Air Quality Monitoring Session PM2.5 Continuous Monitoring

2004 National Air Quality Conference

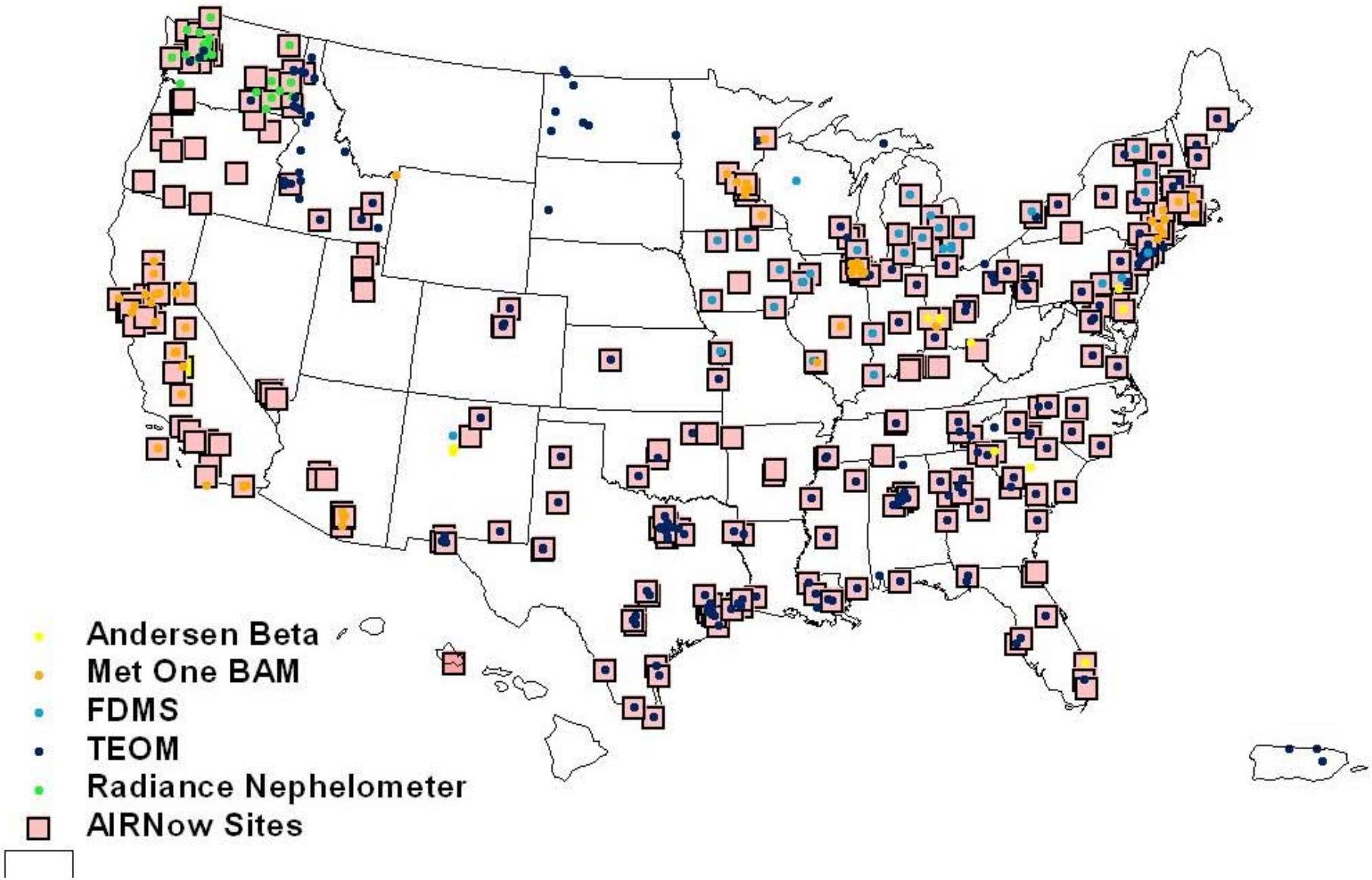
Baltimore, MD

Tuesday February 24th

Topics

- Network Update
- National Monitoring Strategy and PM2.5 continuous monitoring
- Expected Data Quality
- PM2.5 Site Information Table
- FDMS (and other) Data Comparisons
- Met One BAM 1020 Scatterplots
- Summary
- California ARB Continuous PM2.5 Network Experience

PM2.5 Continuous Monitoring Sites Reporting to AIRNow and AQS - February 2004



National Monitoring Strategy

- Major focus on multi-pollutant monitoring
- NMS directs several technology investments:
  - PM2.5 continuous monitors
  - Trace gas analyzers for CO, SO2 and NO2/NOy
  - Data Management Systems
- Scientific review last summer
- Draft regulatory changes being circulated
- Implementation plan being written
- Proposal expected this year
- Final expected in 2005
- PM2.5 continuous monitoring has two potential areas for enhancements
  - Within network approval to replace part of FRM network
  - DQO process to objectively define National Equivalency

What is the expected quality of the PM2.5 continuous monitoring data

(Presented at NAQC 2003, San Antonio)

- Need to balance describing air quality in a general sense such as AQI color codes with describing it in a very specific sense such as an exact index value of 50
- As a starting point for identifying the expected quality of the data two statistics are suggested as compared to a collocated FRM:
  - method bias of +/-10%
    - Taken from DQOs that apply to NAAQS monitoring.
  - correlation of 0.9 (squared correlation of 0.81)
    - Based on interpretation of “Data Quality Objectives (DQOs) for Relating FRMs and Continuous PM2.5 Measurements to Report an AQI.
- Ultimately, individual agencies need to decide for themselves.

AirNowTech - Microsoft Internet Explorer

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PM2.5 Site Information Table

Current DMC Status

Polling Summaries

Monitoring Sites

Data Queries

Forecast System

Forecast Queries

Agency Info / Setup

Resources

AIRNow Notifier

Contacts

Logoff ST1

Display all Agencies

Agency ID	Agency Name	# of PM2.5 Sites	# FRM-like	# Ready for Public
AL2	Jefferson County Department of Health	8	8	8
AR1	Arkansas Dept. of Environmental Quality	3	3	3
AZ1	Arizona Department of Environmental Quality	4	0	4
AZ3	Pima County Department of Environmental Quality	4	4	4
BC1	British Columbia Ministry of Water, Land and Air Protection	22	0	0
BC2	Greater Vancouver Regional District	4	0	0
CA1	Sacramento Metro. AQMD	3	0	3
CA2	San Francisco Bay Area AQMD	5	5	5
CA3	South Coast AQMD	4	0	0
CA4	San Diego APCD	2	0	2
CA5	Ventura County APCD	1	1	1
CA6	San Joaquin Valley Unified APCD	2	0	2
CA8	California Air Resources Board	12	0	12
CK1	Cherokee Nation	1	1	1
CN1	Environment Canada	23	0	0
CO1	Colorado Department of Public Health and Environment	4	2	4
CT1	Connecticut Dept. of Environmental Protection	4	0	4
DC1	District of Columbia - Department of Health - AQ Division	1	0	1
DE1	Delaware Dept. of Natural Resources and Environment	2	0	2
DMC	Data Management Center	3	0	0

Done Internet

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AirNowTech - Microsoft Internet Explorer

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PM2.5 Site Information Table

PM 2.5 Site Information Table > Sites for NC3

- Current DMC Status
- Polling Summaries
- Monitoring Sites
- Data Queries
- Forecast System
- Forecast Queries
- Agency Info / Setup
- Resources
- AIRNow Notifier
- Contacts

Logoff ST1

Agency:	NC3 - Forsyth County Environmental Affairs Dept.
Site:	370670022 - HATTIEAVEN
Parameter:	PM2.5
Latitude:	36.1106
Longitude:	-80.2267
MSA:	GREENSBORO--WINSTON-SALEM--HIGH POINT, NC
Address:	1300 BLK. HATTIE AVENUE
POC:	3
Measurement scale:	Neighborhood-scale 500 M to 4 KM
Sample Collection Description:	PM2.5 SCC w/Correction Factor
Sample Analysis Description:	TEOM Gravimetric 50 deg C
Adjustment Applied at Monitor:	☑
Equation at Monitor:	PM25MASS = 1.03*CM+3
Adjustment Applied After Monitor:	☑
Equation After Monitor:	FRM1HR= (PM25MASS*0.9824) - 0.0277

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Address http://www.airnowtech.org/index.cfm?page=pm25sites&agency=NC3 Go Links

Monitoring Sites

Data Queries

Forecast System

Forecast Queries

Agency Info / Setup

Resources

AIRNow Notifier

Contacts

Logoff ST1

MSA: GREENSBORO--WINSTON-SALEM--HIGH POINT, NC

Address: 1300 BLK. HATTIE AVENUE

POC: 3

Measurement scale: Neighborhood-scale 500 M to 4 KM

Sample Collection Description: PM2.5 SCC w/Correction Factor

Sample Analysis Description: TEOM Gravimetric 50 deg C

Adjustment Applied at Monitor: ☑

Equation at Monitor: PM25MASS = 1.03*CM+3

Adjustment Applied After Monitor: ☑

Equation After Monitor: FRM1HR= (PM25MASS*0.9824) - 0.0277

Are the data FRM-like? ☑

Are the data approved for public reporting? ☑

Additional Comments: Relationship calculated over period 1/1/2002-4/30/2003. RSquare=0.947567813.

Submit Previous Site Next Site

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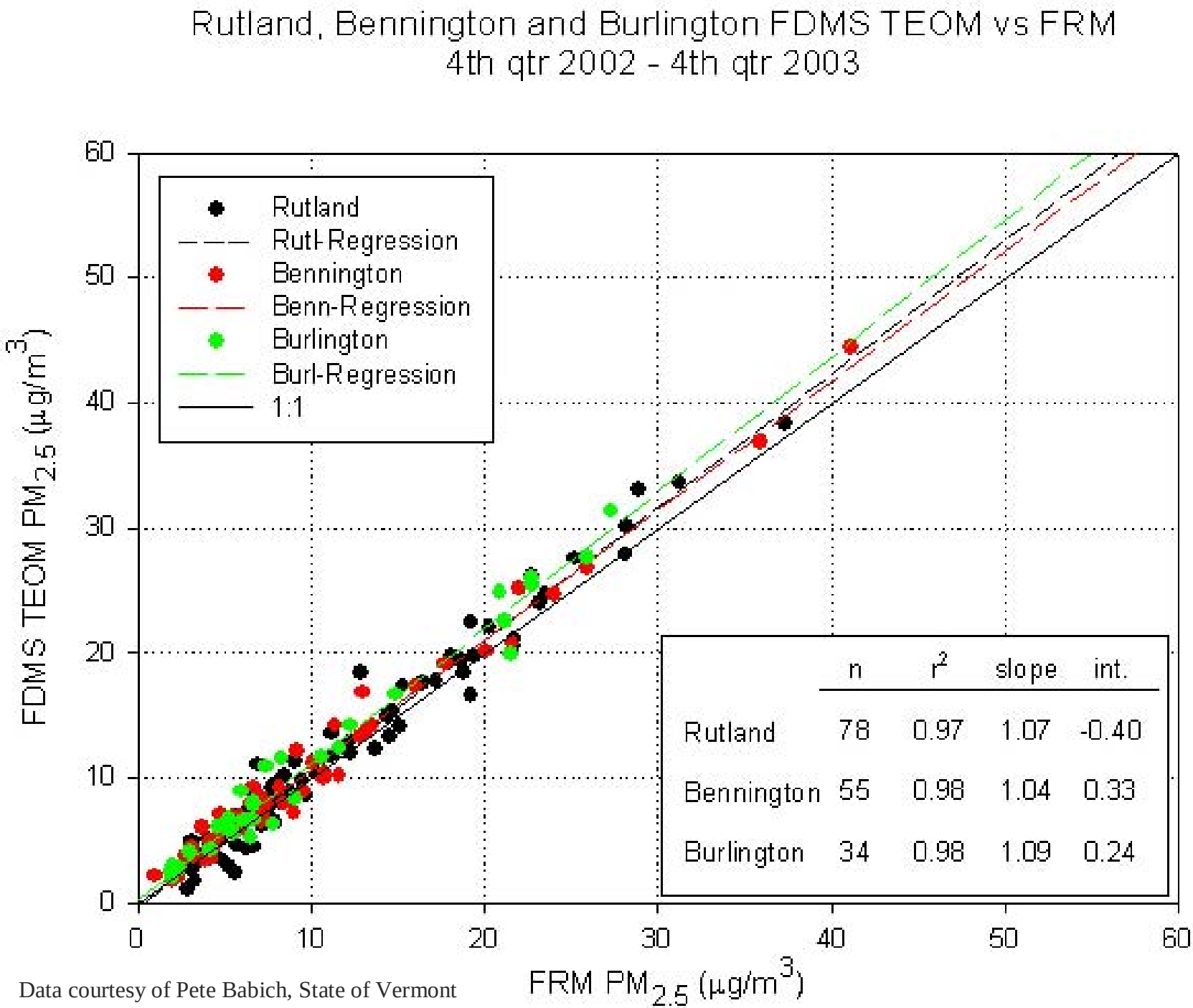
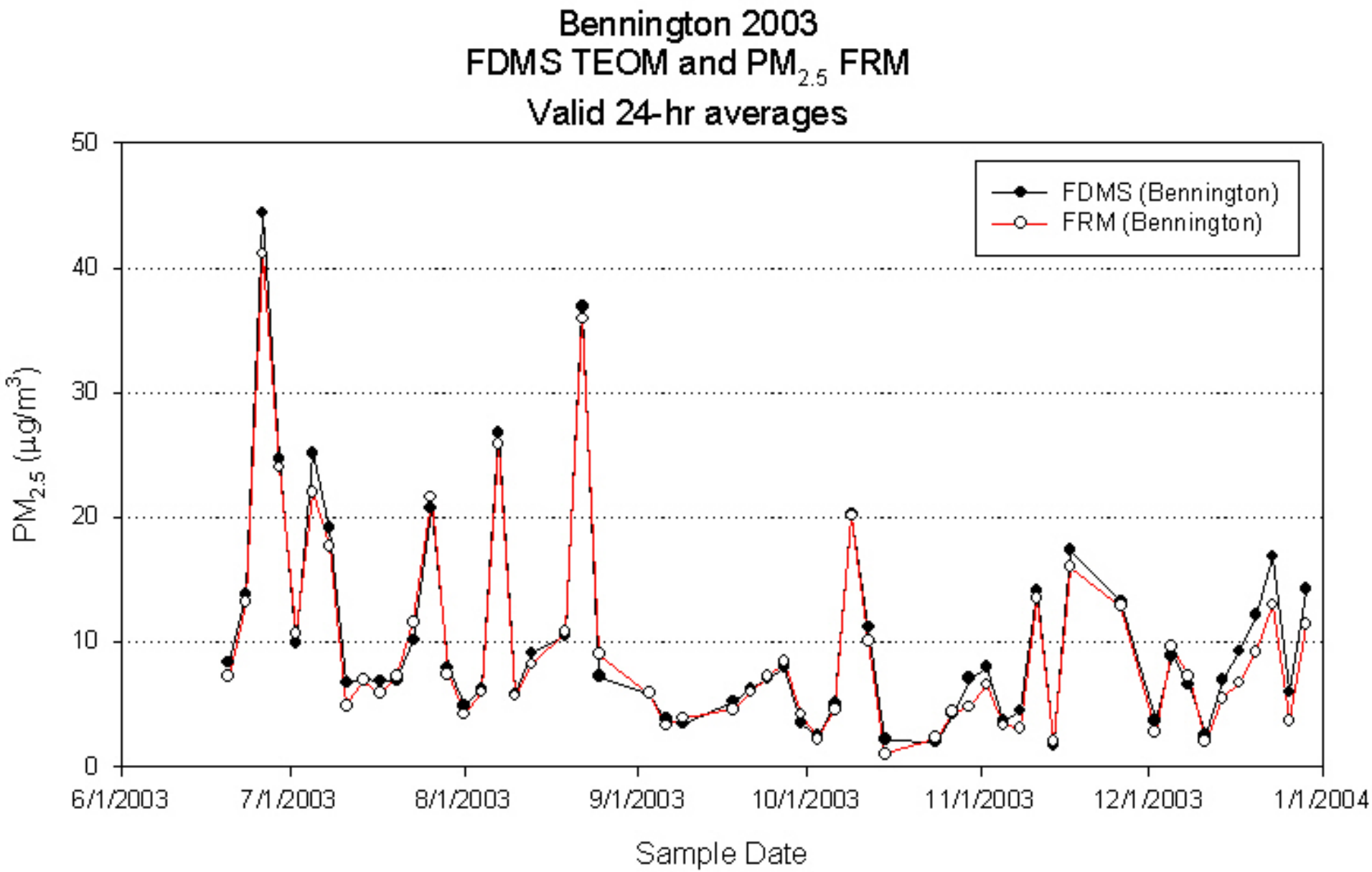
PM2.5 Continuous Monitoring Data Comparisons

