IMPROVE
Particle Monitoring Network: Investigations & Special Studies

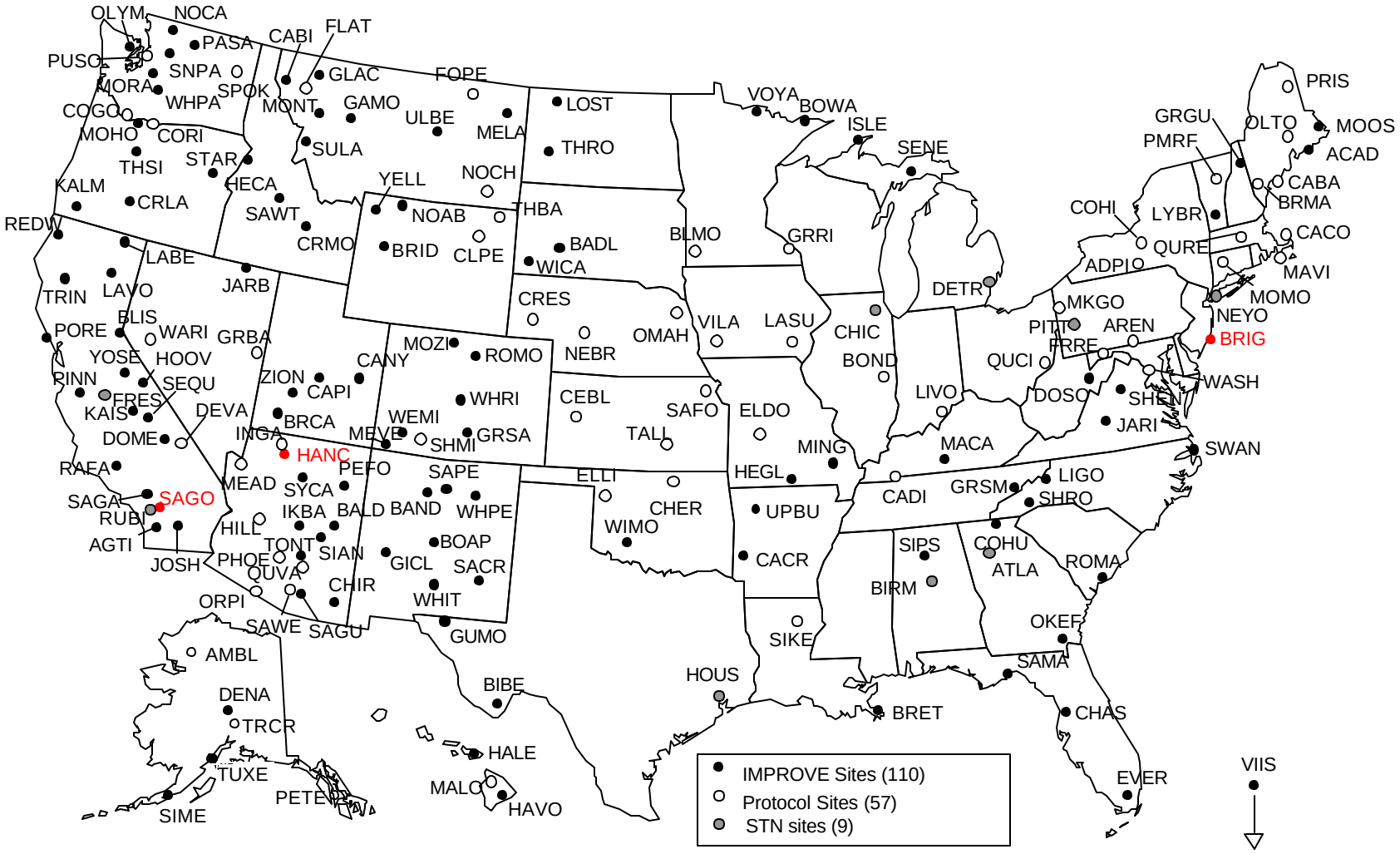
Chuck McDade
Crocker Nuclear Laboratory
University of California, Davis
Glacier National Park, June 2004





IMPROVE Network
Field Denuder Tests

CROCKER NUCLEAR LABORATORY
University of California, Davis



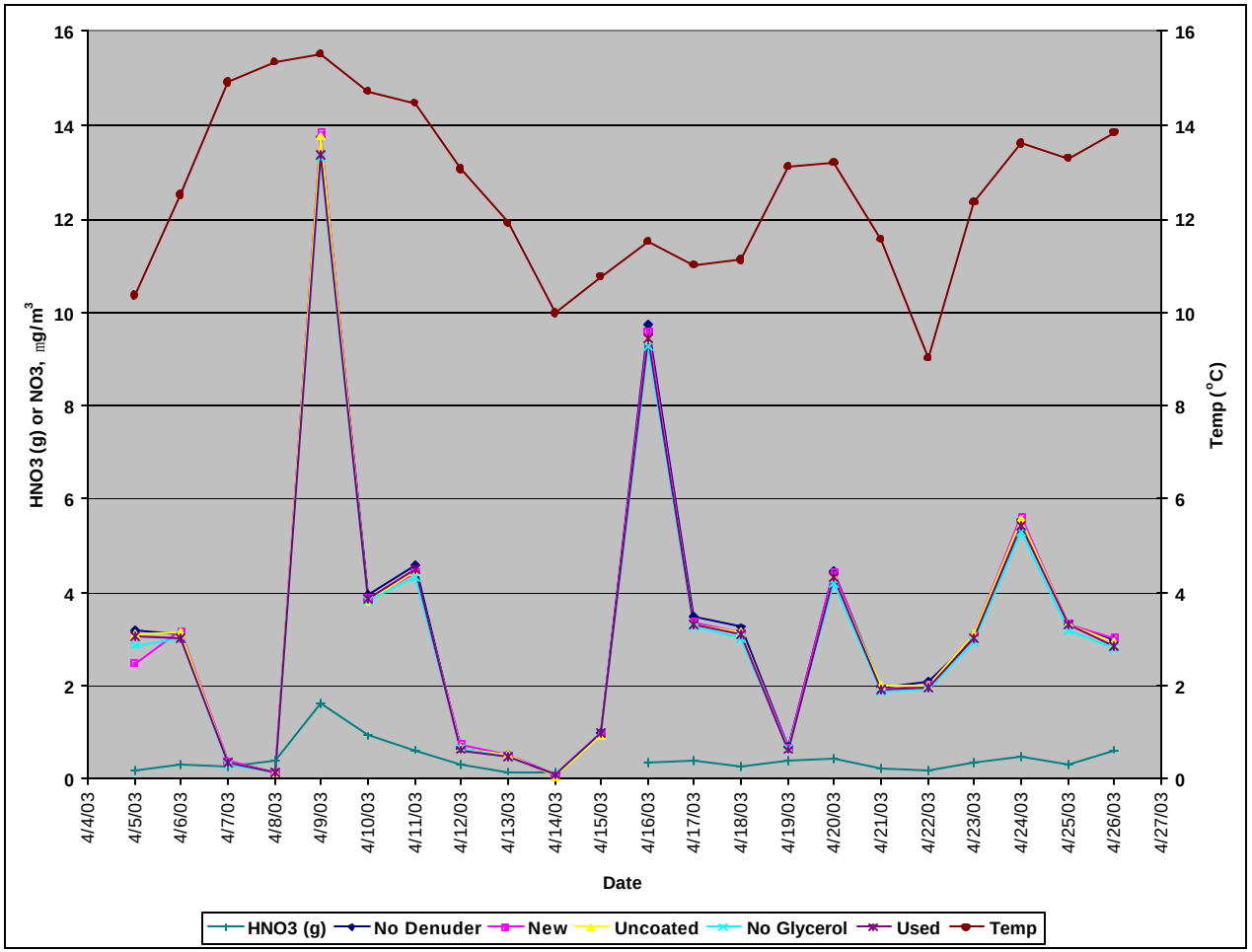
Five Denuder Configurations

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University of California, Davis

- No denuder (Aluminum inlet only)
- Newly coated denuder (IMPROVE standard)
- Uncoated denuder
- Coated denuder, no glycerol
- Used denuder (from Joshua Tree)

