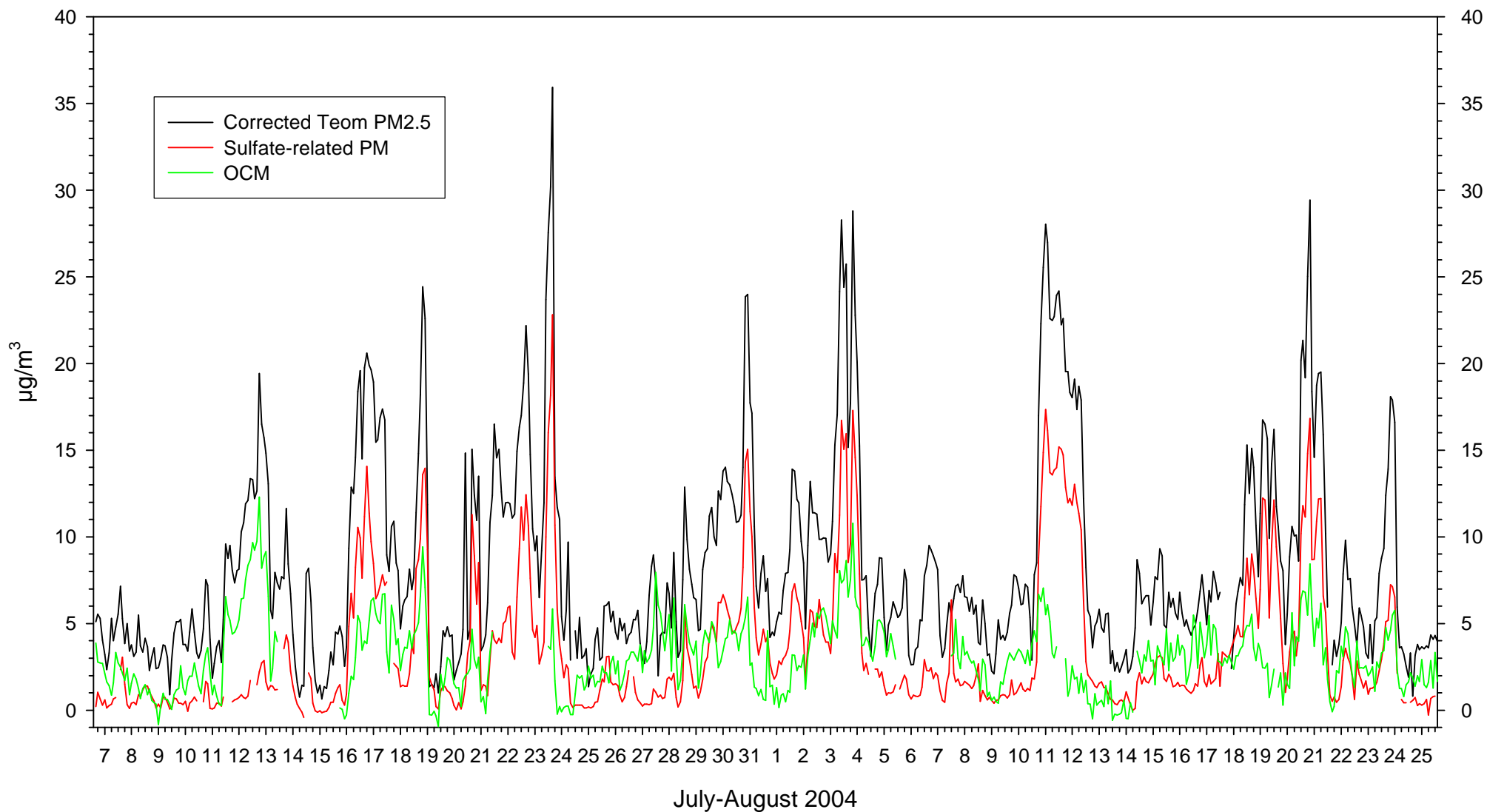


# Frostburg MD SO2 and sulfate detail, August 13-25, 2004