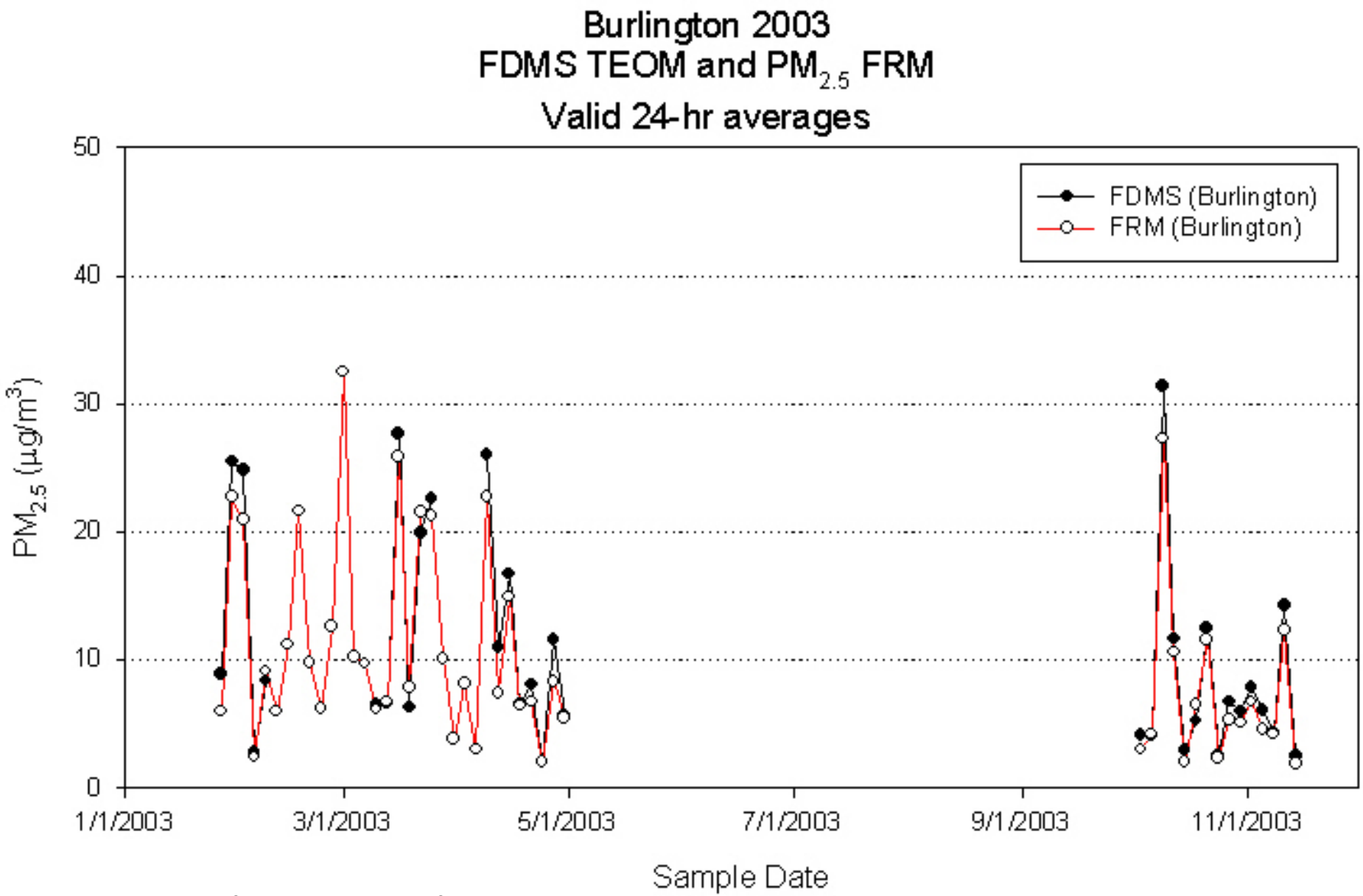
- Vermont
  - FDMS
- Mayville, WI
  - FDMS & TEOM
- Seattle, WA
  - Kent Site
    - Met One BAM, TEOM, Radiance Research Nephelometer
  - Lynnwood Site
    - FDMS, TEOM, Radiance Research Nephelometer
- Indianapolis, IN
  - FDMS, TEOM, Rizzo



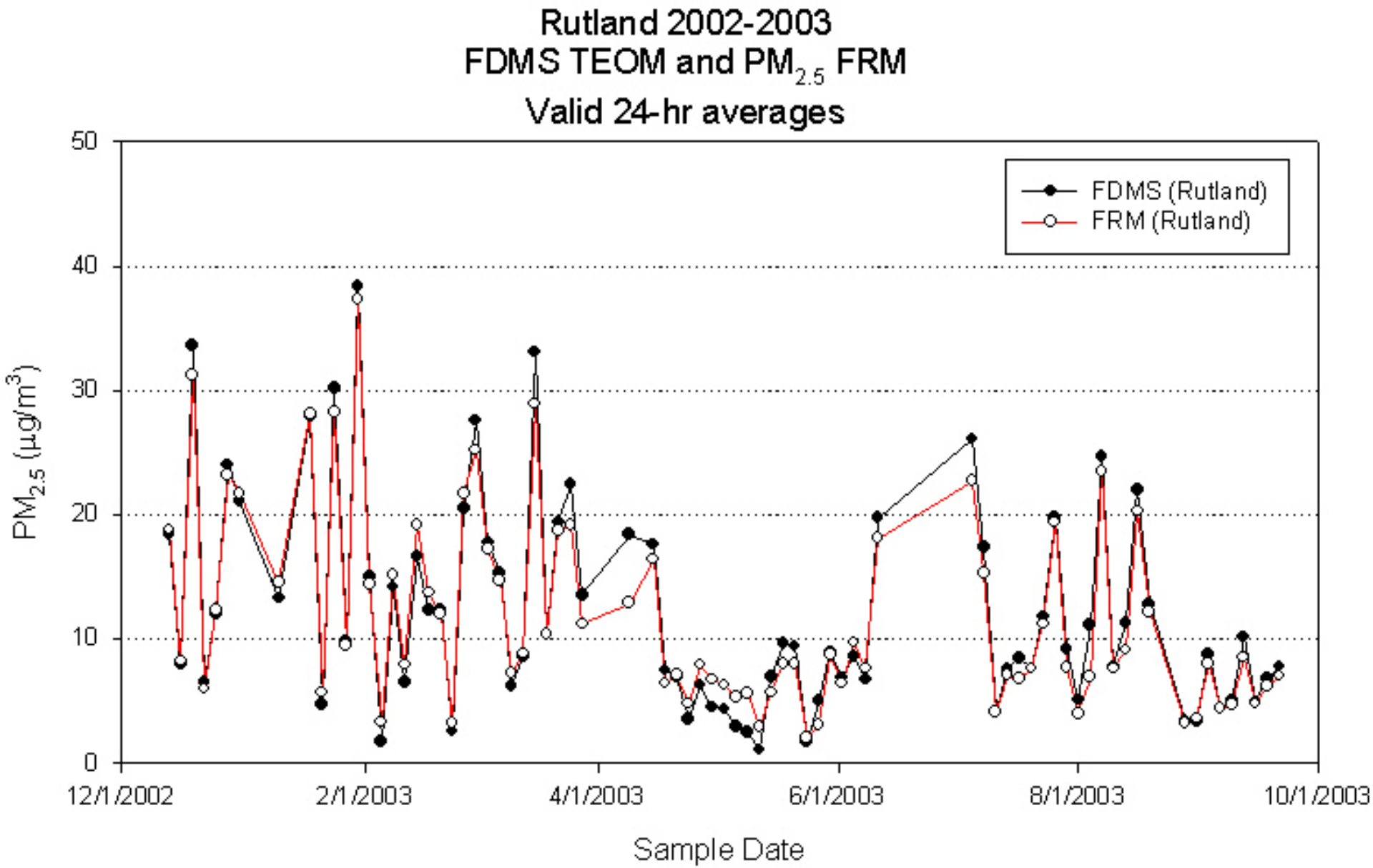
Data courtesy of Pete Babich, State of Vermont



Data courtesy of Pete Babich, State of Vermont



Data courtesy of Pete Babich, State of Vermont



Data courtesy of Pete Babich, State of Vermont

Daily PM2.5 Concentrations from 04/01/02 to 03/31/03

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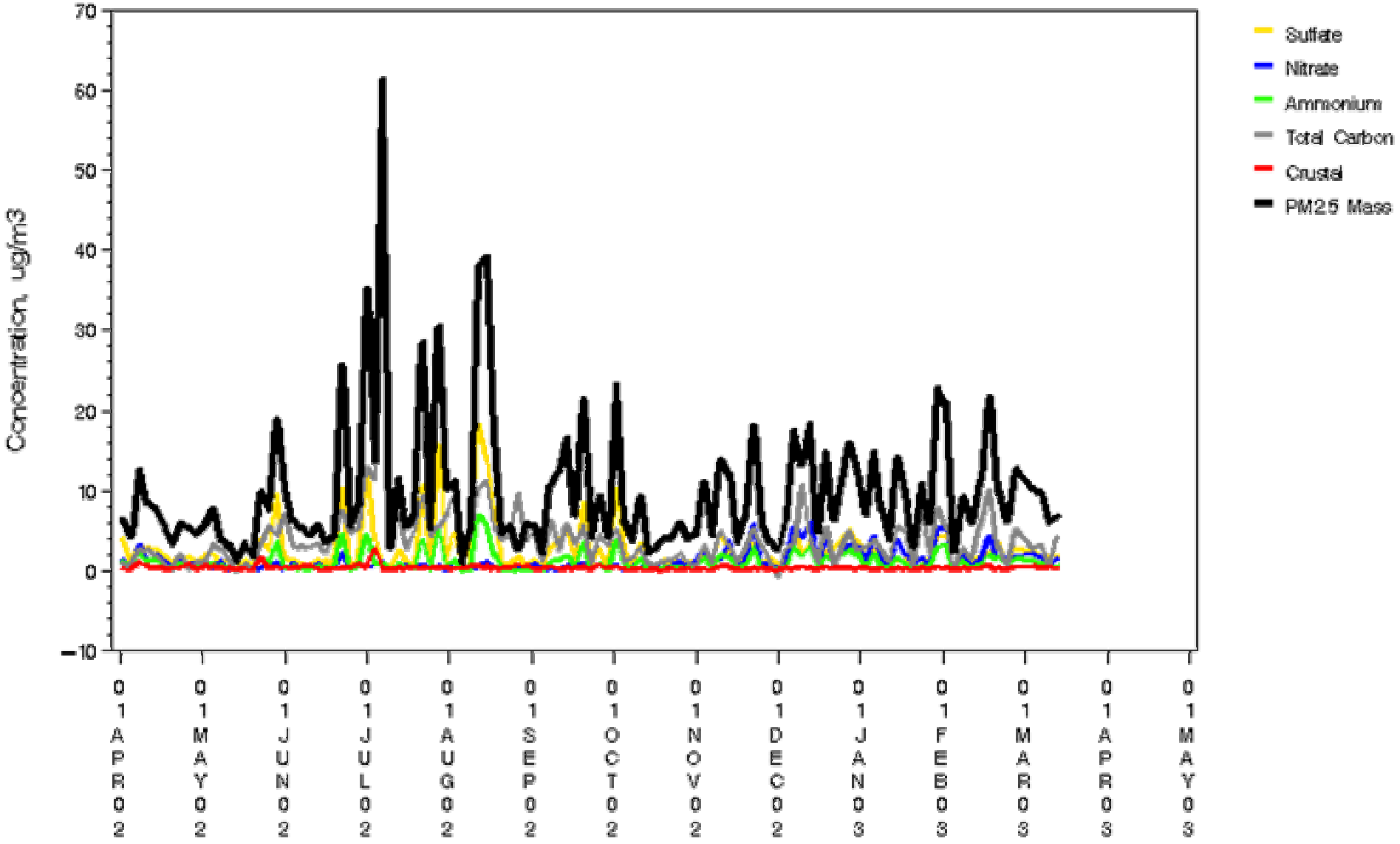
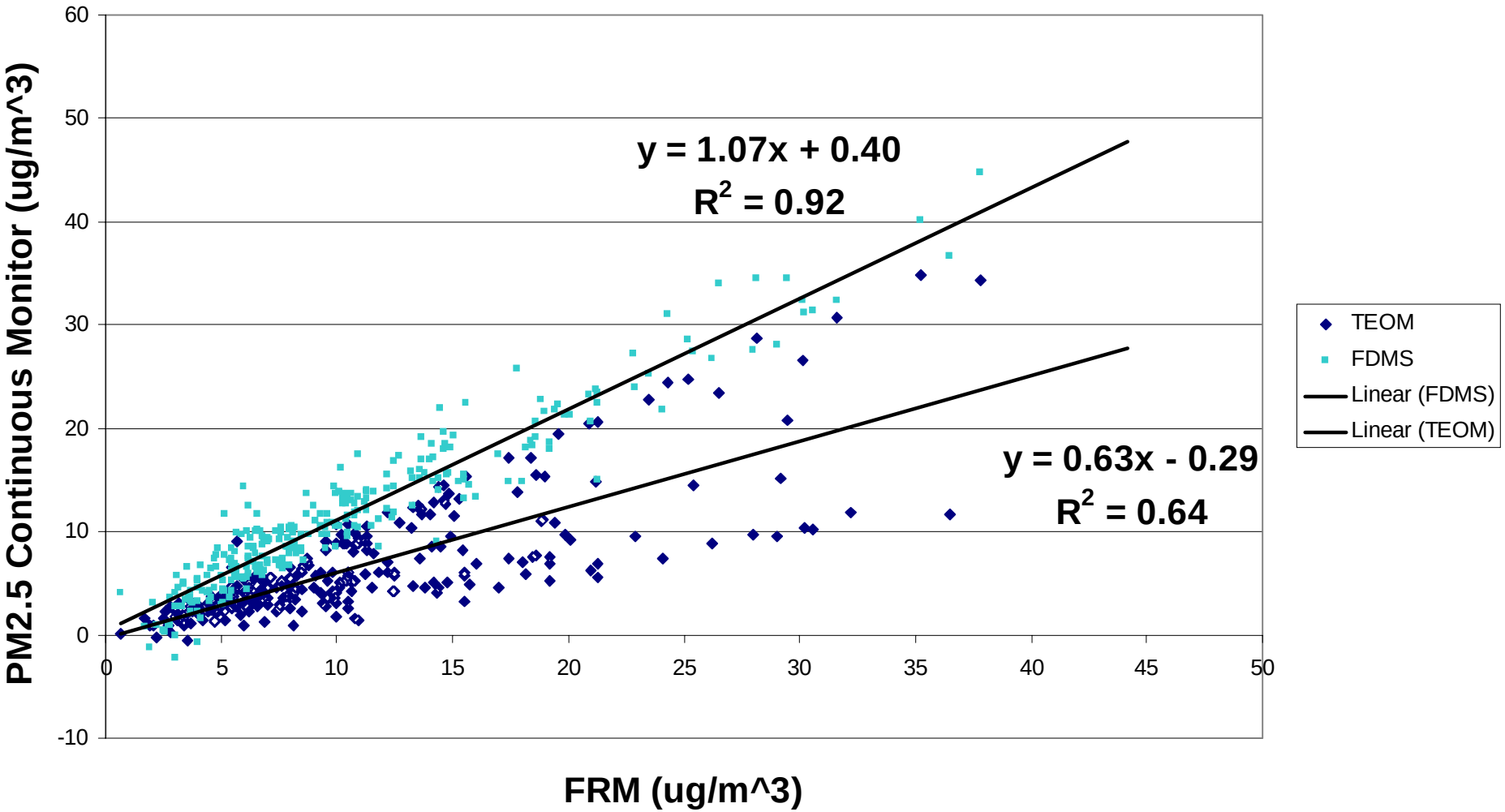