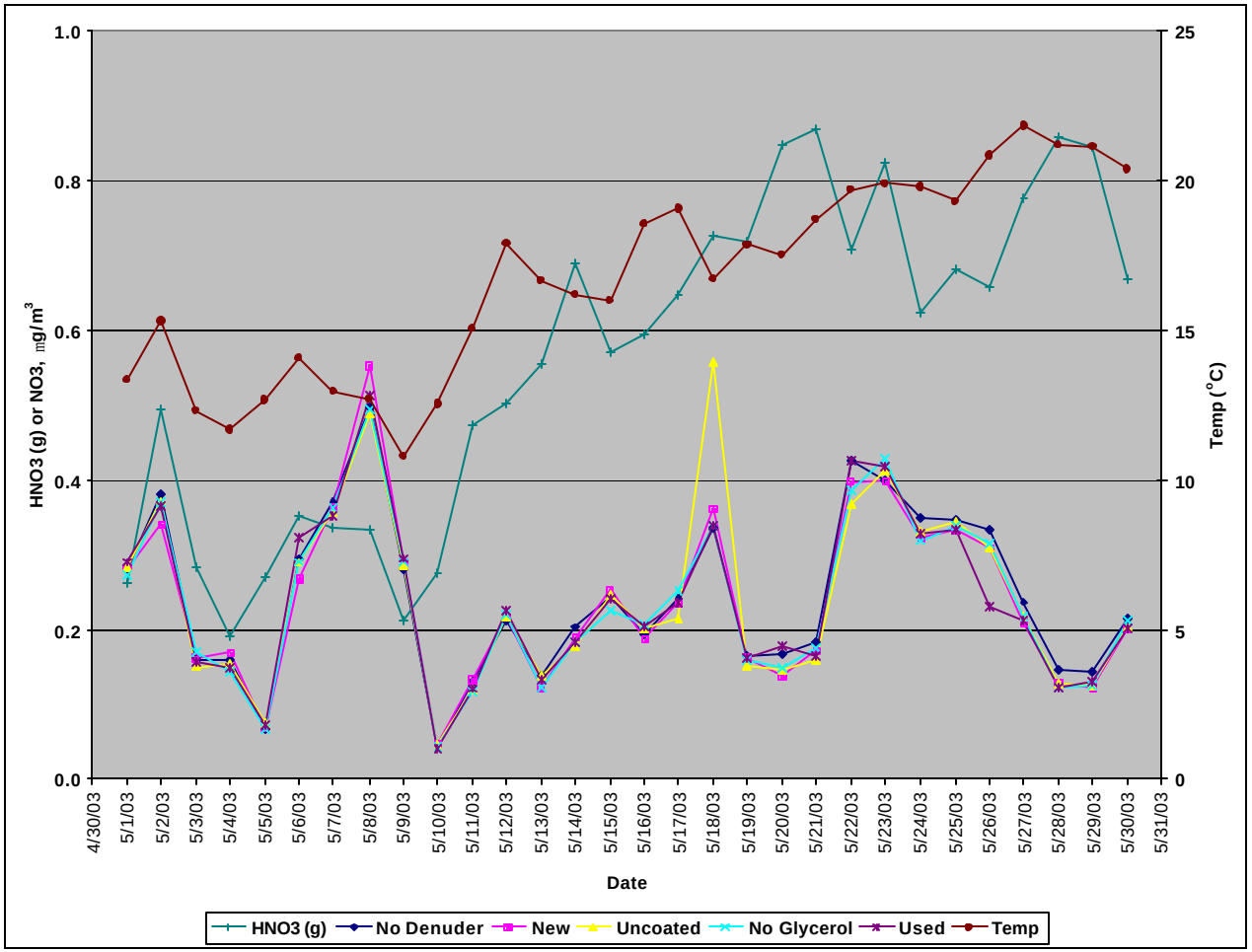
San Gorgonio
April 2003

CROCKER NUCLEAR LABORATORY
University of California, Davis



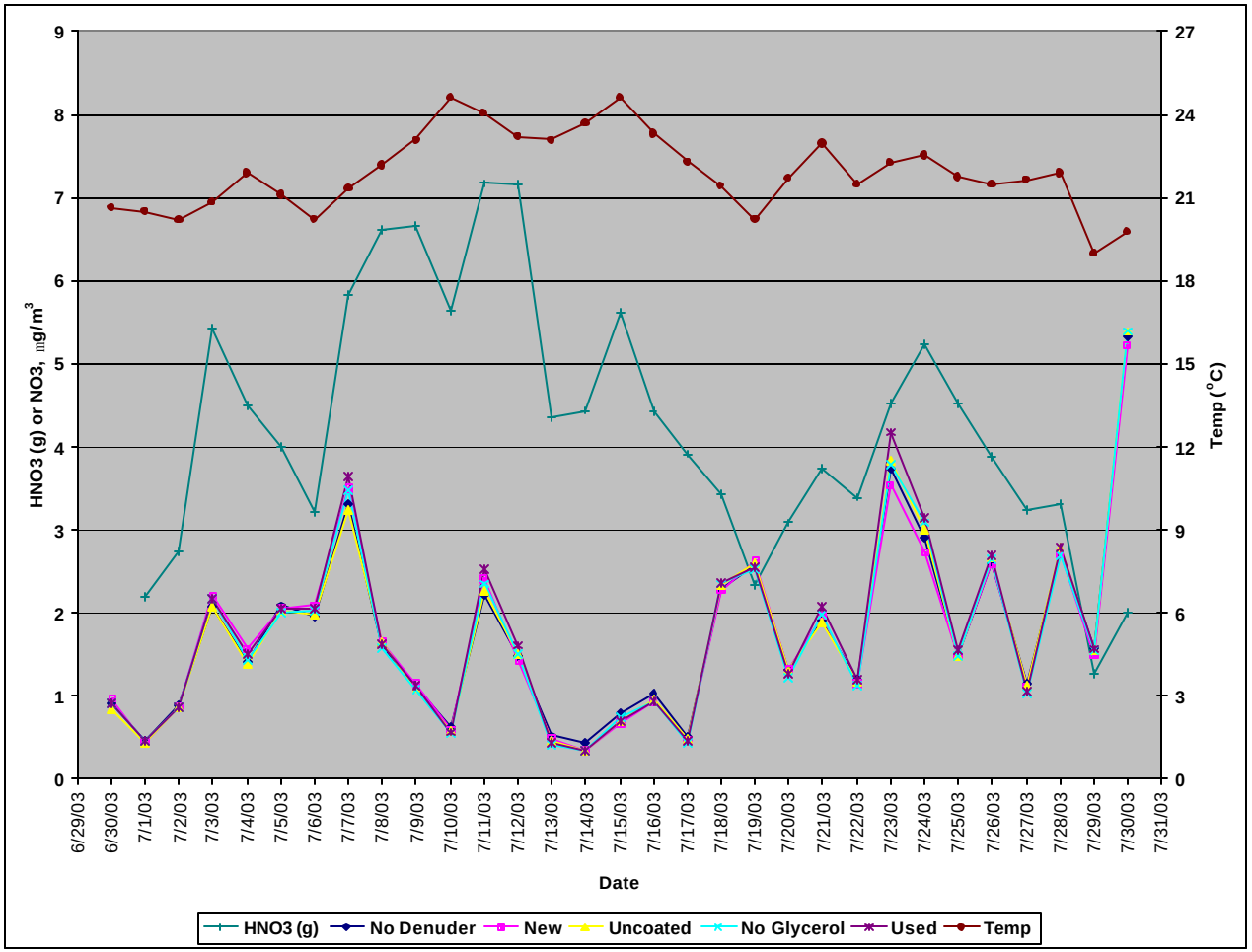
Grand Canyon May 2003

CROCKER NUCLEAR LABORATORY
University of California, Davis



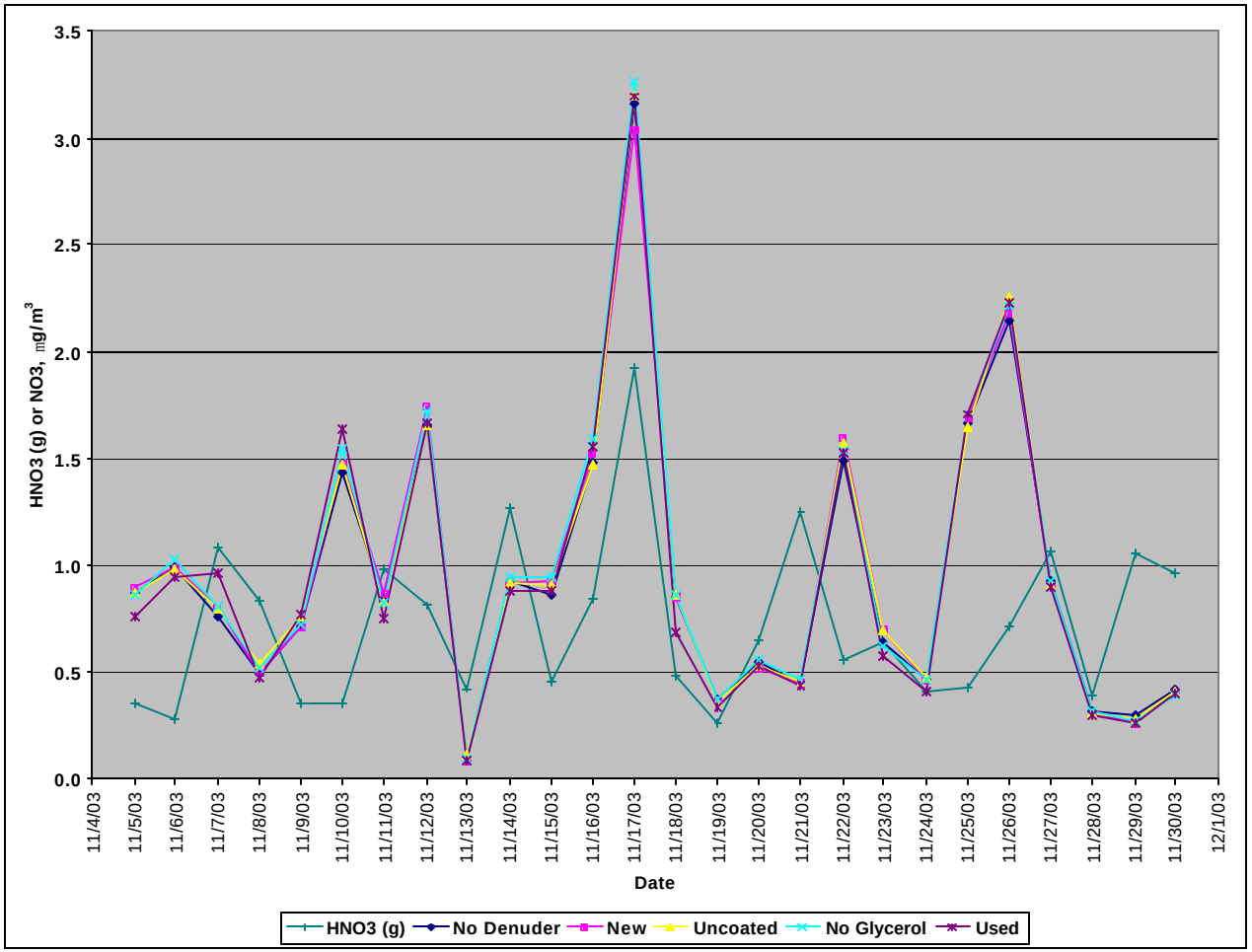
San Gorgonio
July 2003

CROCKER NUCLEAR LABORATORY
University of California, Davis



Brigantine
November 2003

CROCKER NUCLEAR LABORATORY
University of California, Davis



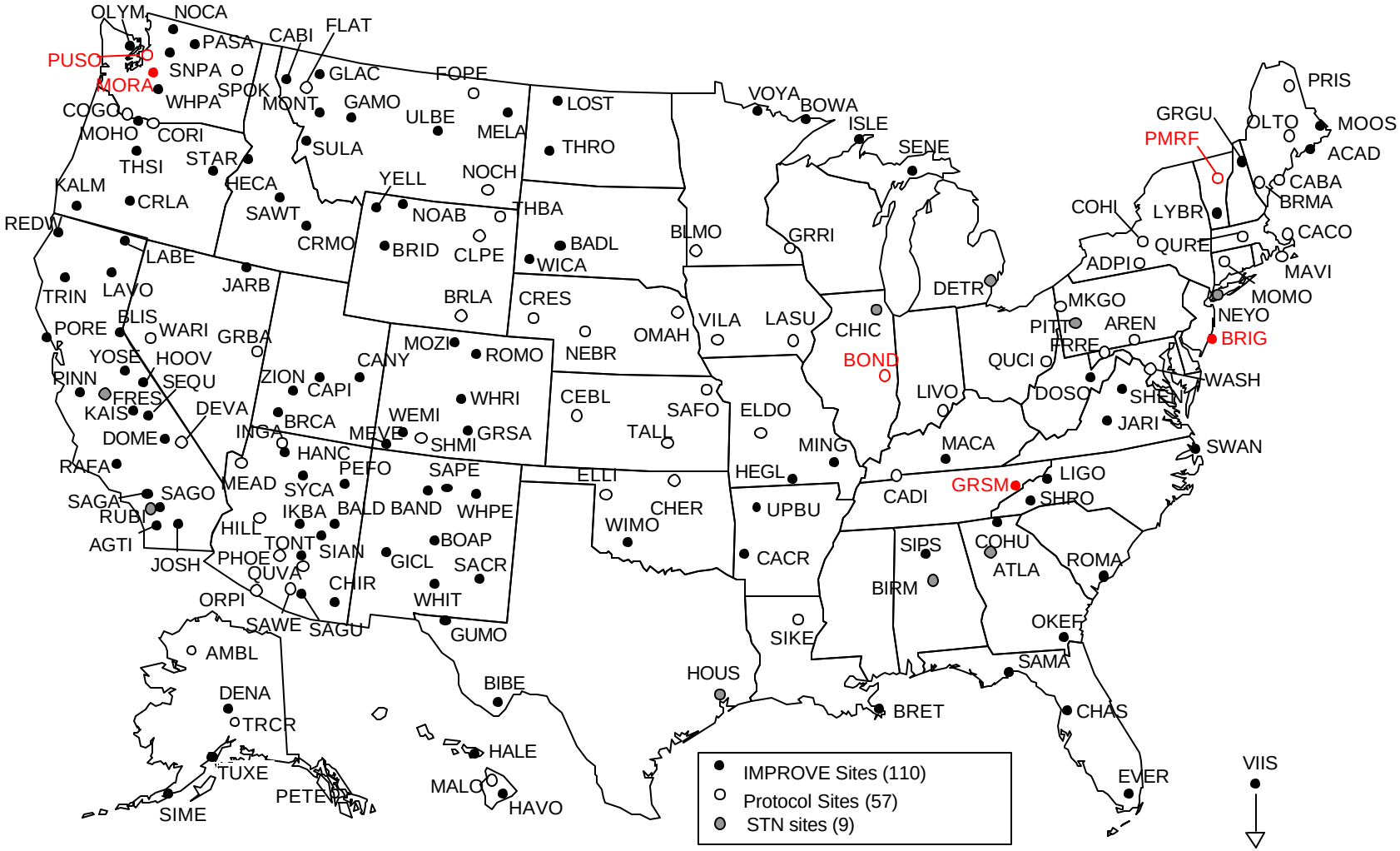
Laboratory Denuder Tests

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University of California, Davis

- To be conducted at CSU
- Known HNO3 concentrations
