Automatic Semi-continuous Field-Deployable Thermal/Optical OCEC Carbon Aerosol Analyzer

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Introduction

- Why Organic and Elemental Carbon Measurements?
  - Climate effects
  - Tracer for Sources
  - Health effects
  - Visibility
- Semi-continuous Field Instrument Specifications, Features and Data
- Field version better suited for continuous monitoring at one location over a period of time

OCEC Field Instrument

- Basic functions
  - Automatically samples and analyzes carbon in a semi-continuous method
  - Accurate thermal/optical OCEC sampler
  - Semi-continuous operation with minimal operator input
  - Field deployable to an enclosed site
  - Pre-set sample collection time(certain hours of the day) or pre-set collection cycle times(repeated time cycle)
  - Sample collection variance from 30 minutes to 4 hours. One or two hour cycles are typical

Basic Functions (continued)

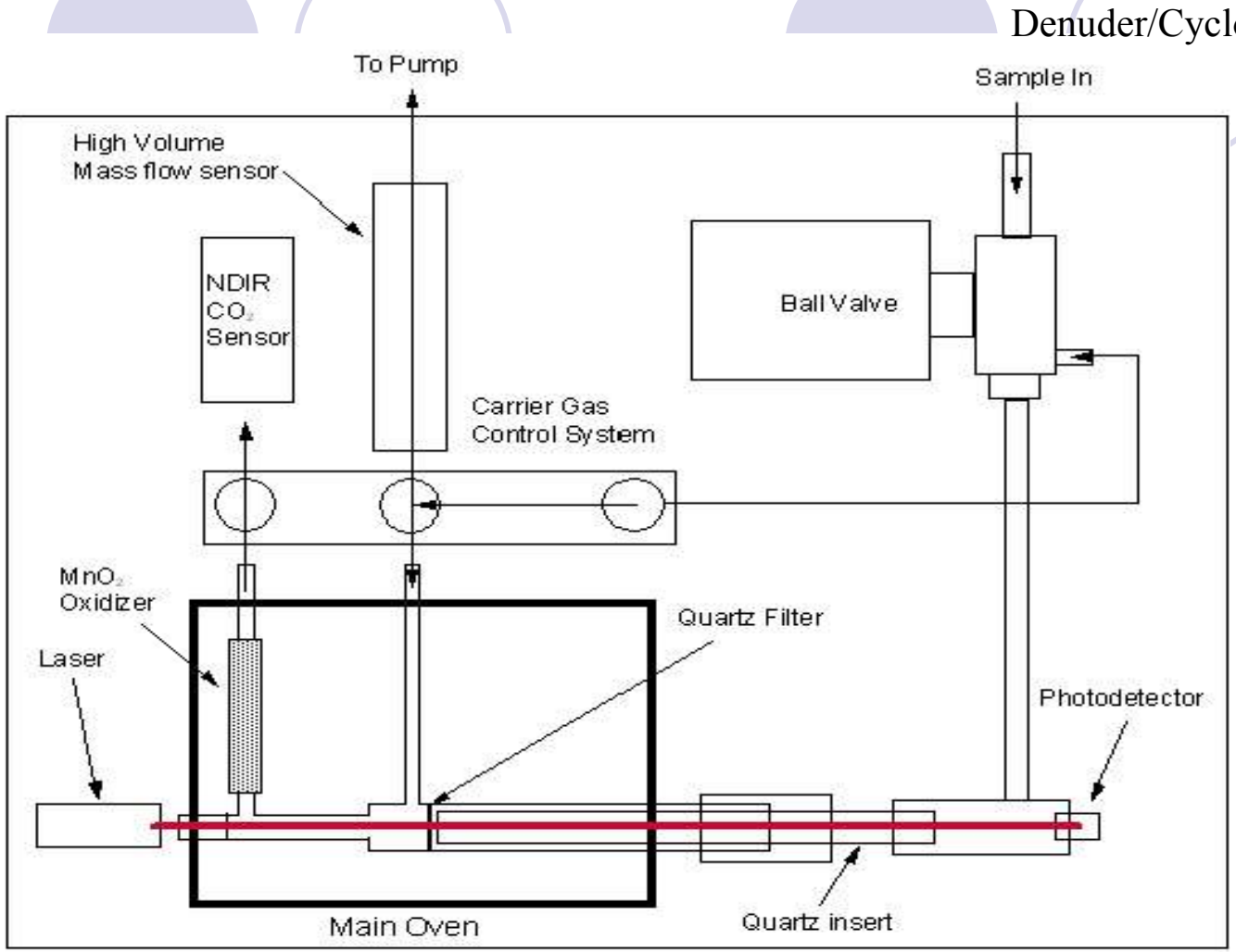
- Sunset Laboratory transmittance based OCEC parameters or user defined (NIOSH 5040, IMPROVE, EPA STN, or any user entered parameter)
- Measure EC by optical measurement and also thermal measurement
- Fast analysis protocol to maximize sample collection time
- Sensitive and smooth detector system