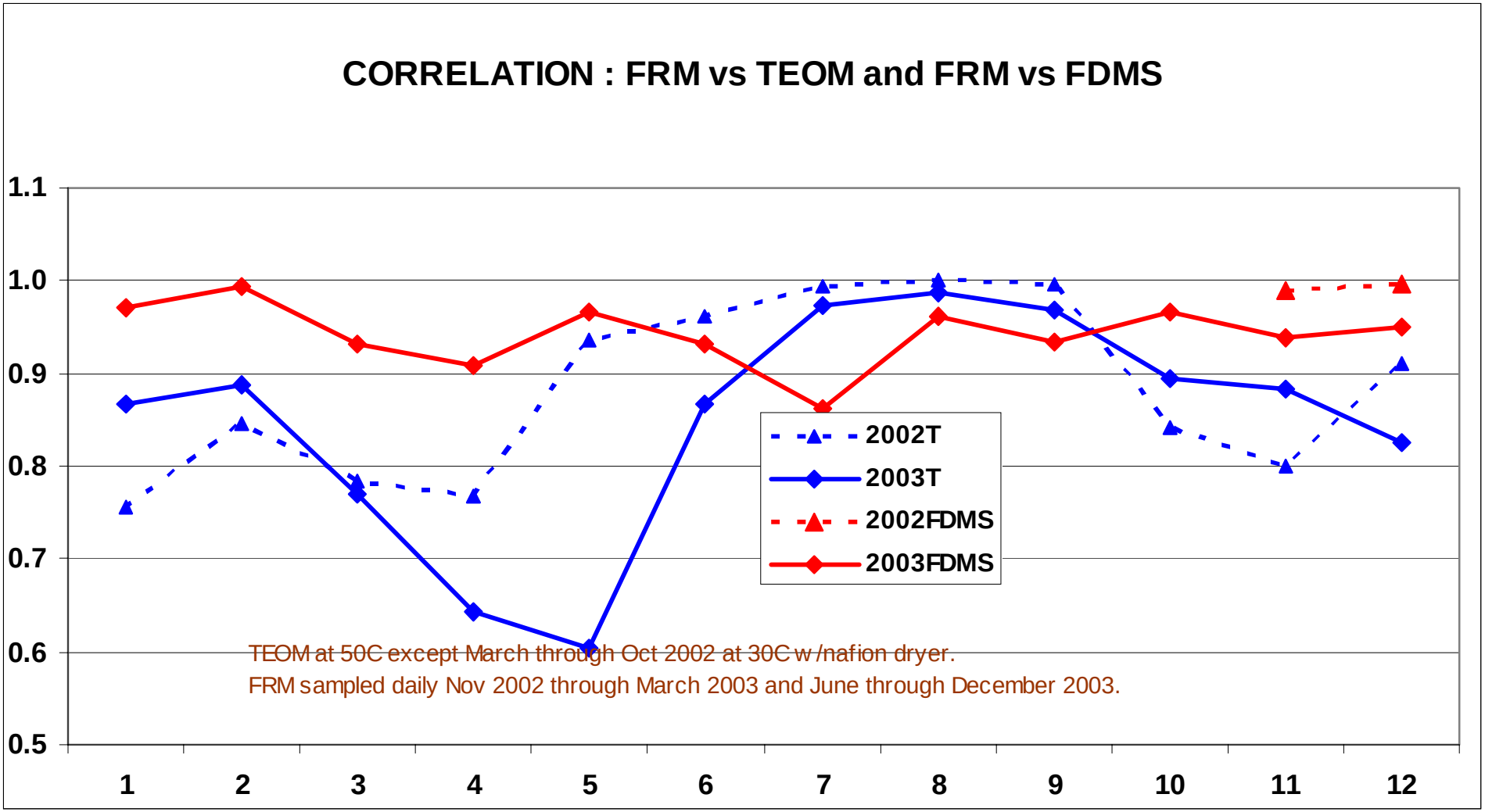
Source: EPA's Air Explorer (http://intranet.epa.gov/airexplorer/)
Generated on: 22FEB04

Mayville, WI
2003



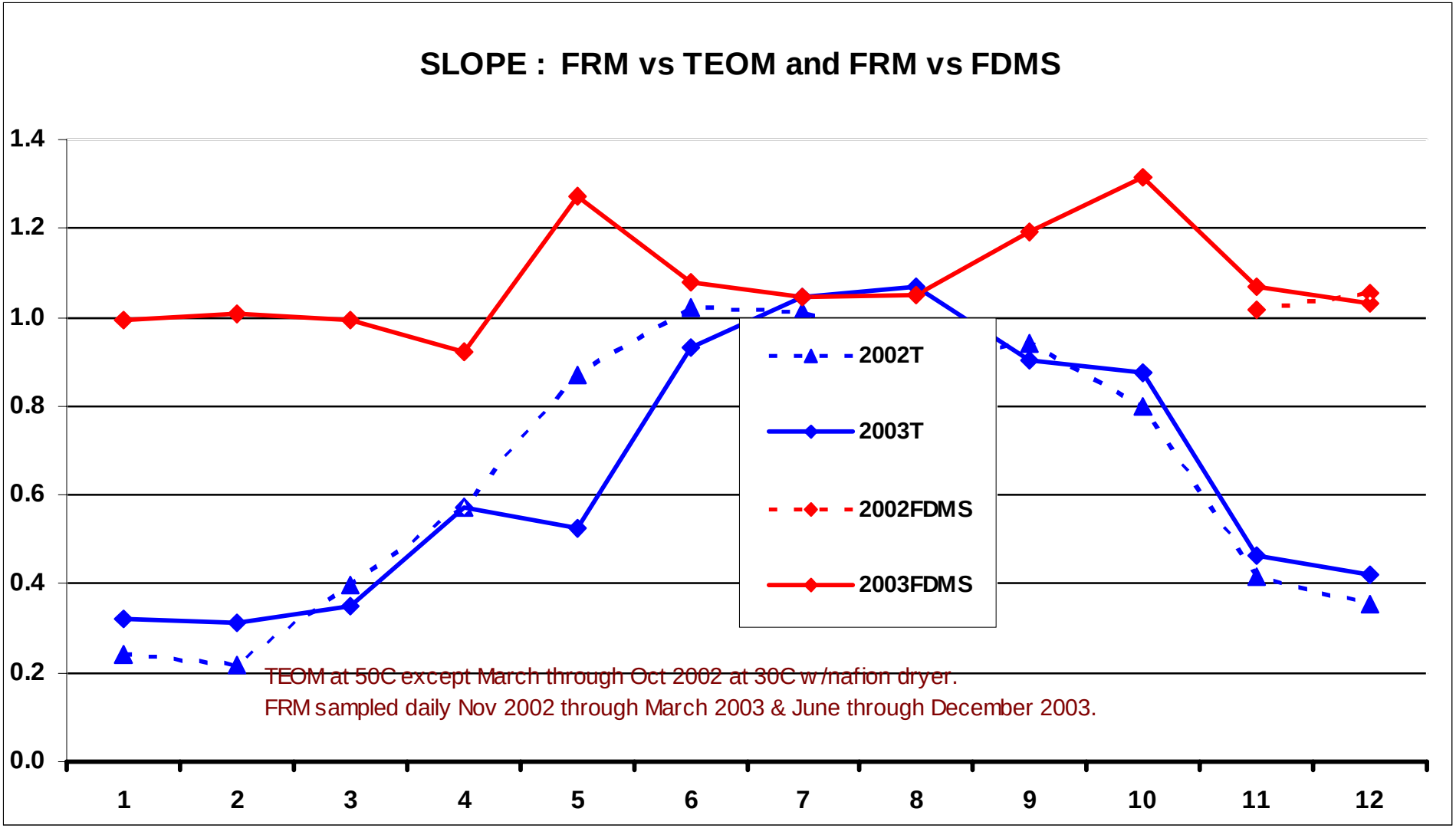
Data courtesy of Dan Nickolie, Wisconsin DNR, not fully validated

Mayville, WI



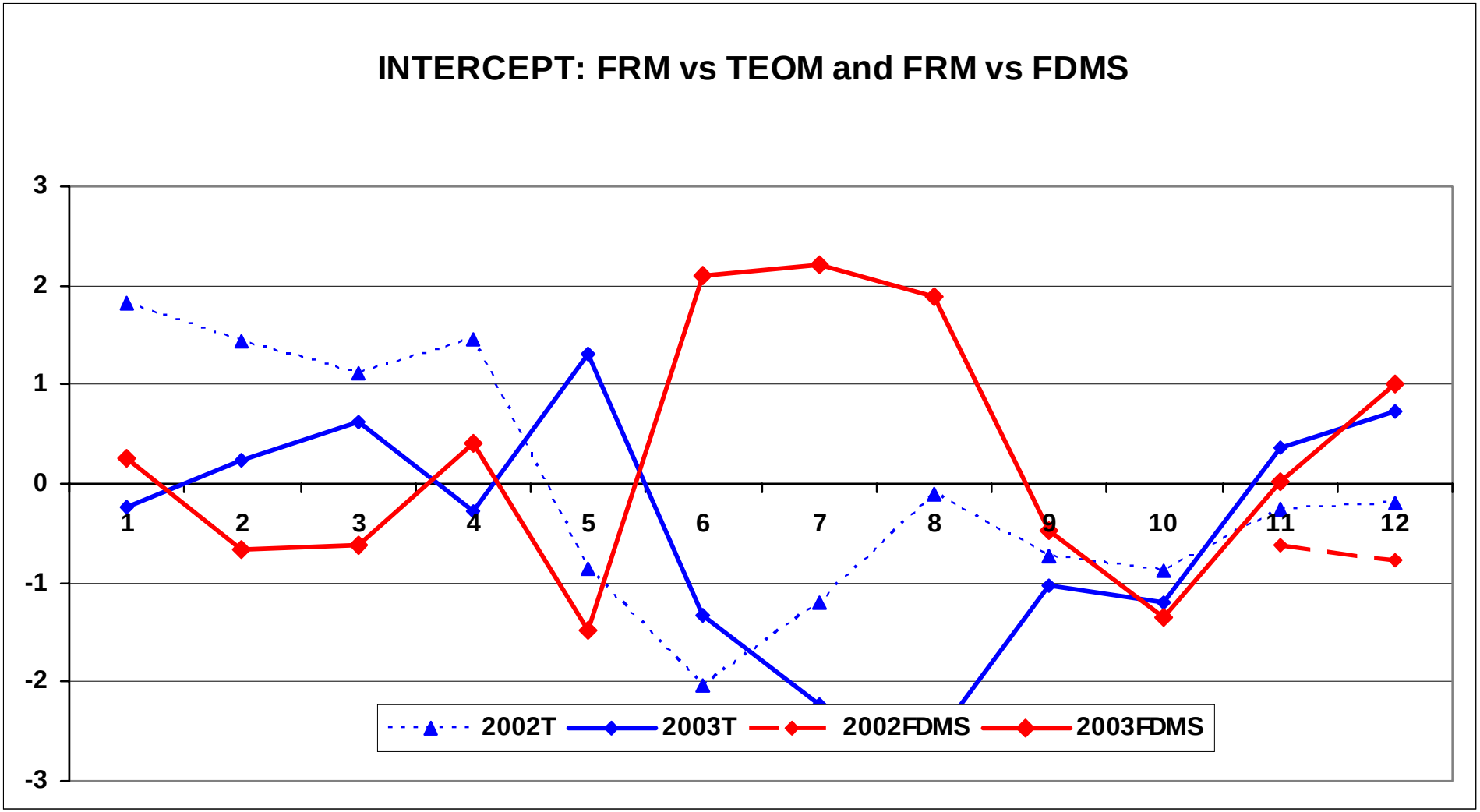
Data courtesy of Dan Nickolie, Wisconsin DNR, not fully validated