- Controlled T & RH
- Assorted denuders, as in the field tests
- Tests underway, results later this summer

IMPROVE Network
Carbon-14 Hivol Sites

CROCKER NUCLEAR LABORATORY
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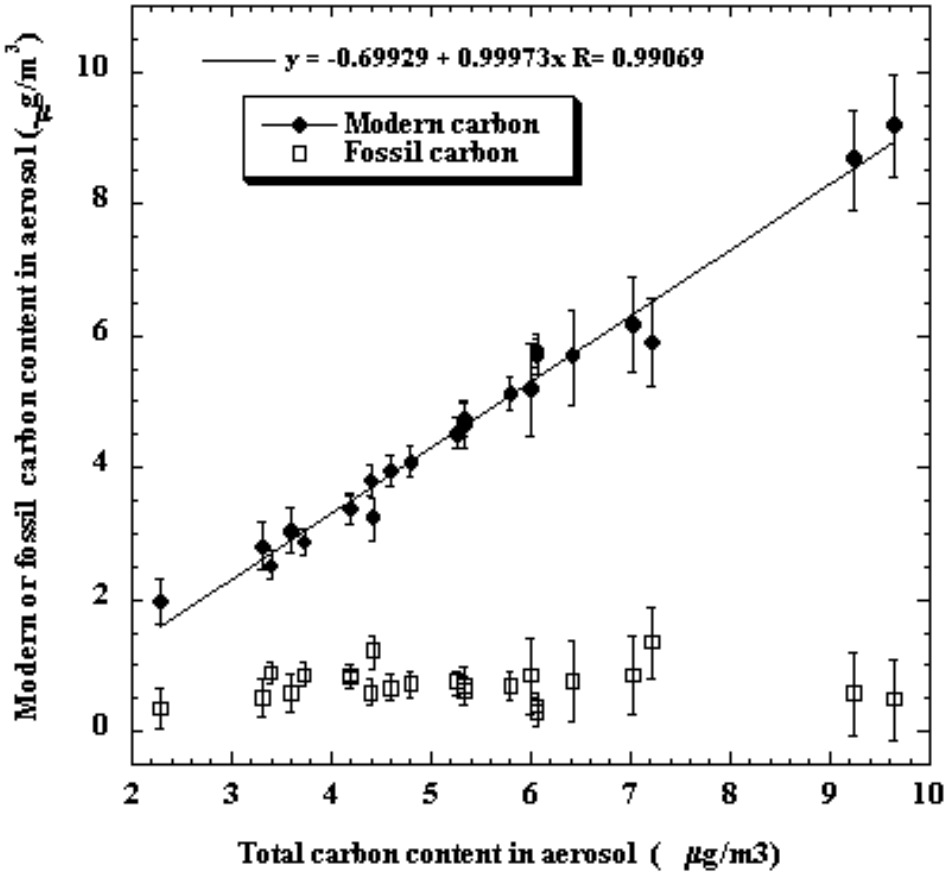
IMPROVE Network
Carbon-14 Hivol

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Carbon-14 Sampling Yosemite, Summer 2002

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Carbon-14 Hivol Schedule & Analysis

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- 6-day integrated samples (Tuesday off)
- June, July, August
- December, January, February
- Analysis at LLNL by Accelerator Mass Spec.