Features

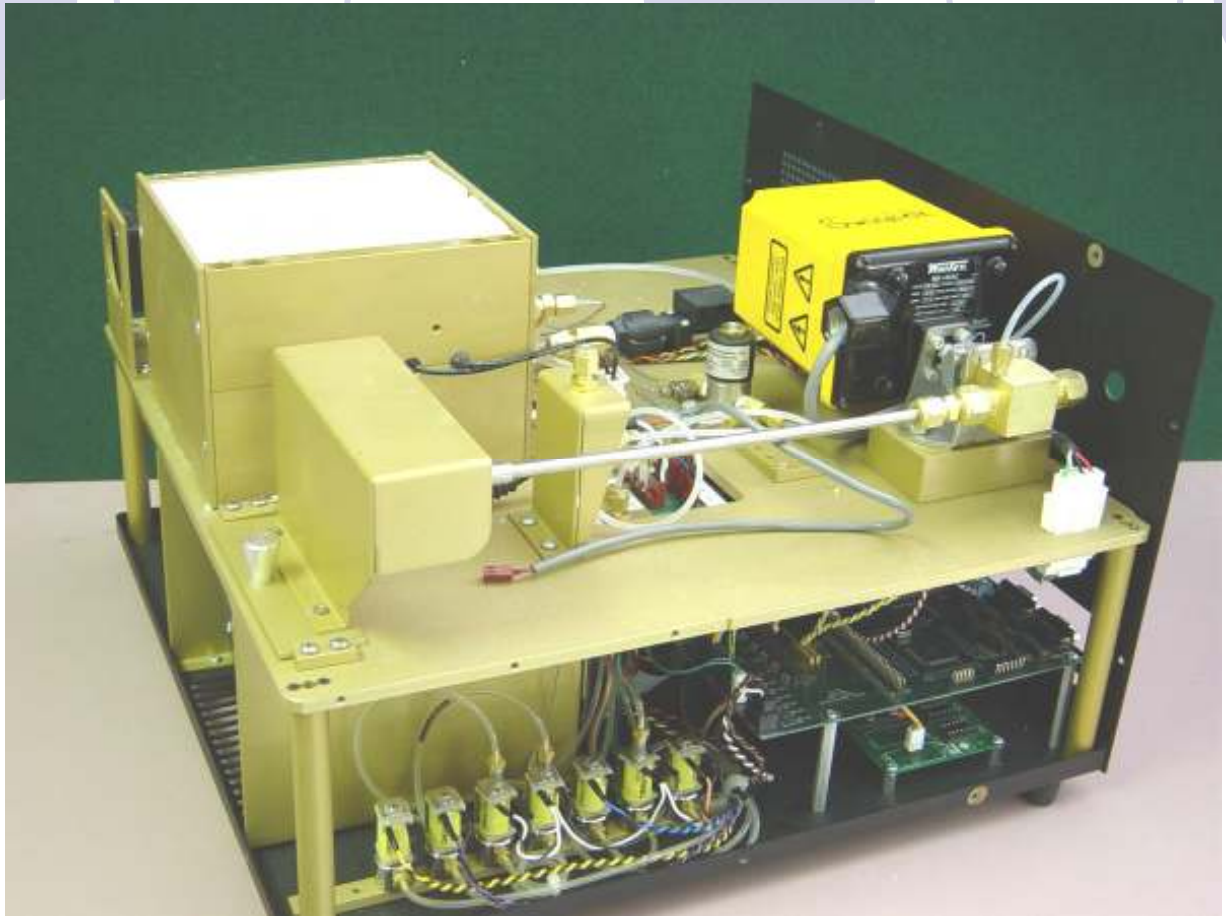
- Time resolution as small as 30 minutes(recommended under unusually high levels)
- Minimum quantifiable levels of 0.4ugC/m^3 for OC and EC
- Sensitive NDIR detector measures carbon after it evolves from the filter and is oxidized to CO2.
- Computer operated flow controllers for all gases to allow for efficient use of gases