Mayville, WI



Data courtesy of Dan Nickolie, Wisconsin DNR, not fully validated

Mayville, WI



Data courtesy of Dan Nickolie, Wisconsin DNR, not fully validated

Daily PM2.5 Concentrations from 04/01/02 to 03/31/03

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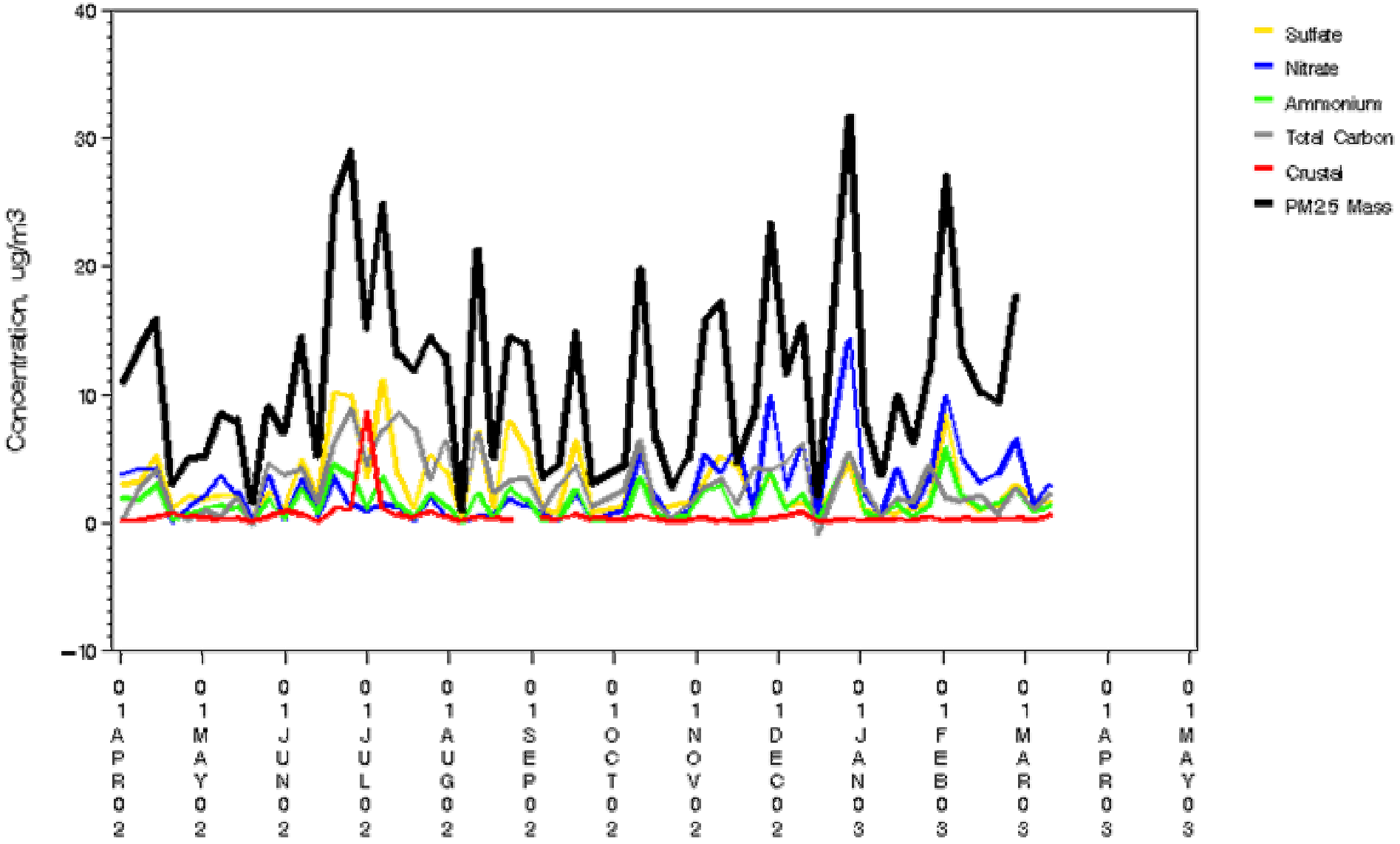
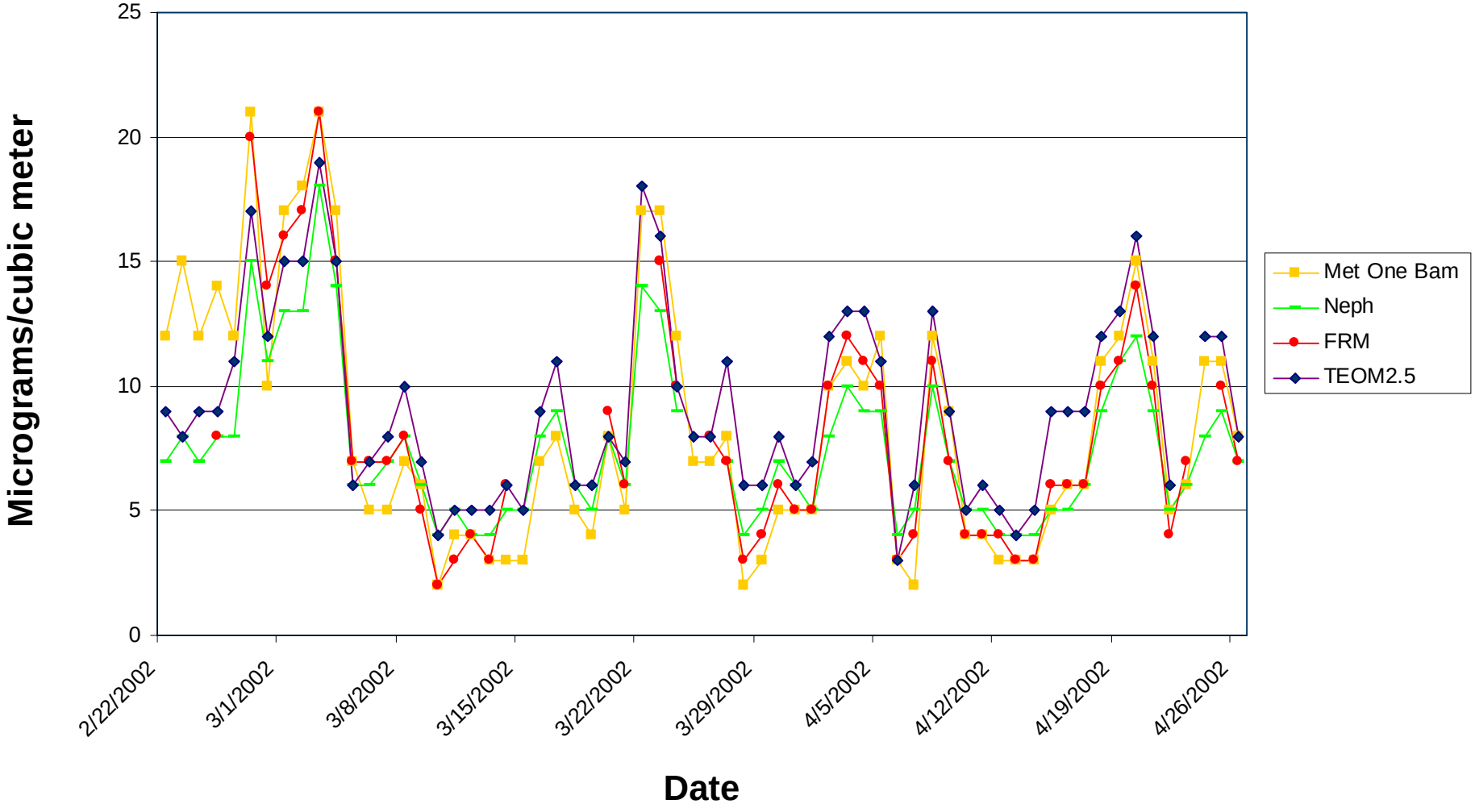
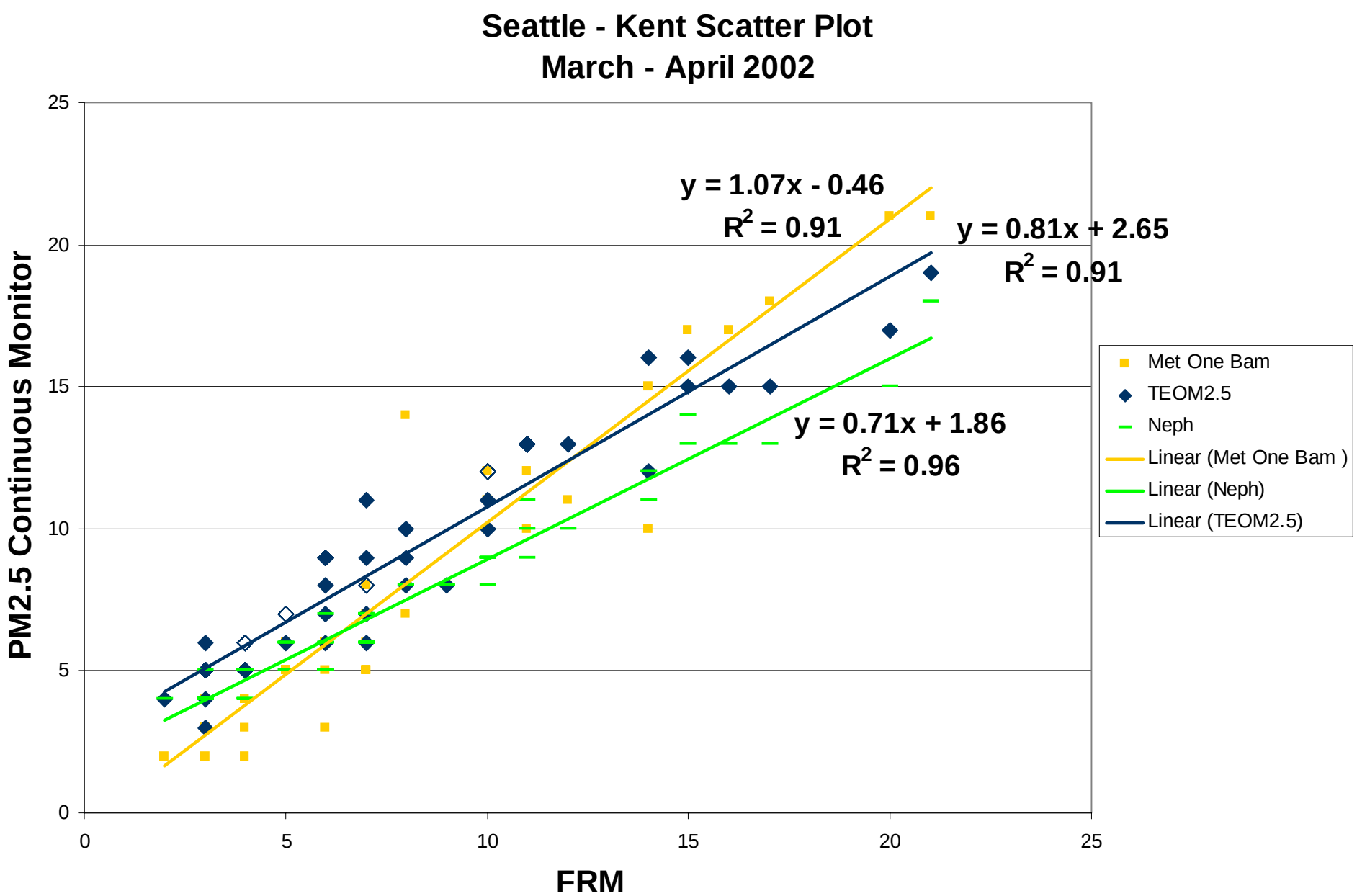


Source: ERA's Air Explorer (http://intranet.epa.gov/airexplorer/)
Generated on: 22FEB04