Carbon-14 Hivol
6 Sites for 2005-2006

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- Grand Canyon, AZ
- San Gorgonio, CA
- Phoenix, AZ
- Tonto, AZ
- Sula, MT
- Rocky Mountain, CO

Davis Test Site

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University of California, Davis



Davis Test Site

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Davis Test Site Samplers

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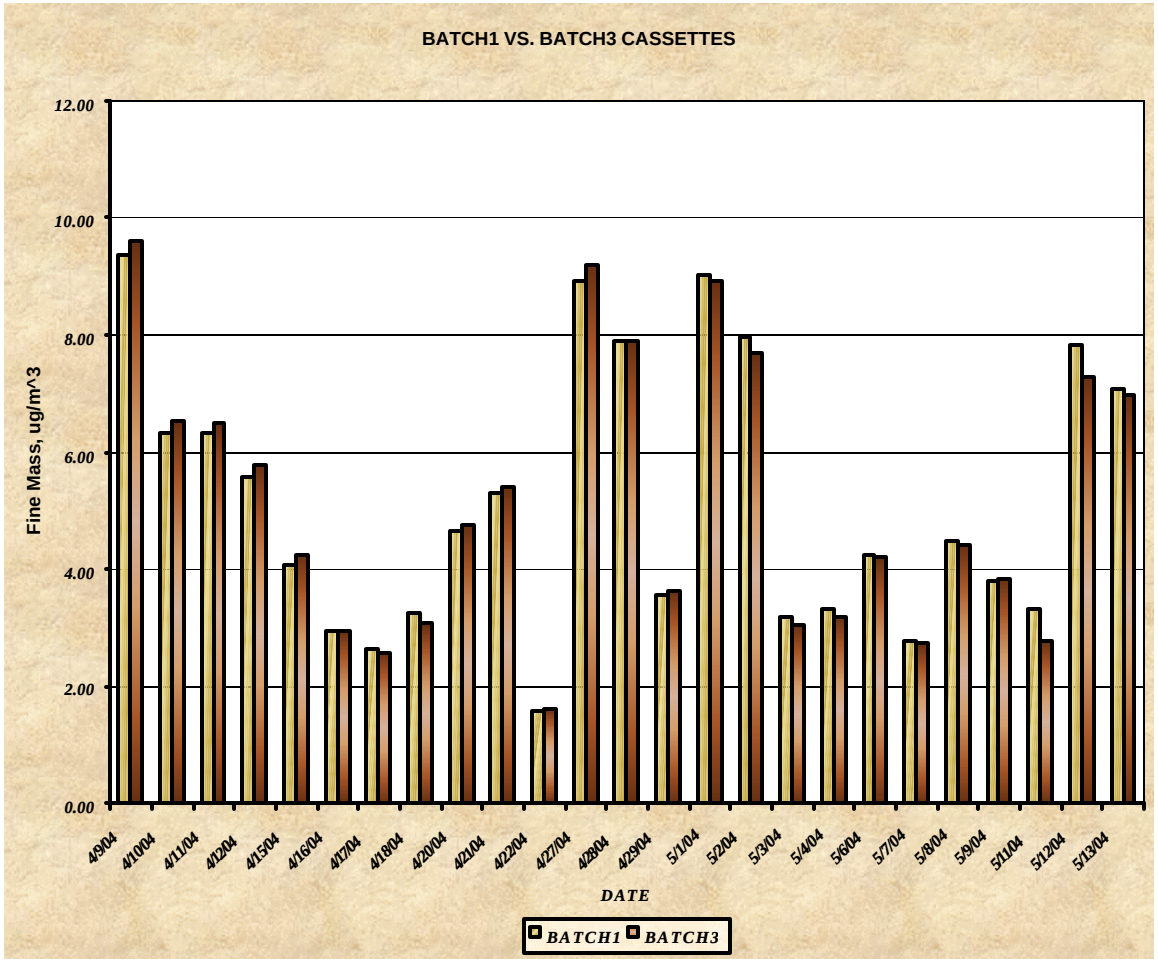
Davis Test Site Experiments

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- Routine diagnostics
- Tests of sampling changes
  - New cassettes
  - New filter lots
- Special investigations
  - Nylon filter characteristics
  - Sampler port dependence
  - Version I vs. Version II samplers

Davis Test Site
Cassette Tests

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University of California, Davis



Davis Test Site Cassette Tests

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University of California, Davis

- 21 Test Pairs, April-May 2004
- Fine mass bias (new minus old)
  - Average Bias = 0.01%
  - Std. Dev. of Bias = 3%
  - Performance is within expectations
- Elemental analysis forthcoming

Davis Test Site
Nylon Filter Tests

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University of California, Davis

- Since December 1995, over 20 different Nylon filter lots have been used
- Tests compare lots and manufacturers
- 28 days of 24-hour samples, April-May 2004
- Ion analysis currently underway

Davis Test Site
Nylon Filter Tests

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University of California, Davis

Nylon Filters

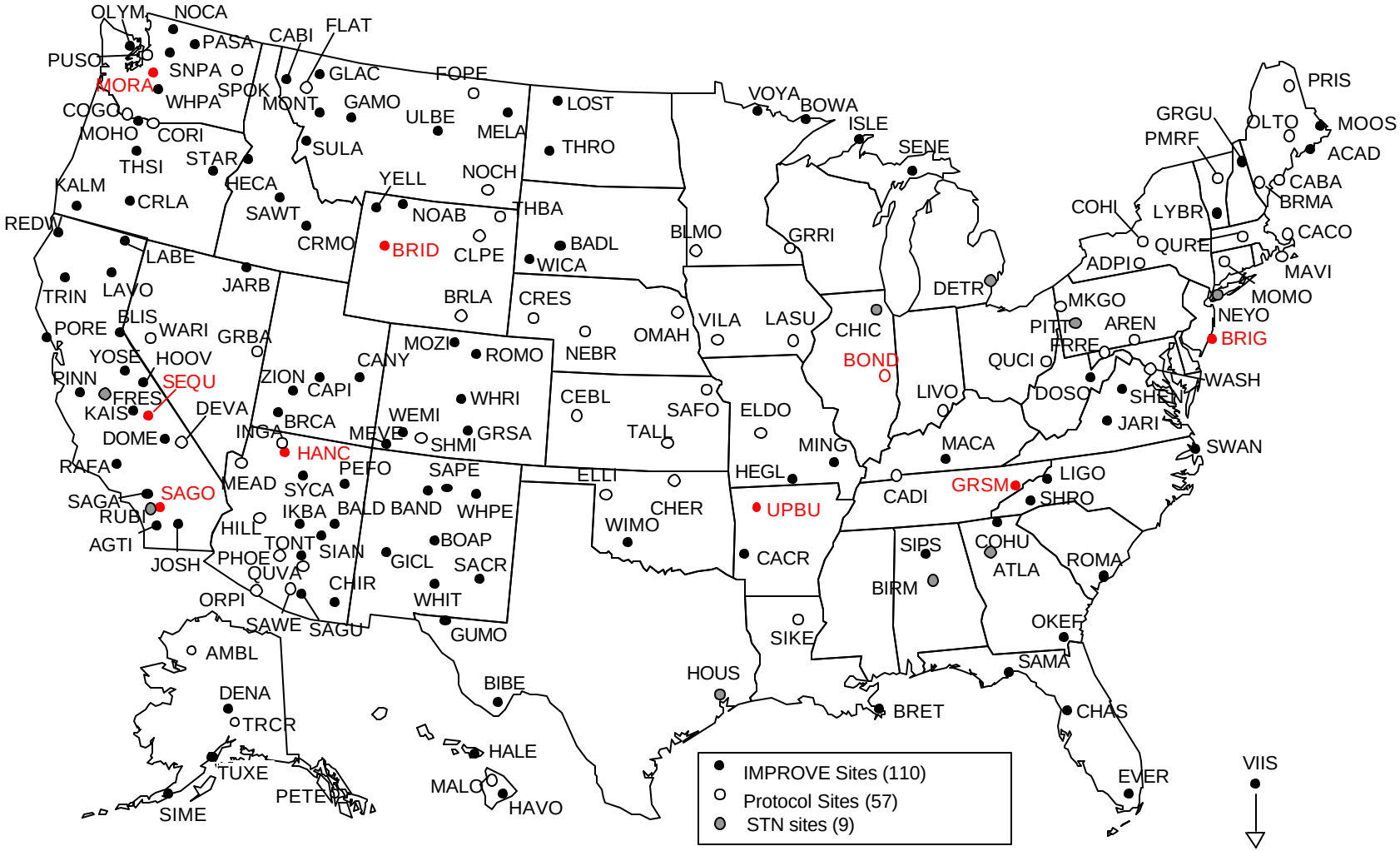


- Four Different Nylon lots were used
  - Magna Nylon, GE Osmonics, BK05161B
  - Magna Nylon, GE Osmonics, BK09061E
  - Nylasorb, Pall Gelman, BNC1716
  - Nylon, Advantec MFS Inc., 201622
- Filter lots often have visible and texture differences
- All made from nylon

[redacted]