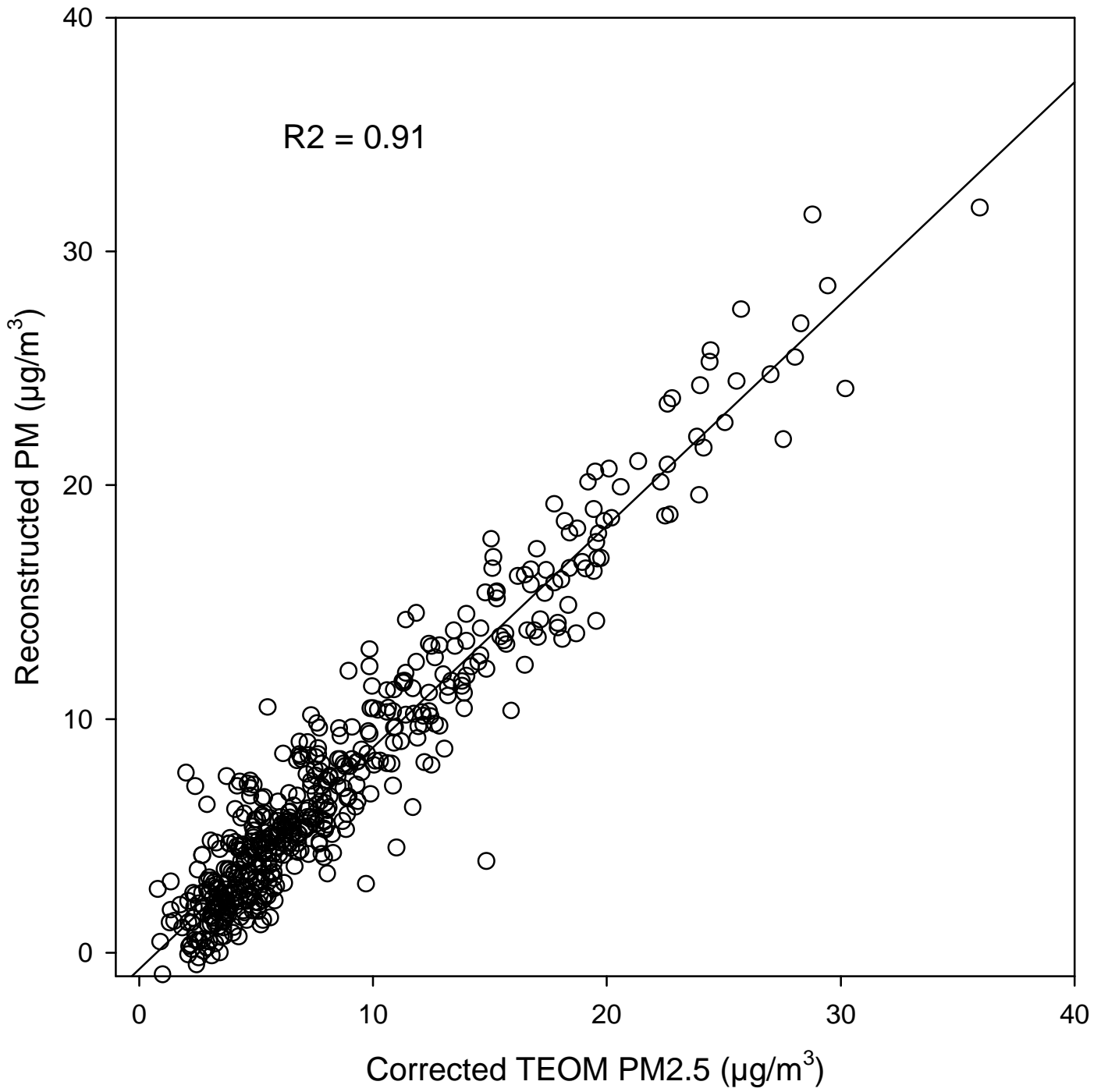
## Piney Run (Frostburg) MD SO2 and SO4, August 2004