Seattle-Kent Data Comparison
24 hour averages

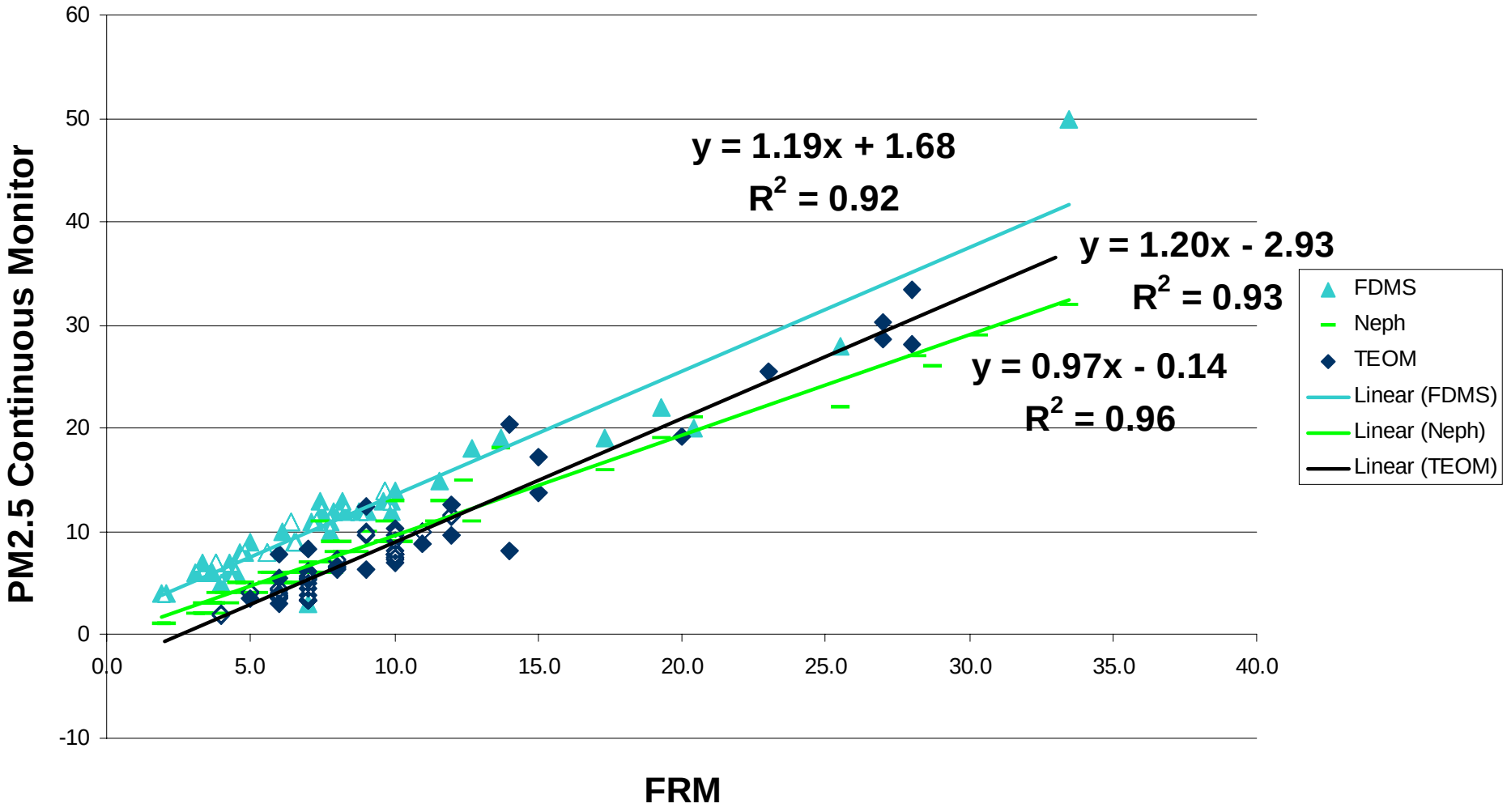


Data courtesy of Mike Gilroy, PSCAA



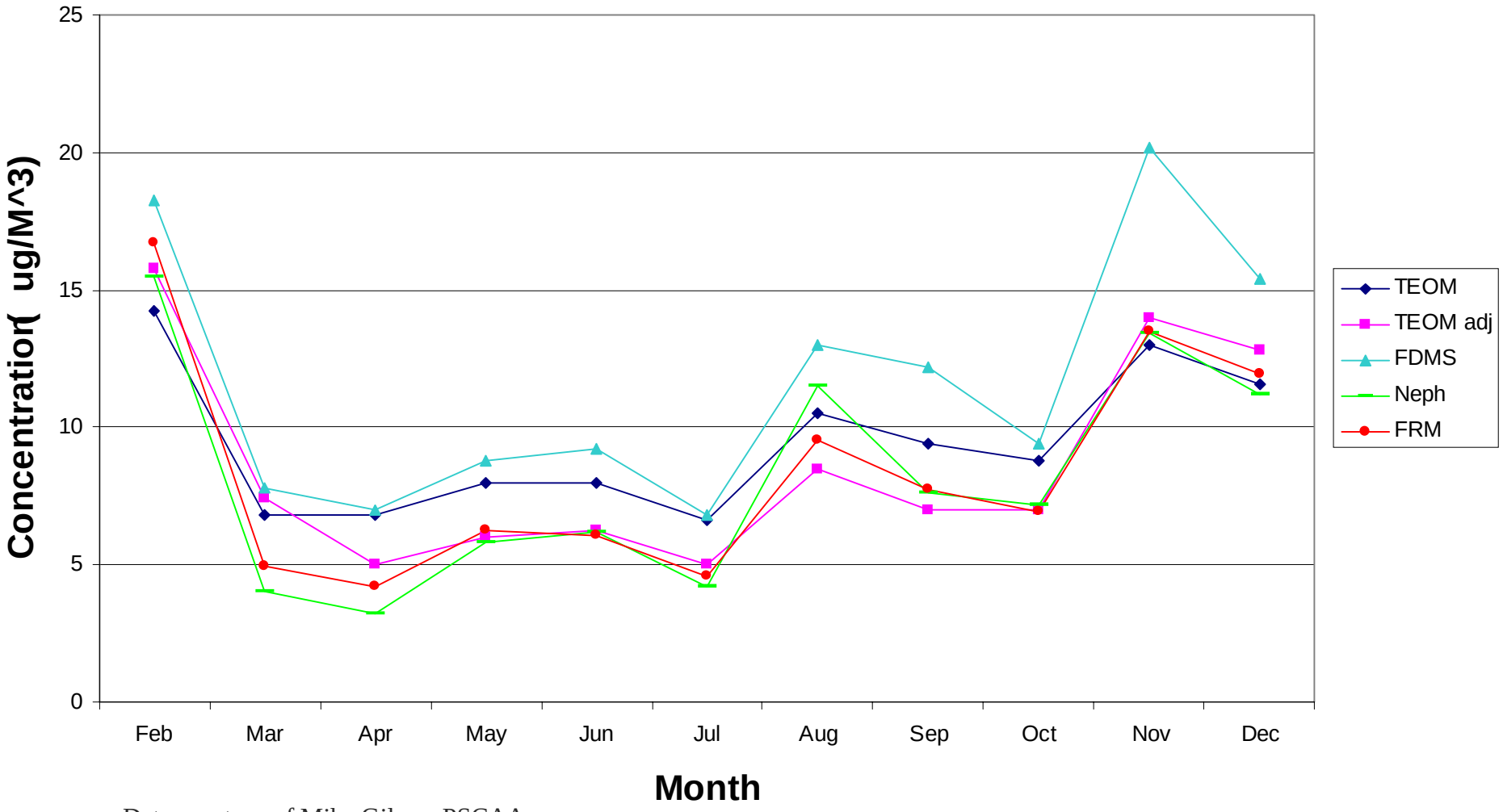
Data courtesy of Mike Gilroy, PSCAA

Seattle-Lynnwood
Scatterplot - 2003



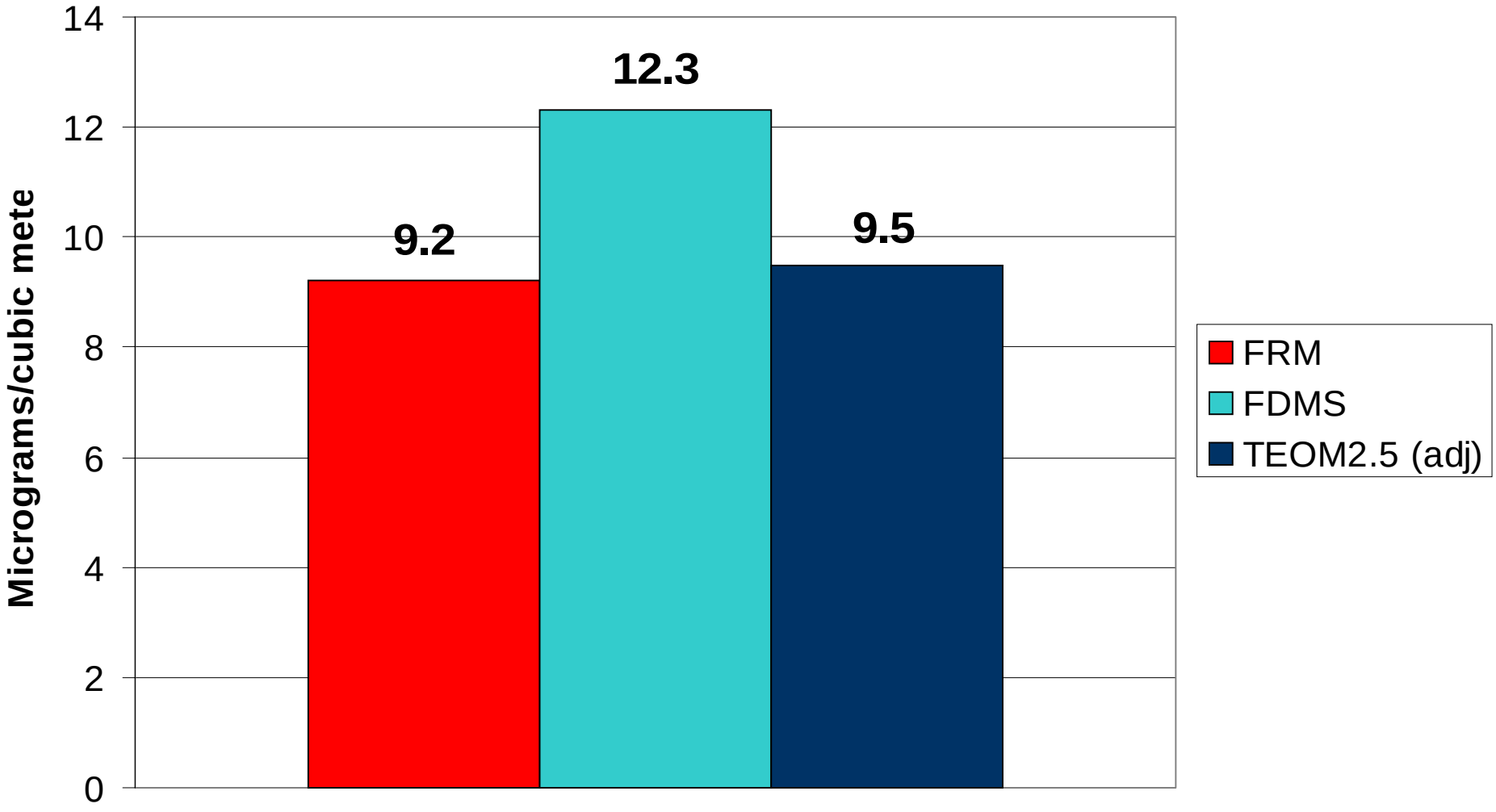
Data courtesy of Mike Gilroy, PSCAA

Seattle - Lynnwood
Monthly PM2.5 Concentrations for 1/6 FRM days



Data courtesy of Mike Gilroy, PSCAA

Annual Average Comparison
Lynnwood 2003



Data courtesy of Mike Gilroy, PSCAA

Daily PM2.5 Concentrations from 04/01/02 to 03/31/03

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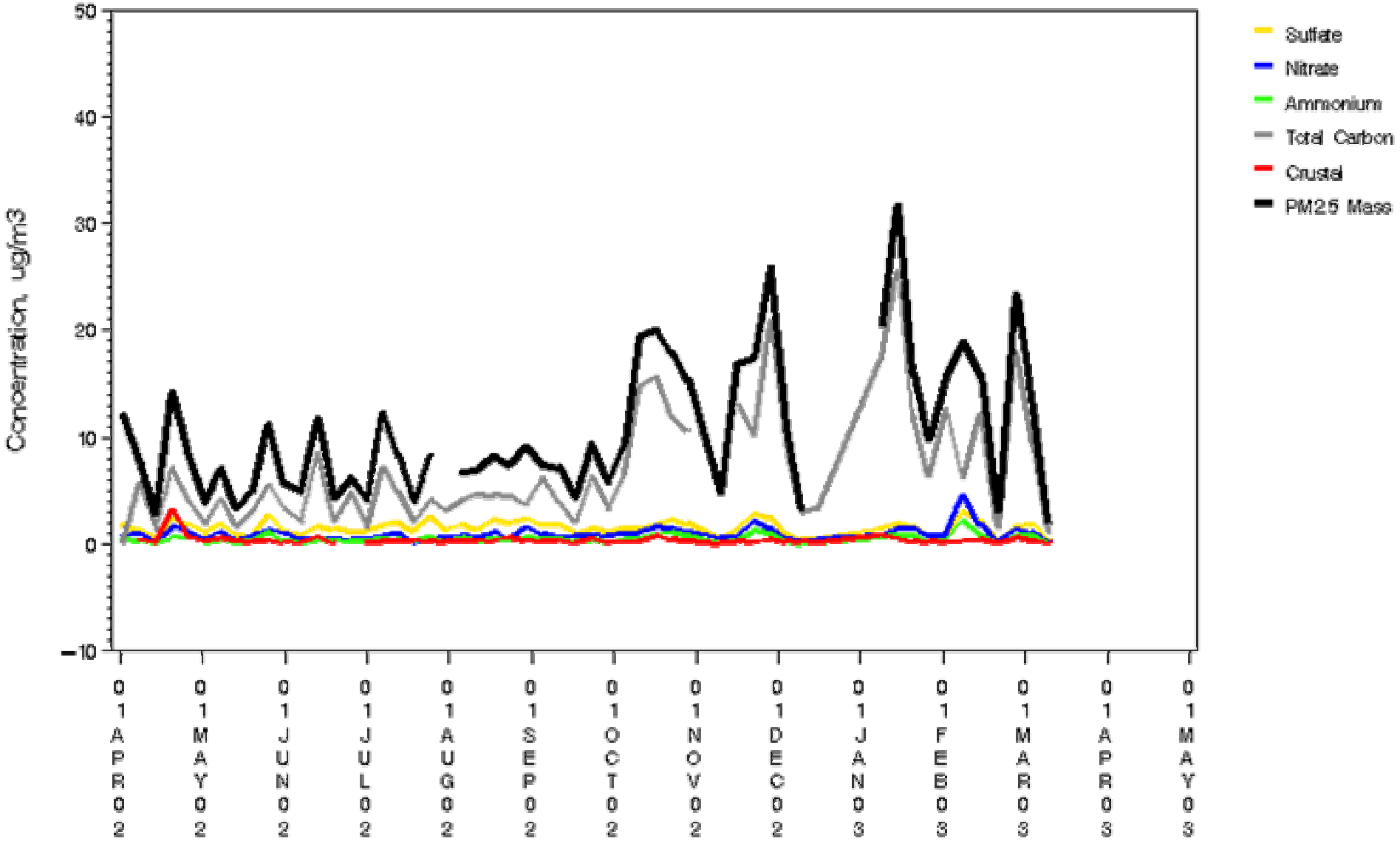
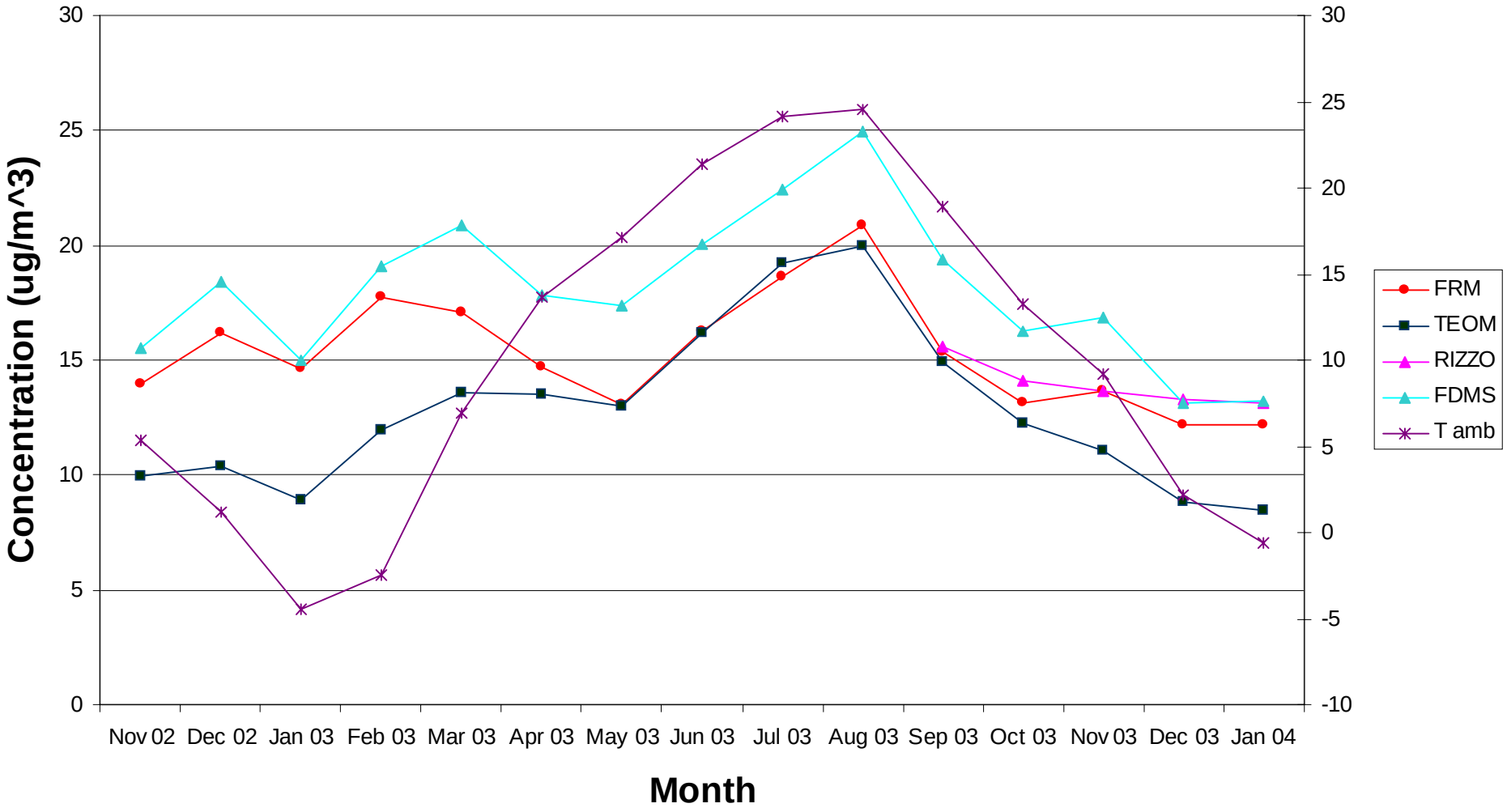