IMPROVE Network
PM-10 Speciation Sites

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University of California, Davis



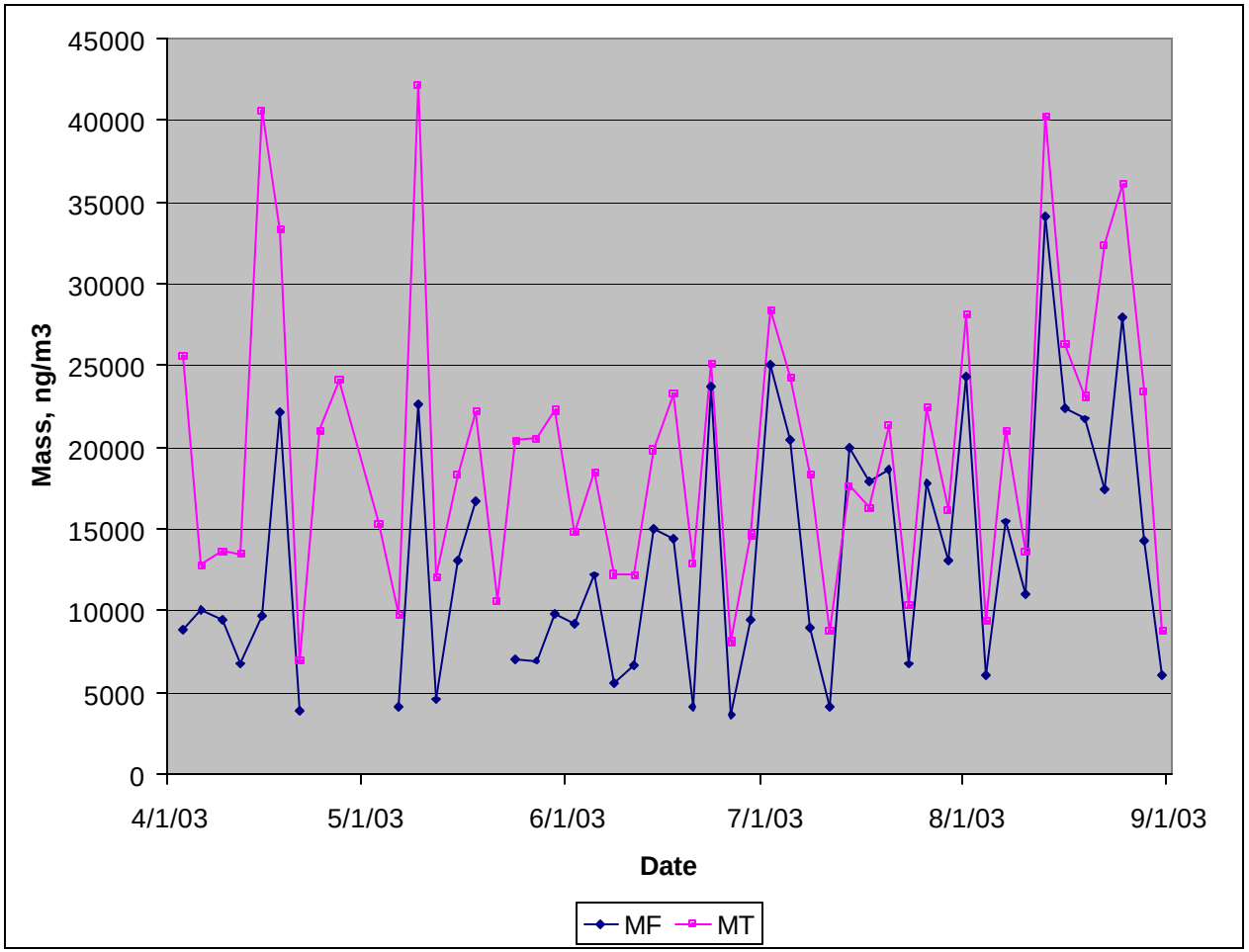
San Gorgonio PM-10 Speciation Site

CROCKER NUCLEAR LABORATORY
University of California, Davis



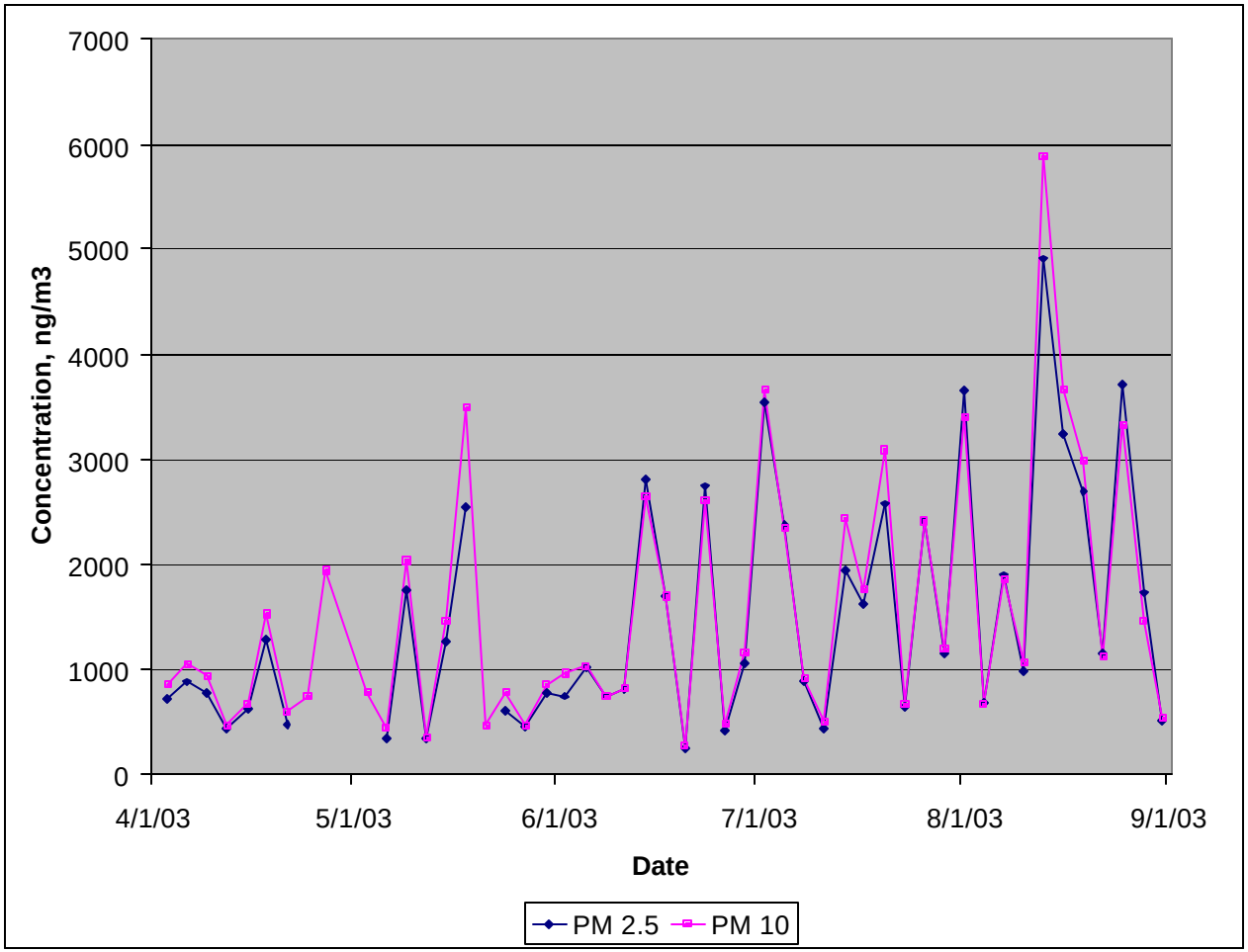
Bondville PM-10 Speciation Fine and Total Mass