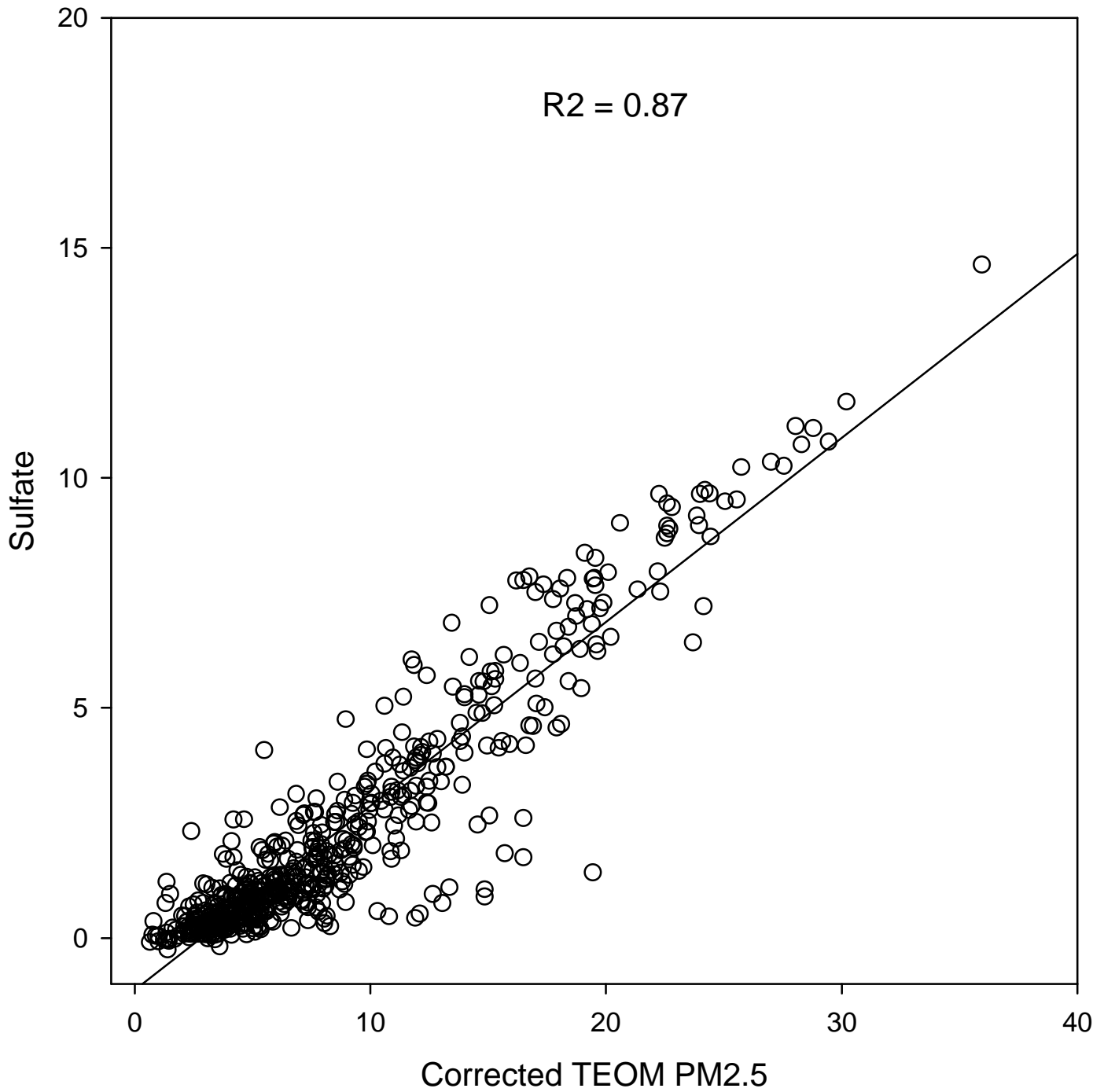
# Acadia NP 2-hour averages



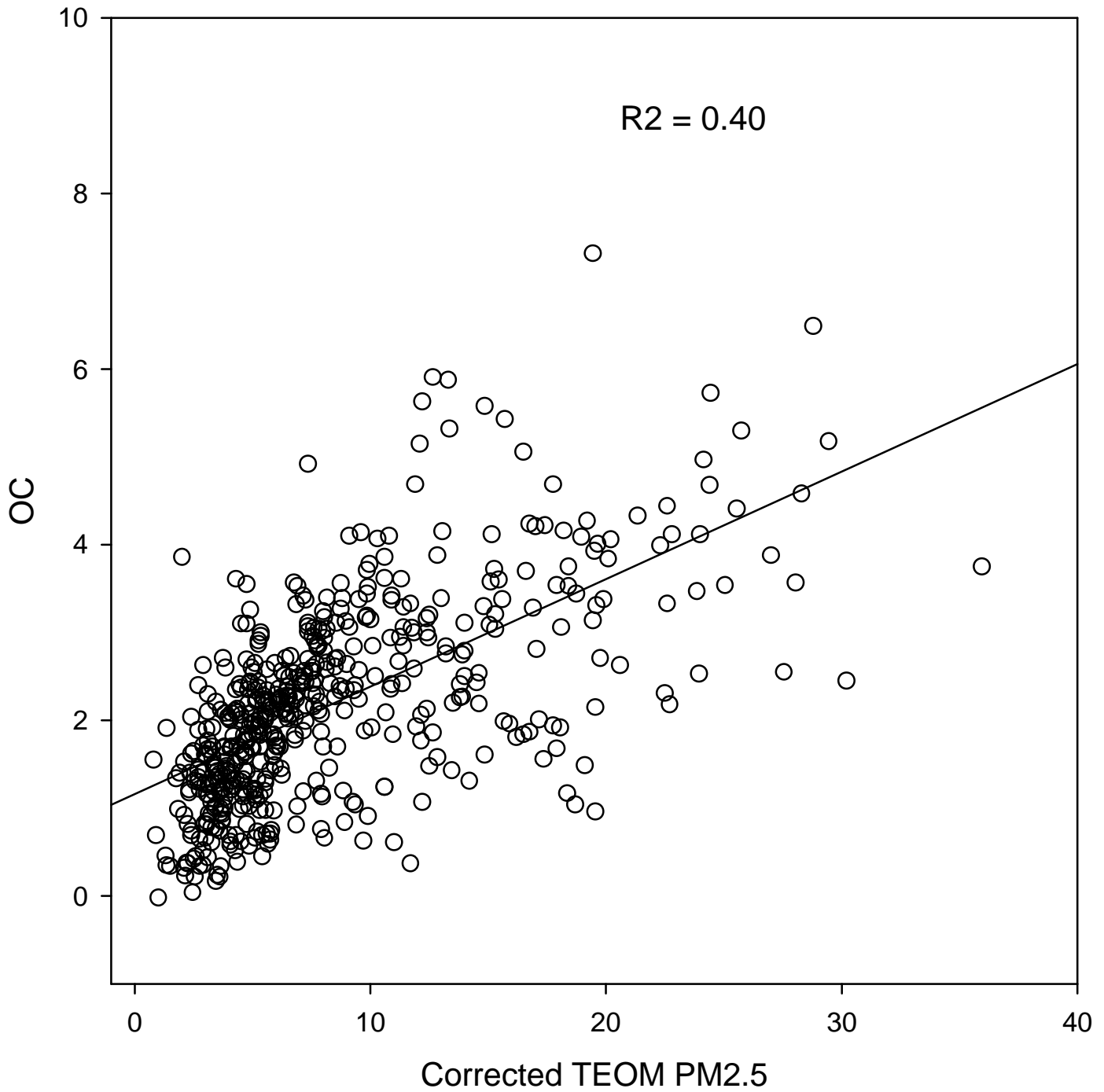
Acadia NP July 6-Aug 26 2004  