Source: EPA's Air Explorer (http://intranet.epa.gov/airexplorer/)
Generated on: 22FEB04

Seattle Qualitative Statements

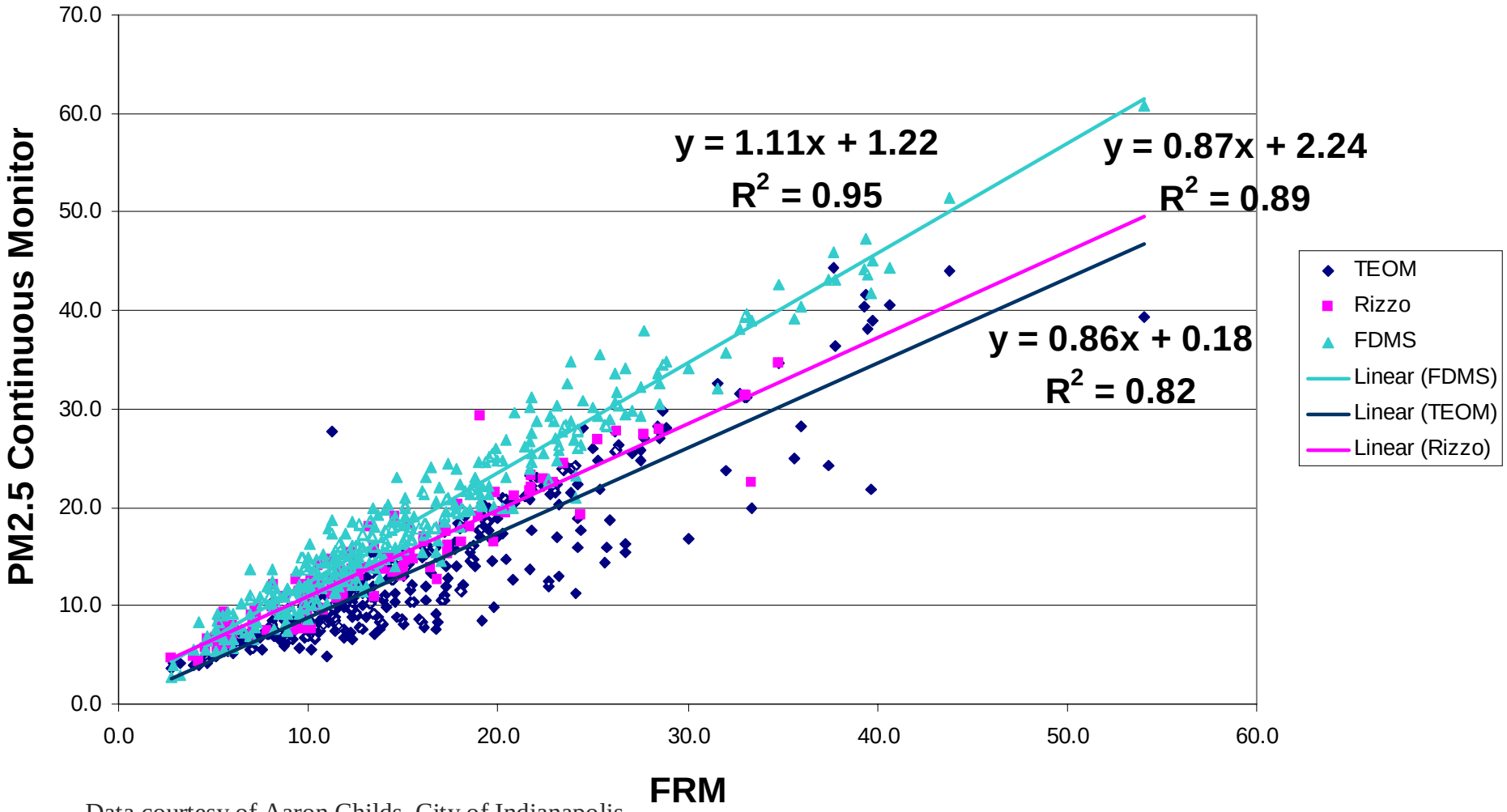
- No method is perfect - Complete agreement remains an unrealistic expectation.
- Each technology is credible in providing highly time resolved trends of fine particle levels.
- Barring development of the perfect method, decisions for procurement need to be weighted significantly by logistics such as cost of O/M, skill level required for use.
- Seasonal adjustments for temperature and seasonal relationships with FRM's are very important.
- Use of different collocated technologies adds confidence in assessing real-time trends despite frustration that occurs when one reads 14 ug/m^3 and the other 16 ug/m^3. In reality, from a health perspective they are about the same number. Need to make semi-subjective judgement which device to trust and use it for making decisions.

Indiana - Washington Park
Monthly PM2.5 Concentrations



Data courtesy of Aaron Childs, City of Indianapolis

Indiana - Washington Park
Scatterplot 2003



Data courtesy of Aaron Childs, City of Indianapolis

Daily PM2.5 Concentrations from 04/01/02 to 03/31/03

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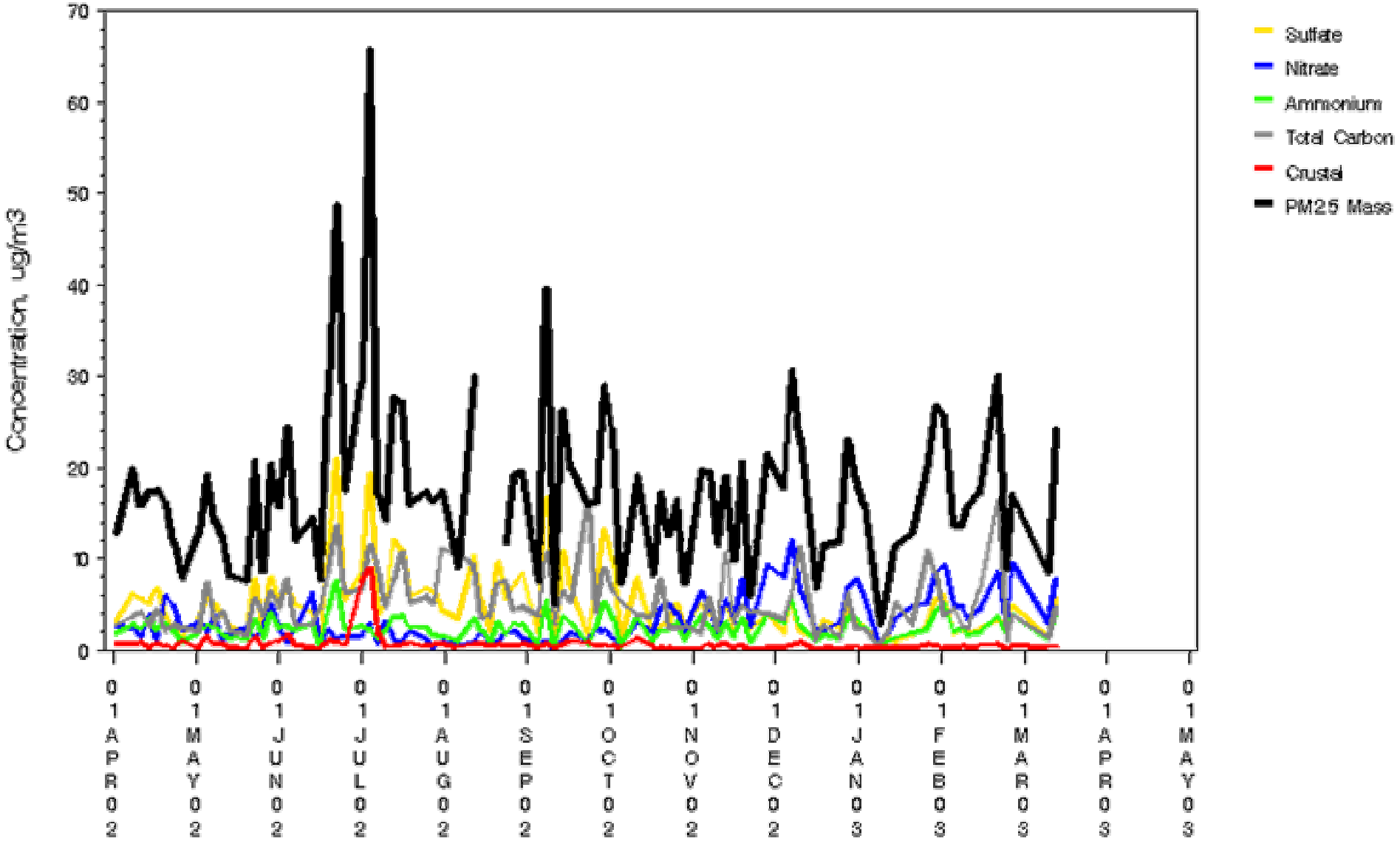


Source: EPA's Air Explorer (http://intranet.epa.gov/airexplorer/)
Generated on: 22FEB04

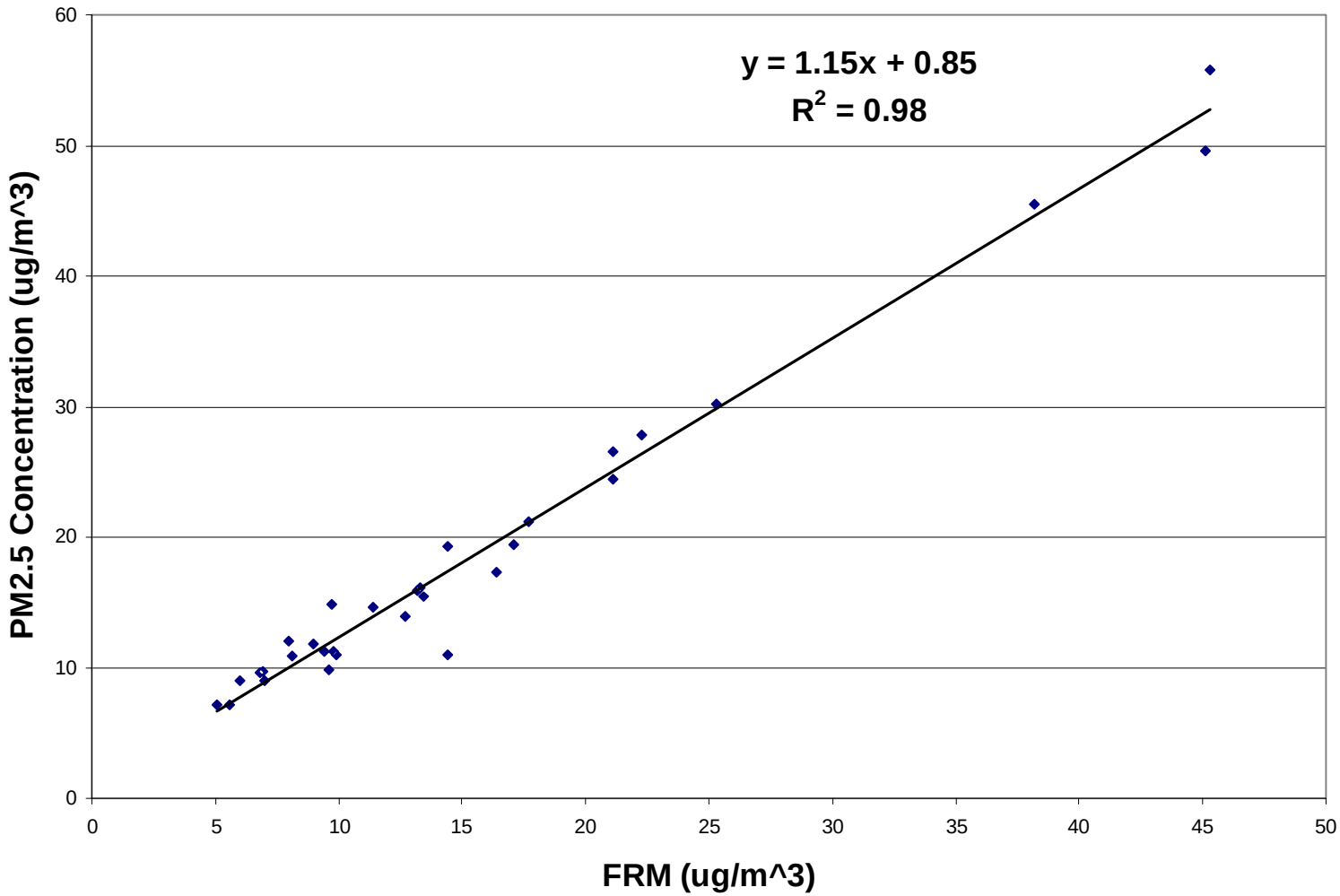
FDMS Notes

- Vermont commented that data quality improved when FDMS was installed in standard sample station rather than small outdoor enclosures.
- Datalogging is different than conventional TEOM
  - See R&P note.
- FDMS can be an upgrade to most TEOMs
- Indianapolis commented that warm days in normally cold months can lead to higher FDMS values relative to the FRM