CROCKER NUCLEAR LABORATORY
University of California, Davis

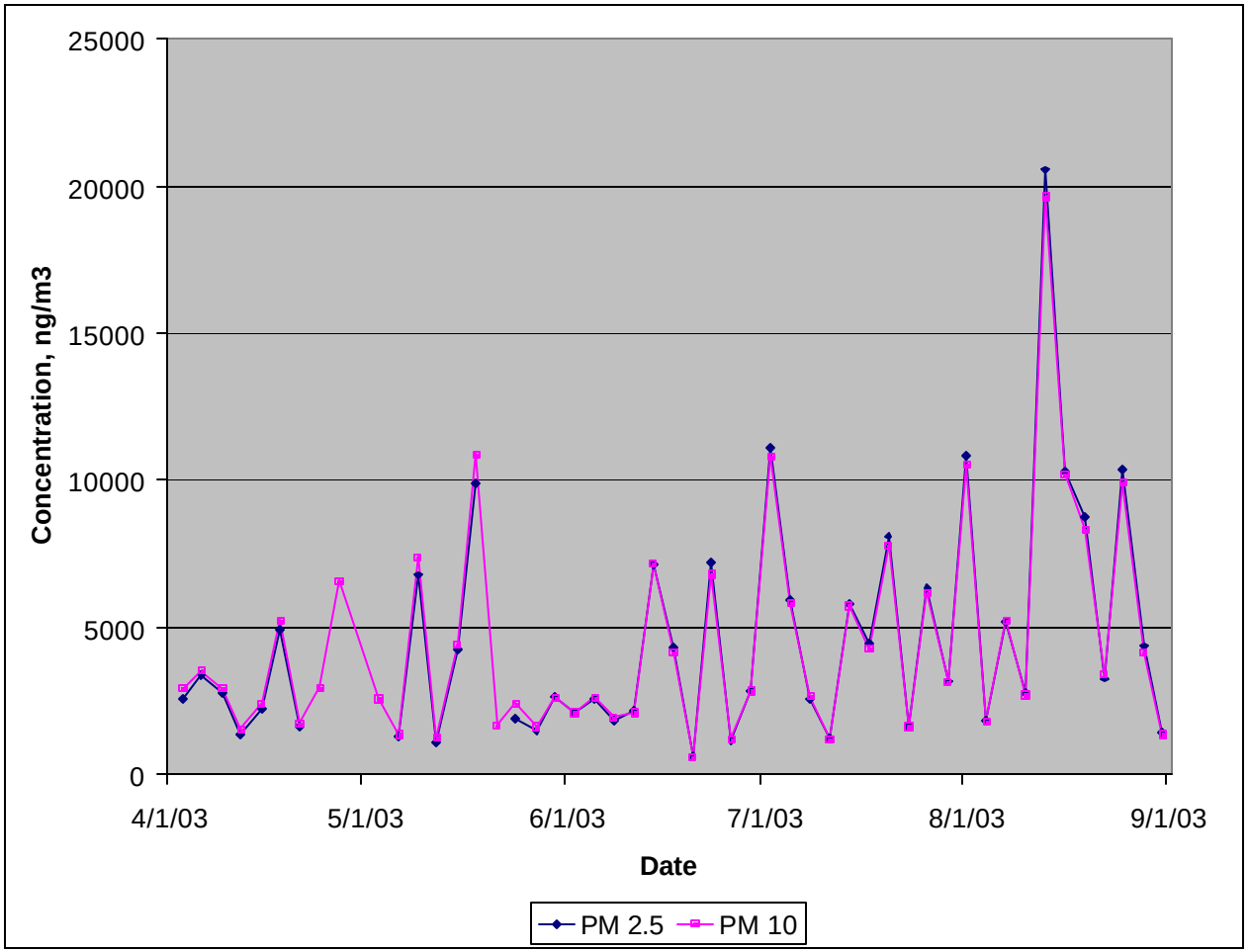


Bondville PM-10 Speciation
Sulfur

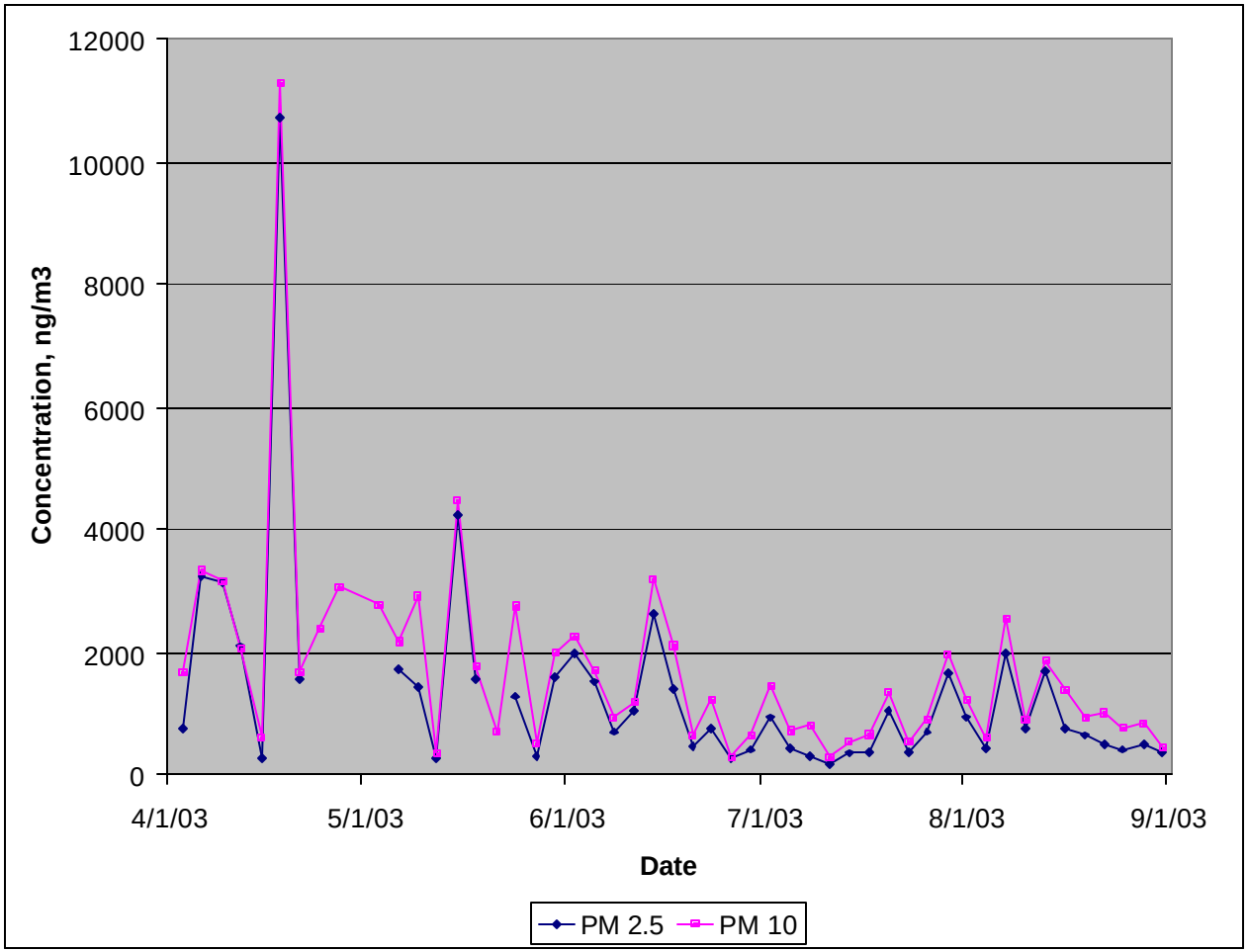
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University of California, Davis