2-hour Reconstructed PM vs. TEOM PM2.5



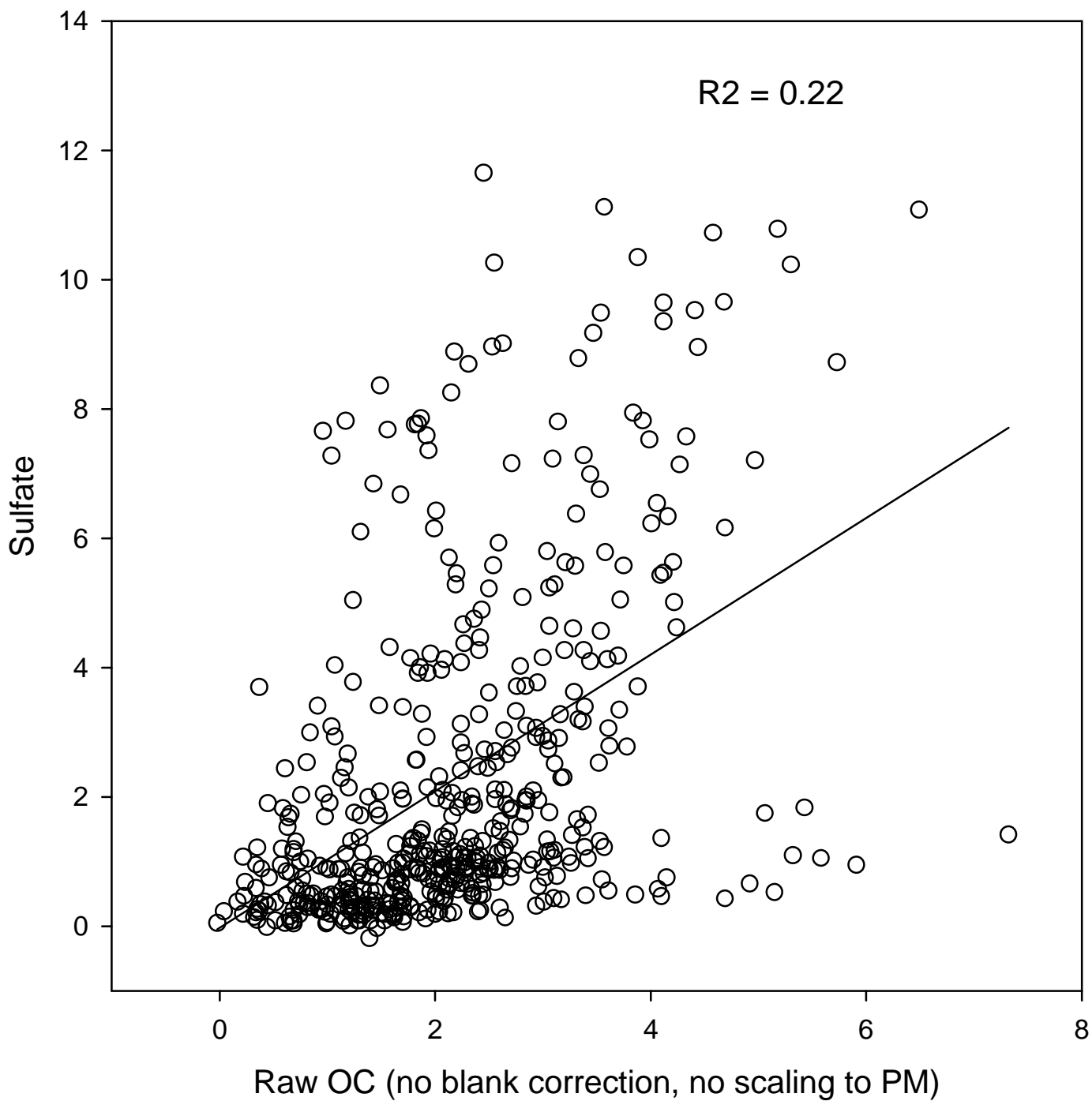