Met One BAM 1020 Scatterplots

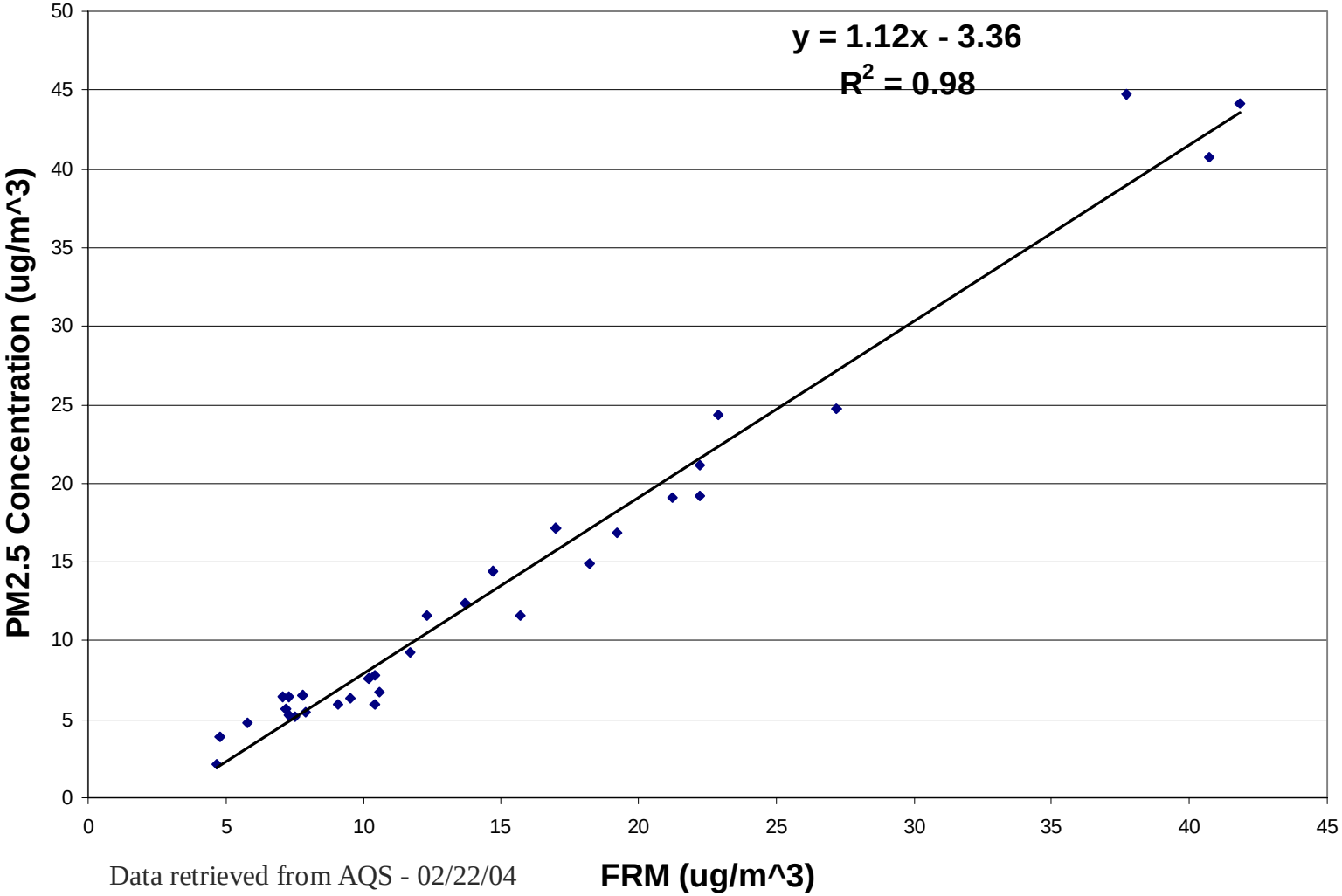
- 2 scatterplots per state are selected to illustrate performance over a range of sites:
  - Connecticut
  - Illinois
  - Massachusetts
  - Minnesota

Hartford, CT - 090031018
June -September 2003



Data retrieved from AQS - 02/22/04

Waterbury, CT - 090092123
June - September 2003



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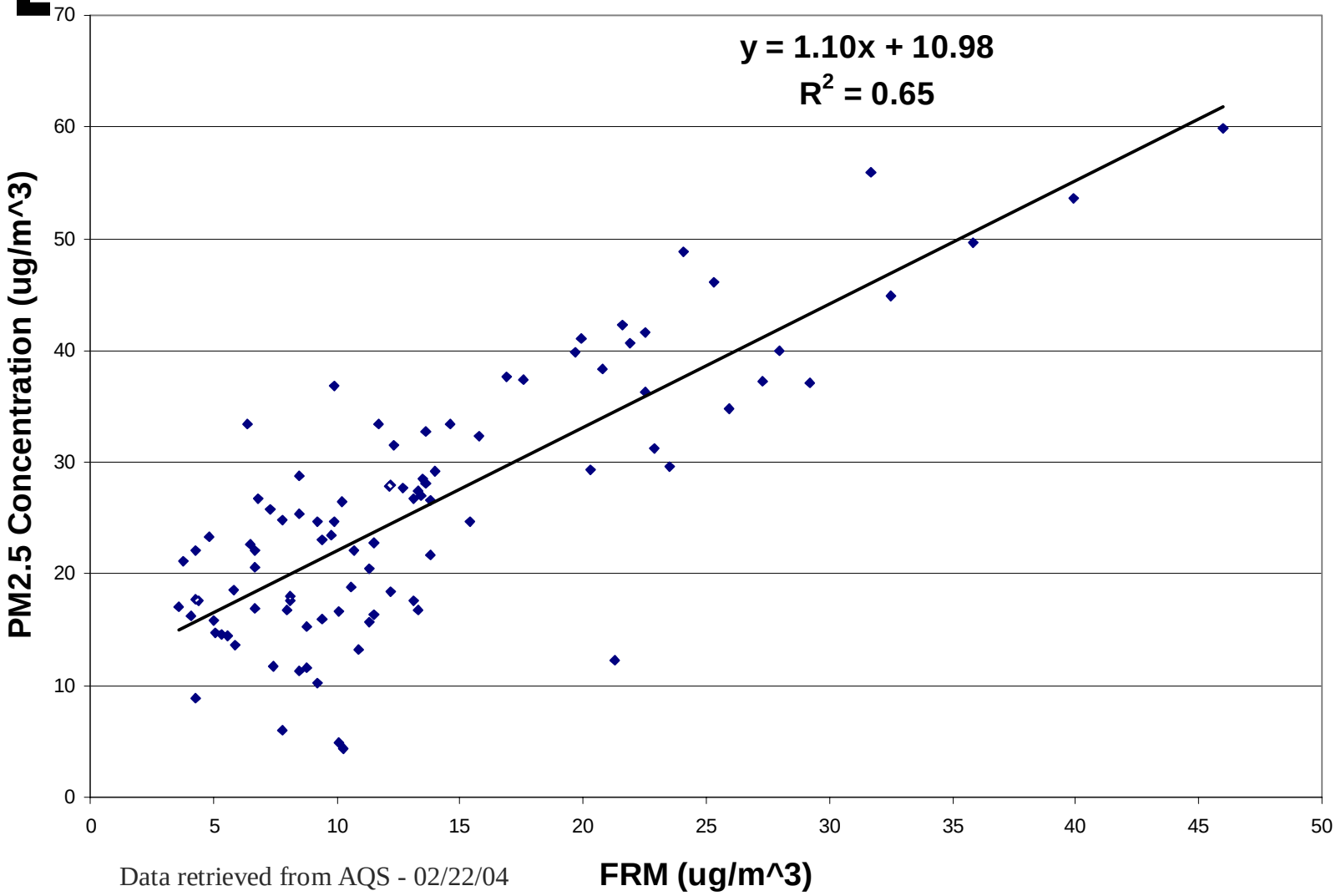
Chicago, IL - 170314007
January -November 2003



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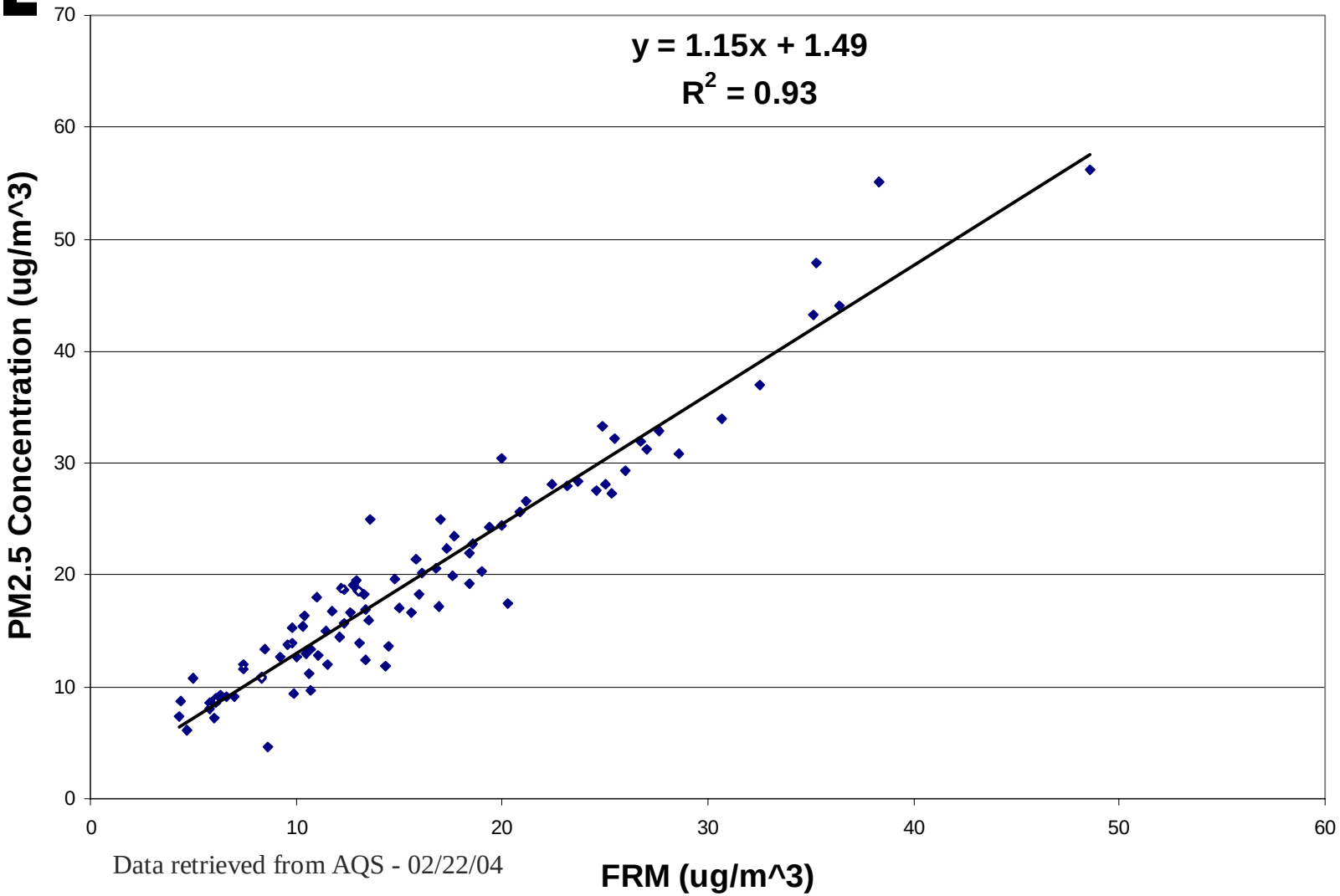
Chicago, IL - 170310057
January - December 2003