Bondville PM-10 Speciation Sulfate

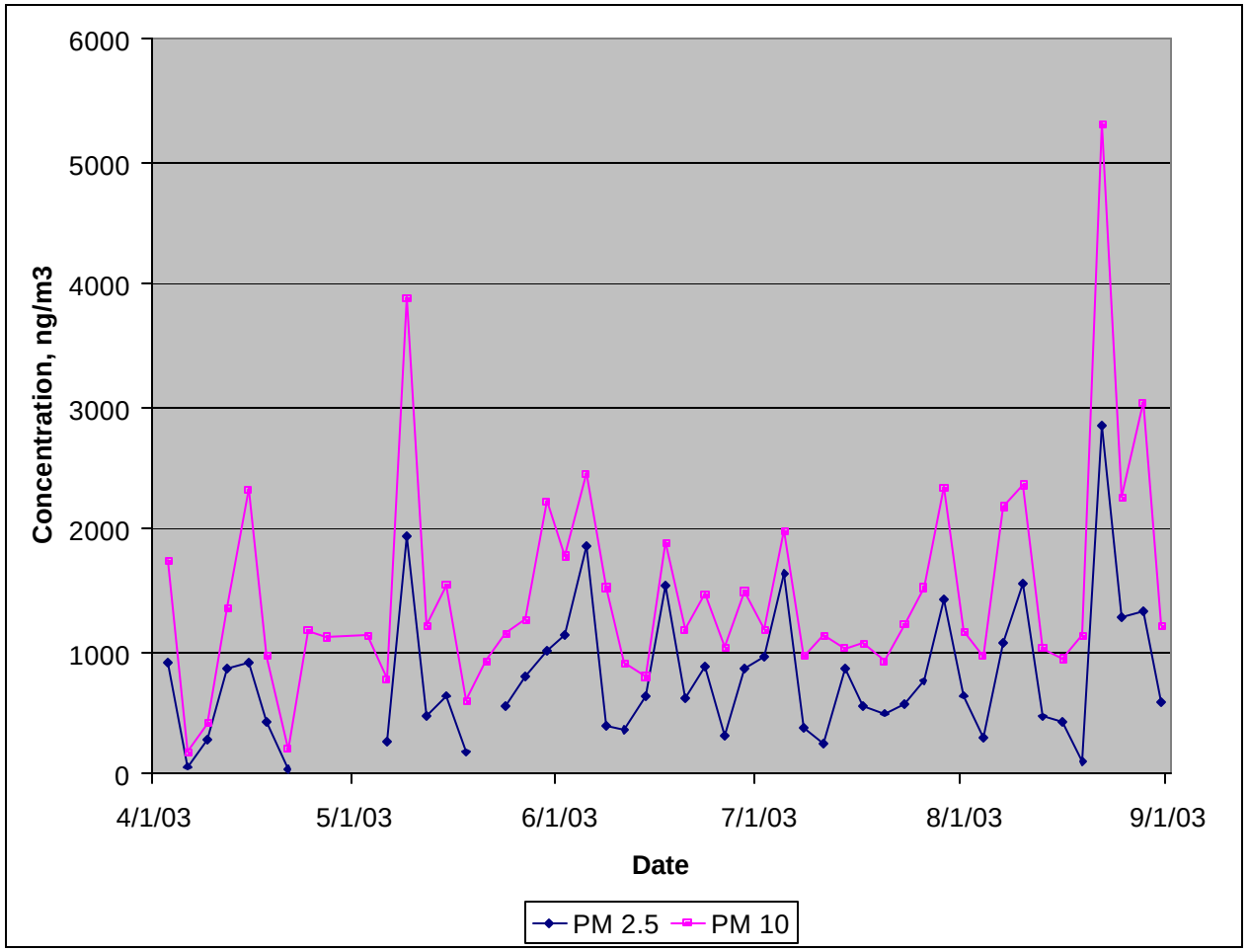


Bondville PM-10 Speciation
Nitrate



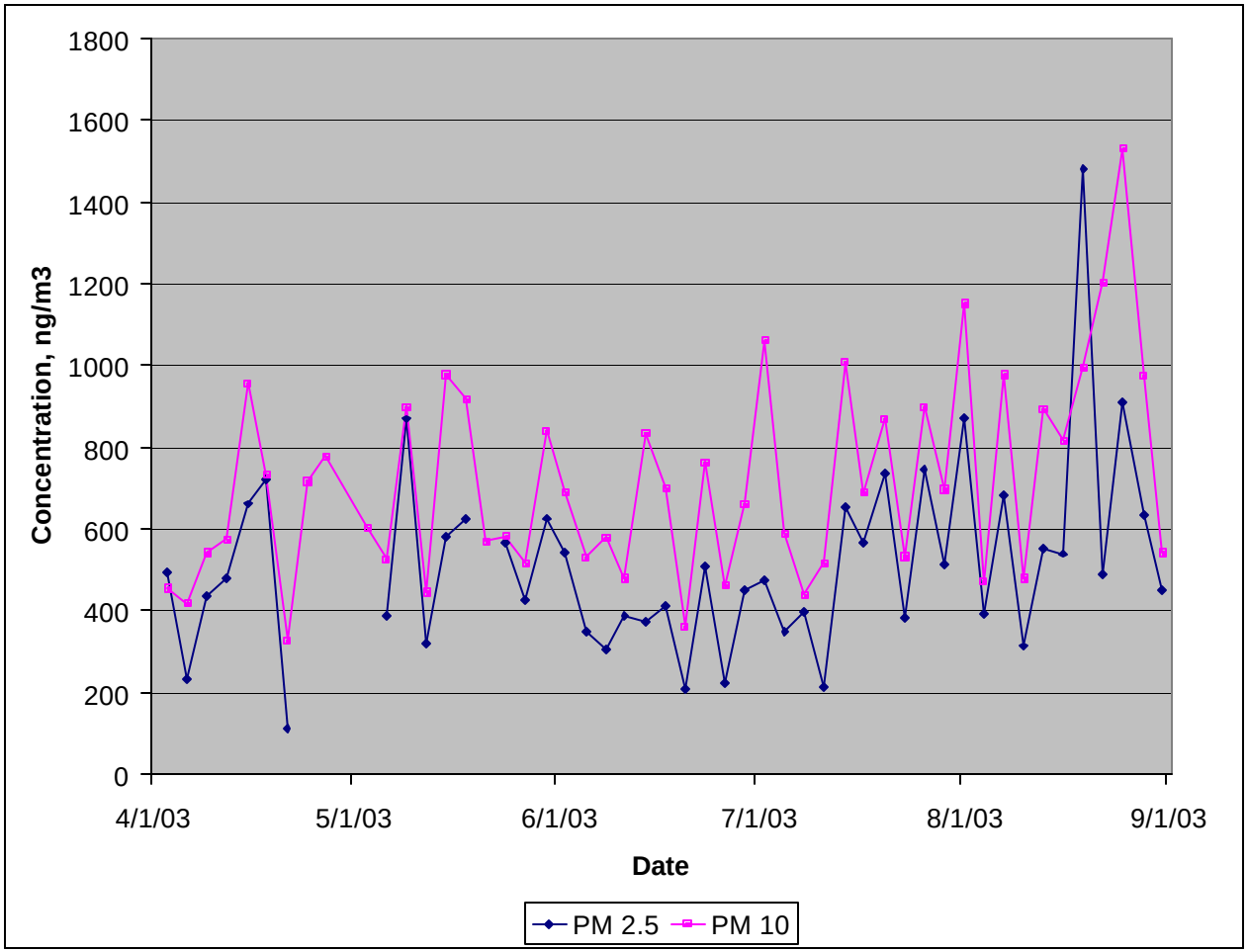
Bondville PM-10 Speciation O3 (OC Fraction)

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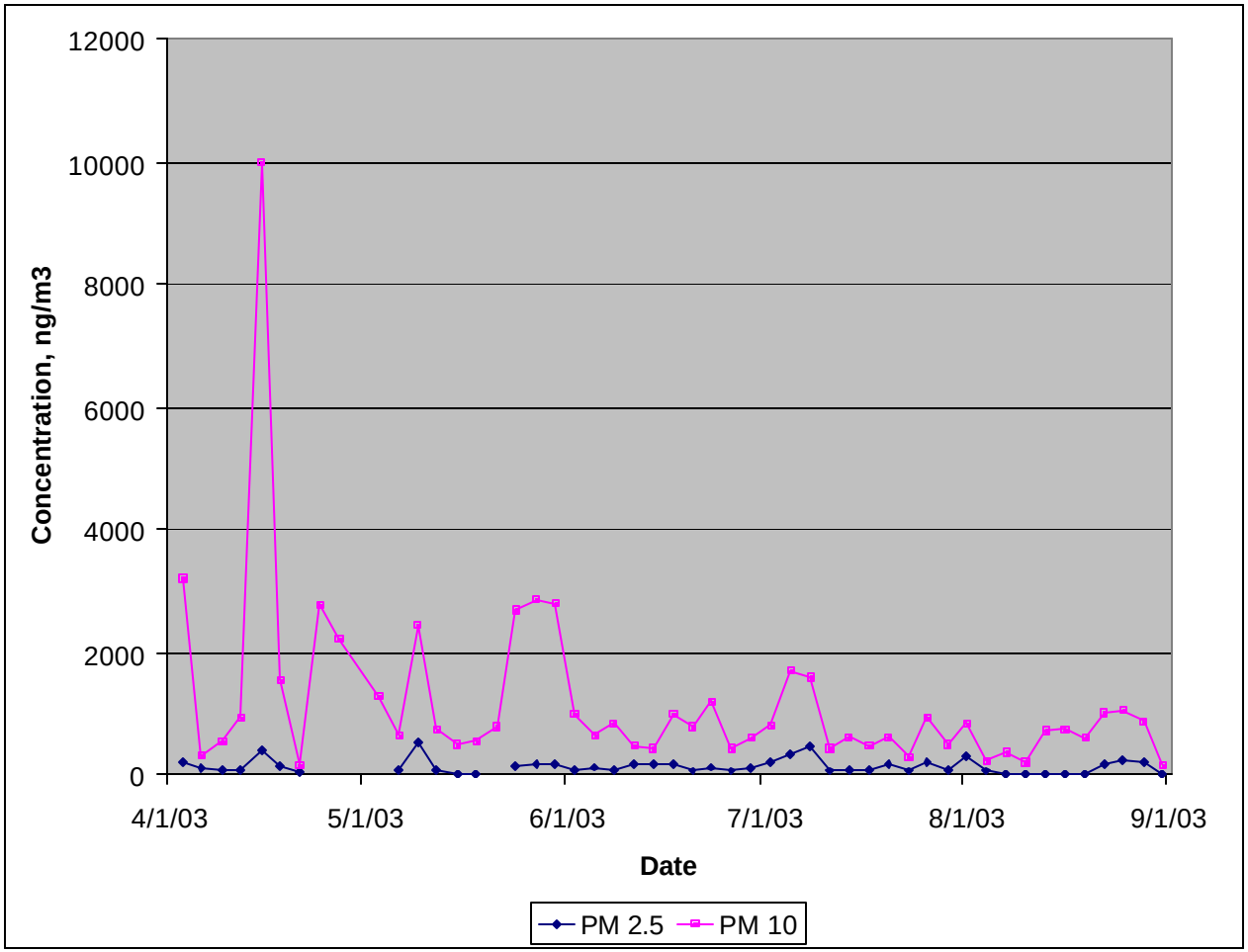


Bondville PM-10 Speciation E1 (EC Fraction)