Acadia NP July 6-Aug 26 2004  
2-hour Sulfate vs. TEOM PM2.5



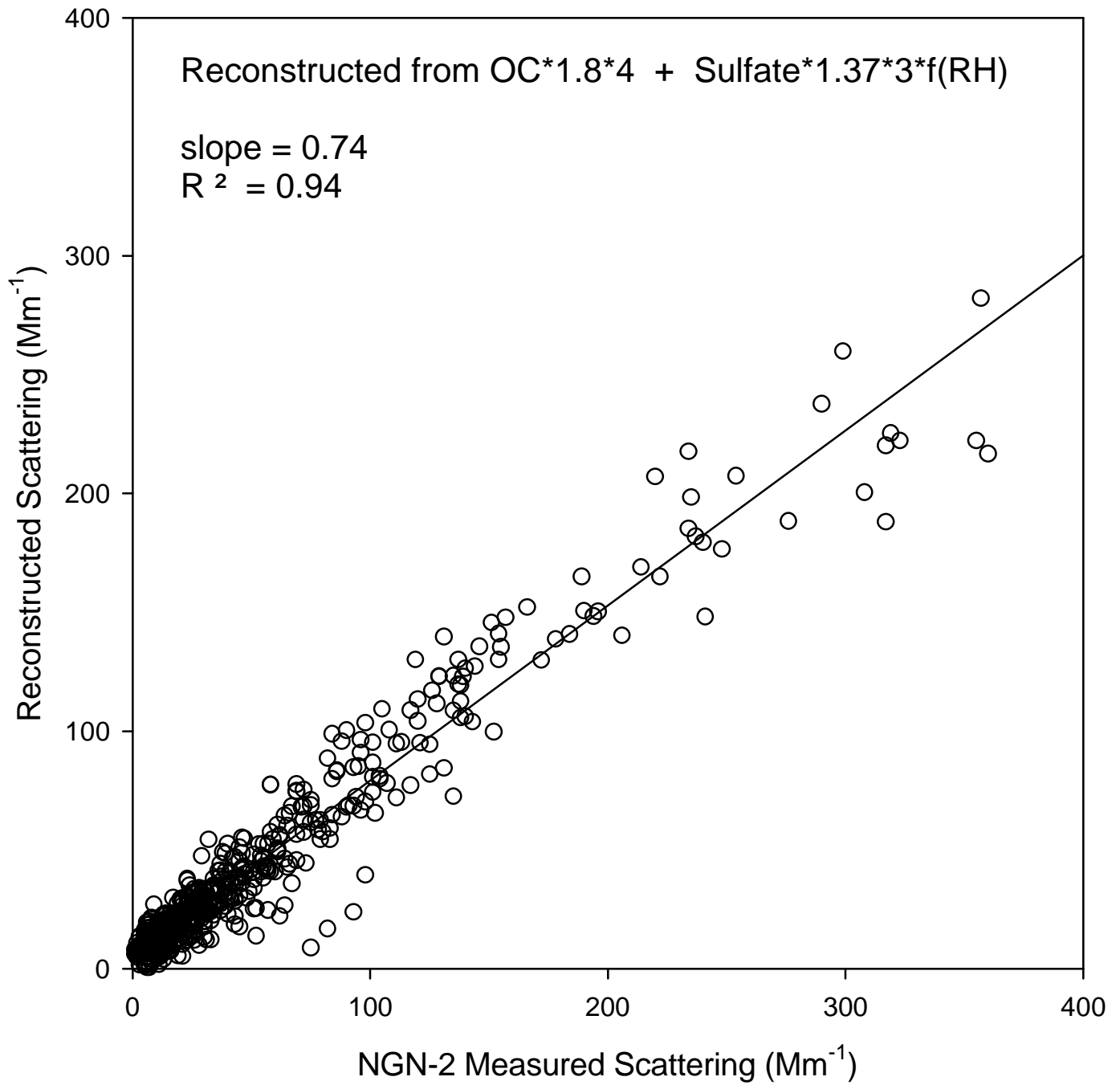