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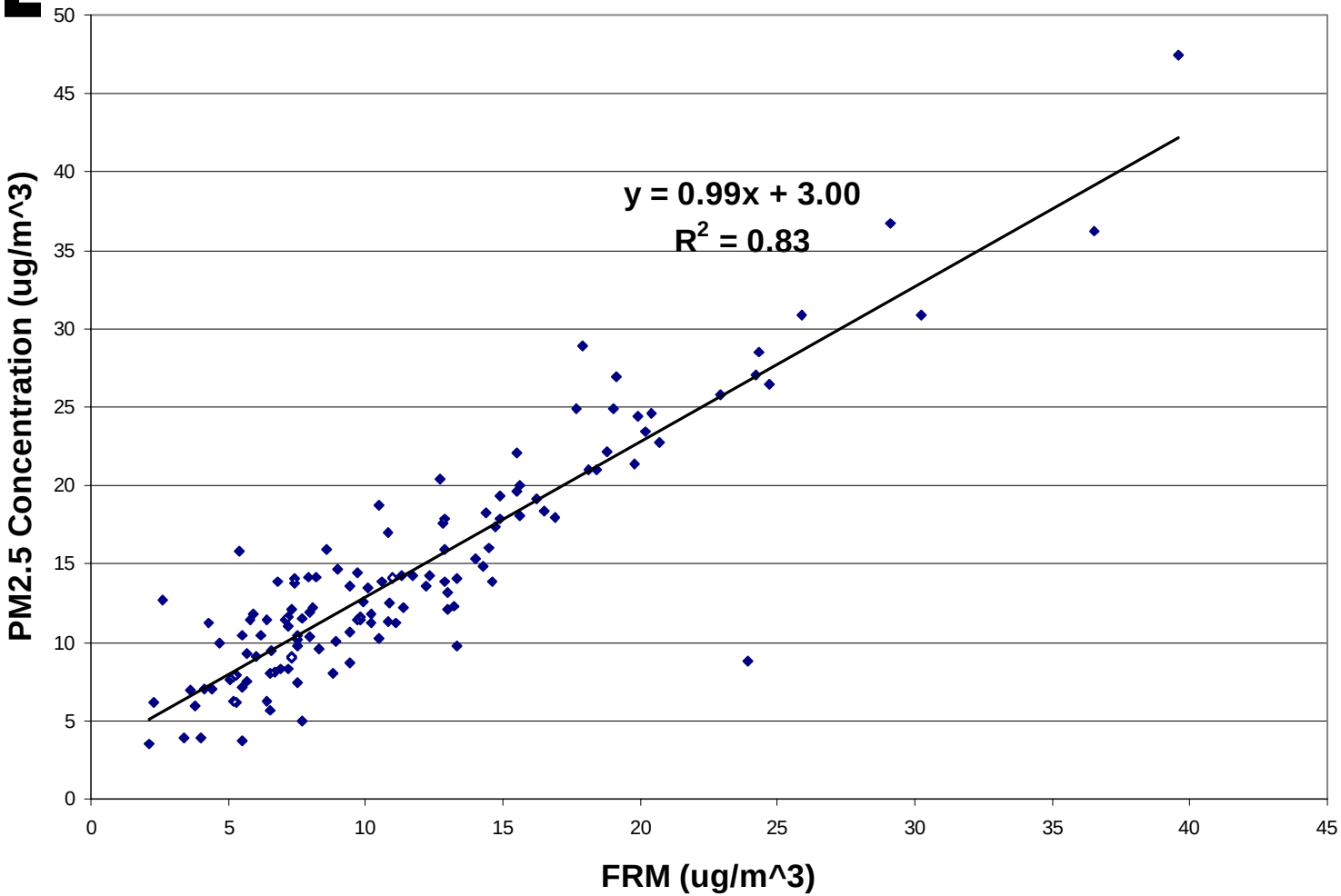
Boston, MA - 250250042
July - November 2003



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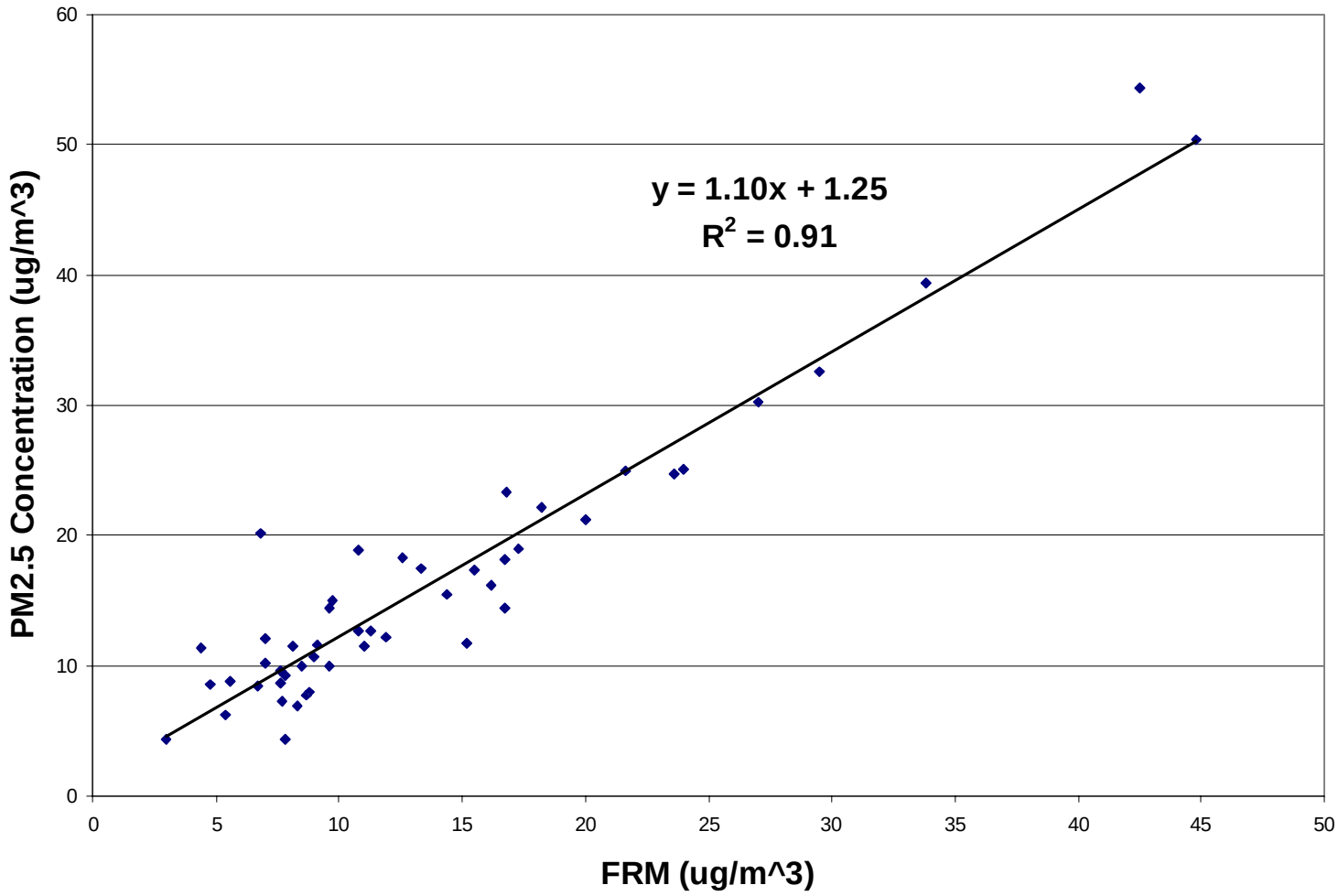
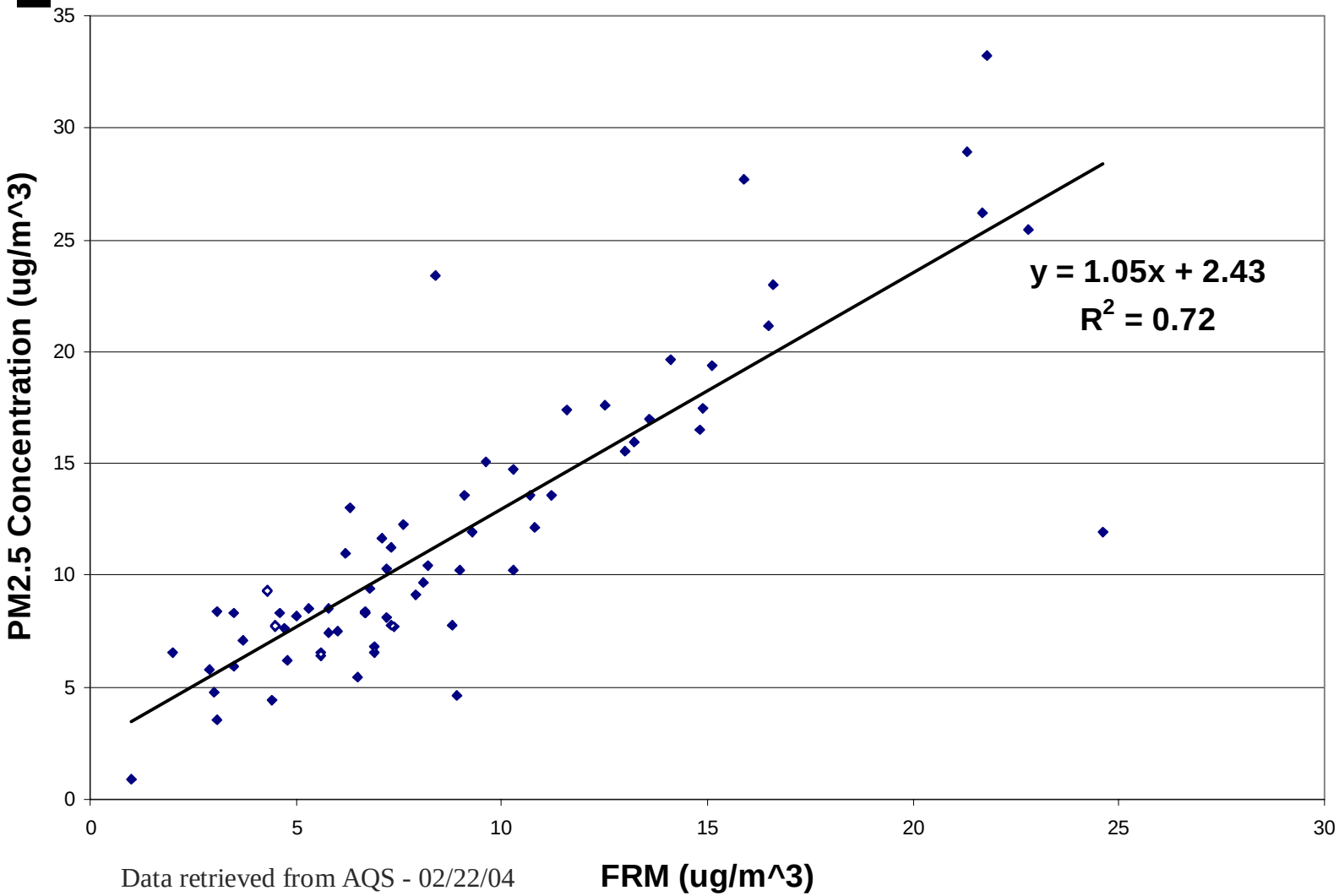
Boston, MA - 250250043
June - November 2003



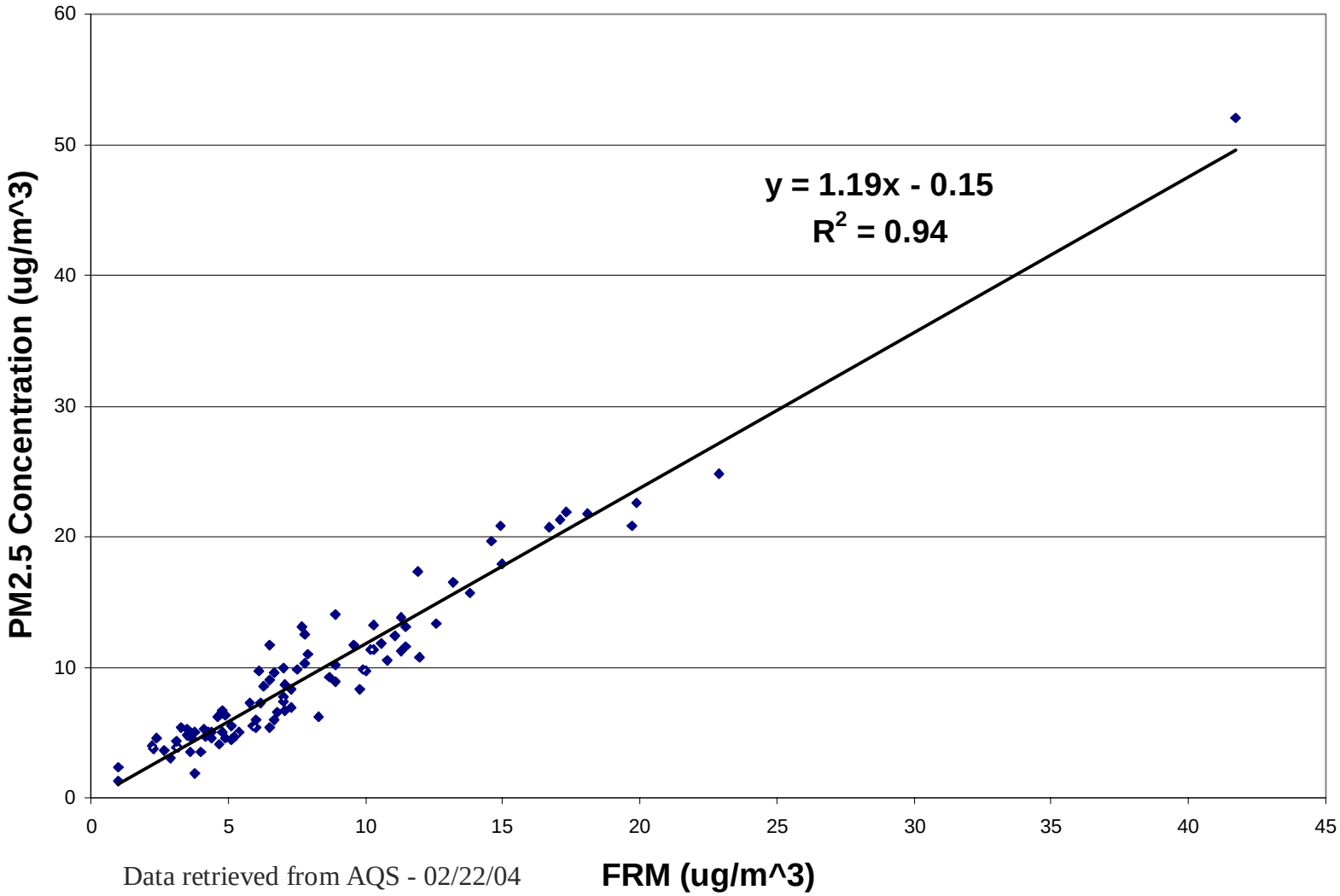
Data retrieved from AQS - 02/22/04

St. Cloud, MN - 271453052
April - November 2003



Data retrieved from AQS - 02/22/04

Duluth-Superior, MN-WI 271377551, Feb - Nov 2003



Data retrieved from AQS - 02/22/04

Met One BAM 1020 Notes

- California ARB recommends:
  - Flow and leak checks every two weeks
- Potential issue with 5 microgram offset if datalogger is not set-up properly
  - Only an issue with analog outputs
- Smart Heater necessary to minimize moisture interference

Summary Notes

- Best scenario is when monitors do not need corrections
- PM monitoring technologies are capable of providing data of desired quality for AQI purposes; however:
  - Need to make sure monitors are checked for flow and leaks on routine basis
  - Need to evaluate data:
    - Determine quality of data
    - Decide if a correction is necessary
      - Document corrections on PM2.5 site information table

California ARB Continuous PM2.5 Network Experience

- California ARB has a web site on PM2.5 continuous work for the State and Air Districts to share information
  - The site is designed to help the Air Monitoring Technical Advisory Committee to communicate their ideas within and outside the group.
- http://www.arb.ca.gov/amtac/phpnuke/
  - The CARB Continuous PM2.5 Network Experience presentation given at AMTAC in October 2003 has been posted on this site.