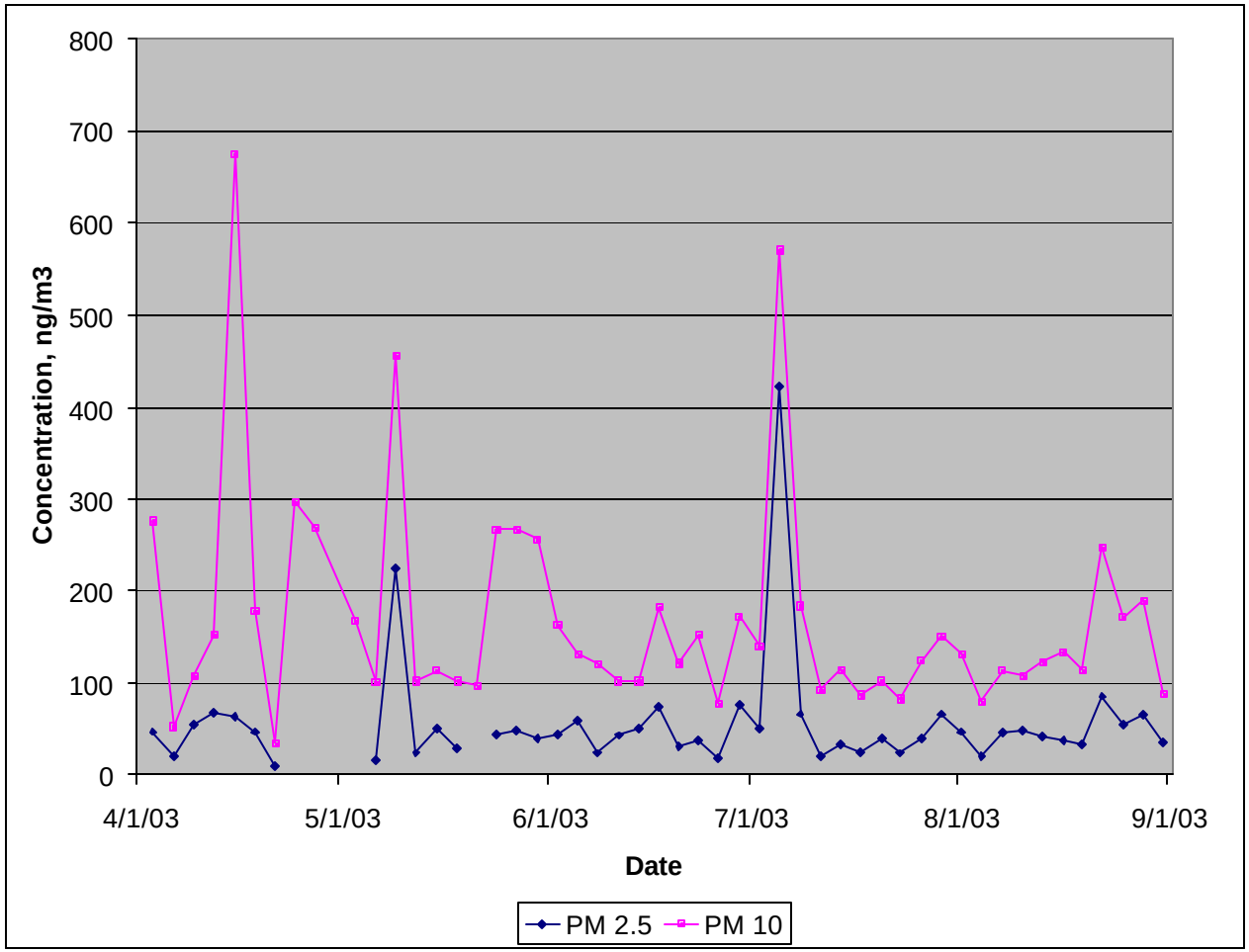
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University of California, Davis



Bondville PM-10 Speciation Silicon

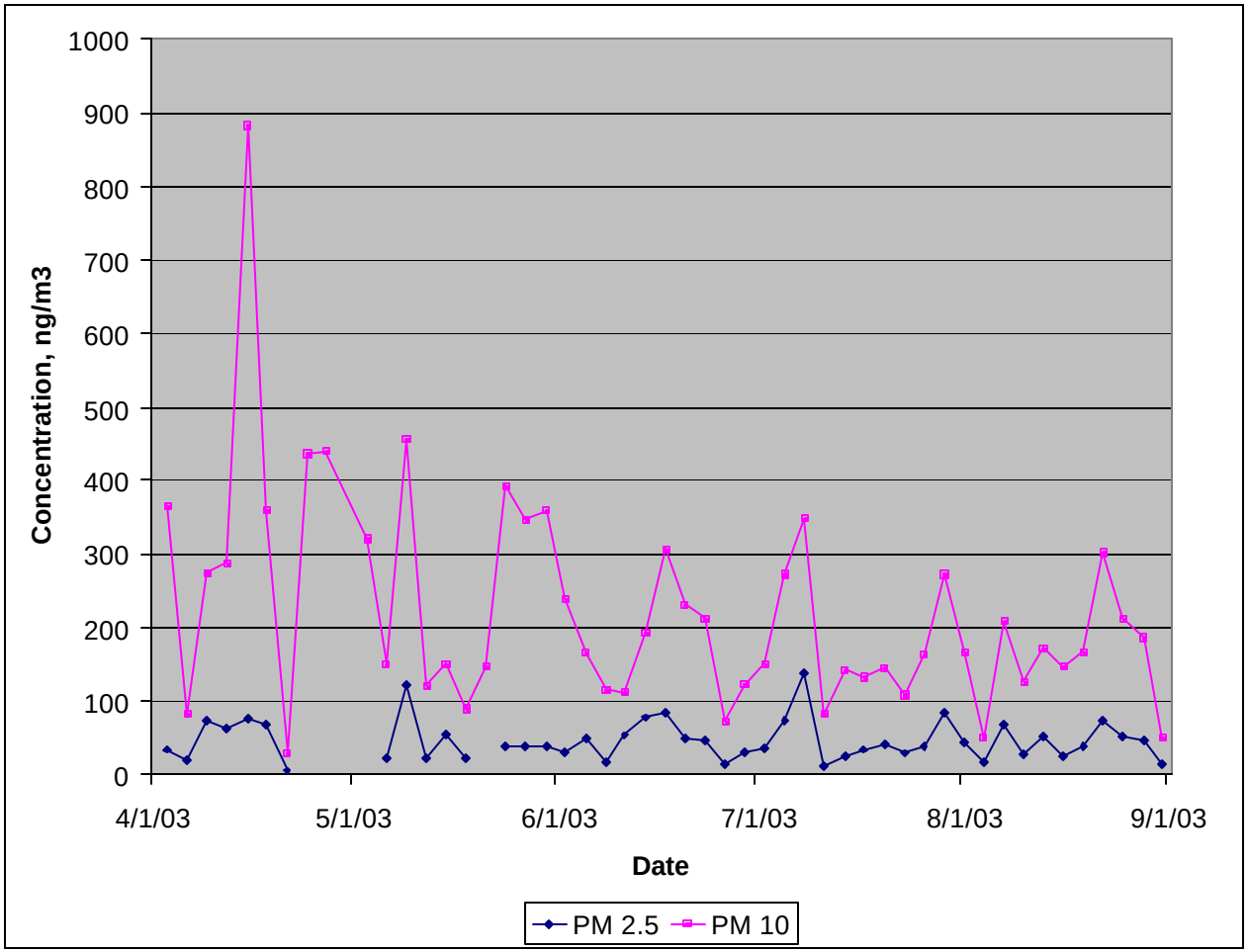


Bondville PM-10 Speciation Potassium



Bondville PM-10 Speciation
Iron

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Great Smoky Mountains Summer 2004 Ion Study

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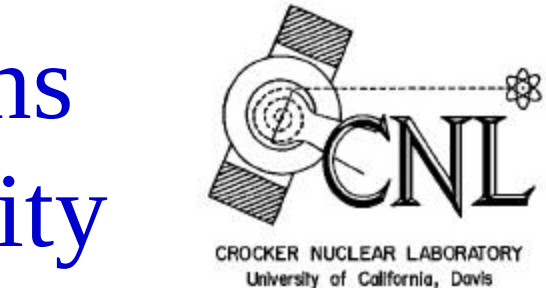
- Designed to characterize ion concentrations and measurement methods in humid, acidic summer environment
- July-August 2004
- UC Davis, CSU, TVA

Great Smoky Mountains
UC Davis & TVA

CROCKER NUCLEAR LABORATORY
University of California, Davis

- UC Davis
  - Ammonia contamination tests
  - Daily speciated $PM_{2.5}$ & PM_{10} IMPROVE samples
- TVA
  - Continuous ammonia
  - Continuous sulfate

Great Smoky Mountains
Colorado State University



- URG filter pack/denuders for $NH4^+$ loss, water extraction efficiency, & aerosol acidity
- MOUDI for ion size distributions
- PILS for $PM_{2.5}$ ions with 15-minute resolution