Acadia NP July 6-Aug 26 2004  
2-hour Raw Sunset OC vs. TEOM PM2.5



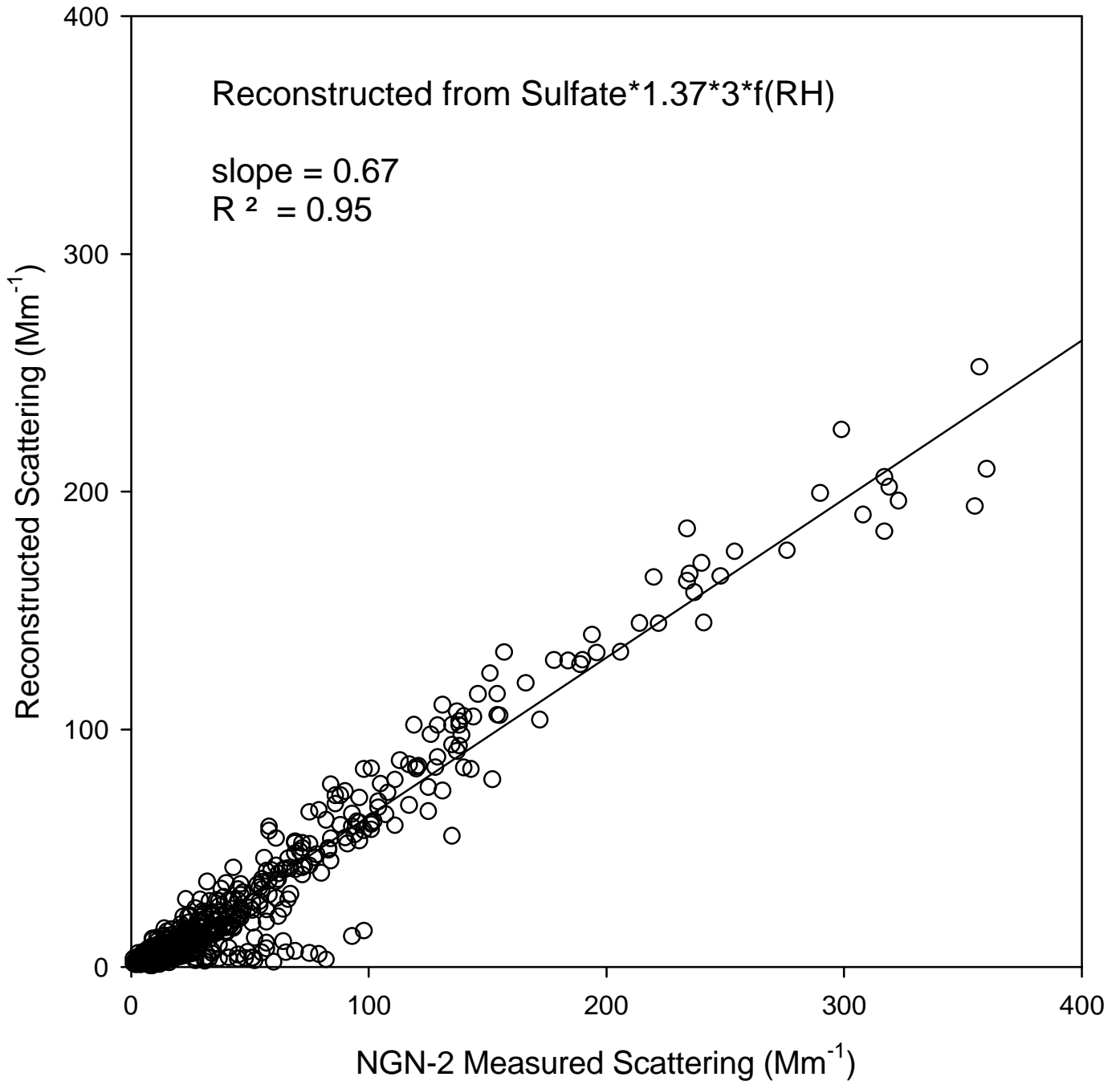
Acadia NP July 6-Aug 26 2004  
2-hour Sulfate vs. Raw Sunset OC



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)