Features (continued)

- Minute by minute optical EC measurements(OptEC)
- Minimal maintenance
- Portable computer allows for easy operation and data storage
- Laser enables pyrolysis correction and compatibility with accepted OCEC method 5040 (NIOSH, National Institute of Safety and Health)



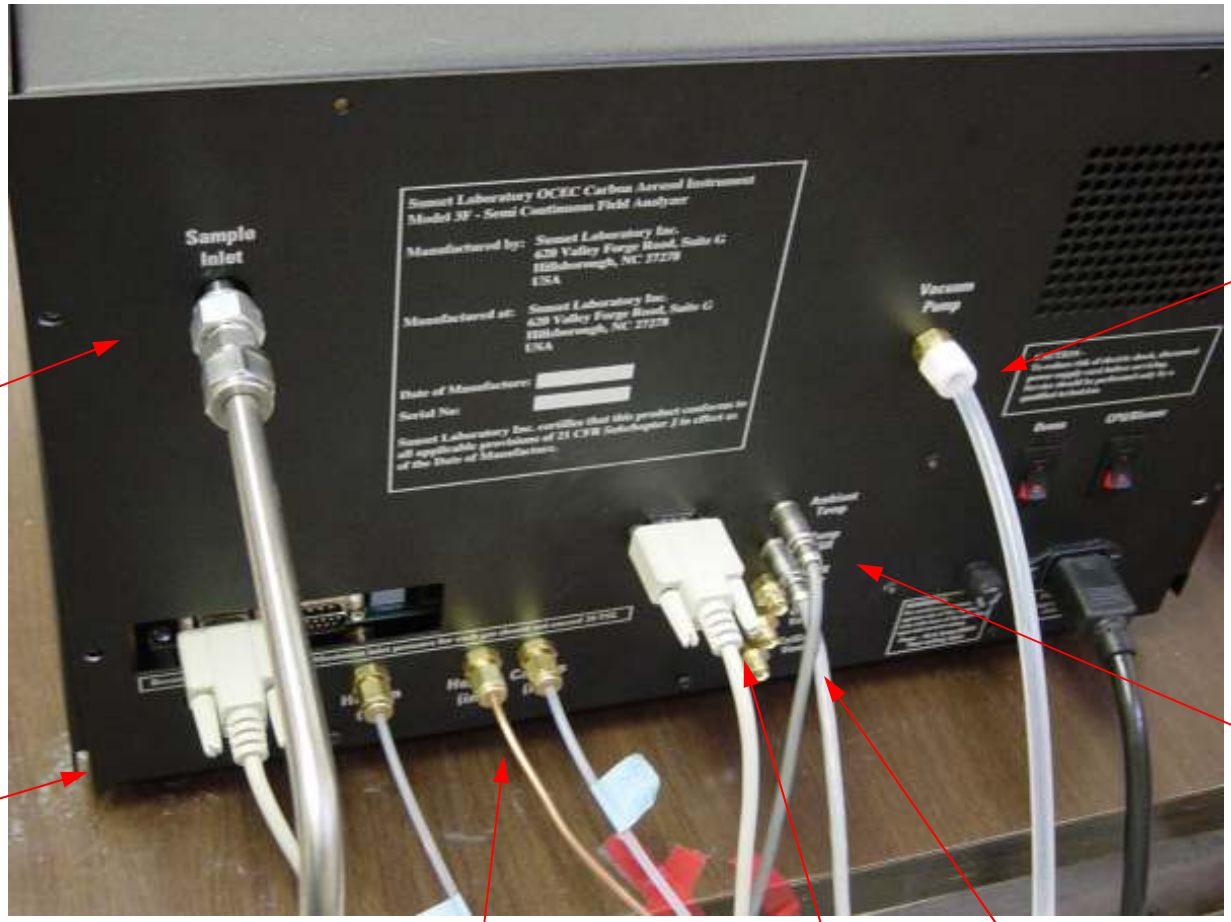
Semi-Continuous OCEC Instrument Diagram



Current Production Model

Model 4 Rack-Mount OCEC

Gas Inputs and other connections



Sample Inlet

Vacuum Line to Ballast Tank

Serial Cable to computer

Remote TC

Support Gases

NDIR Serial Cable

Remote SSR Pump Control

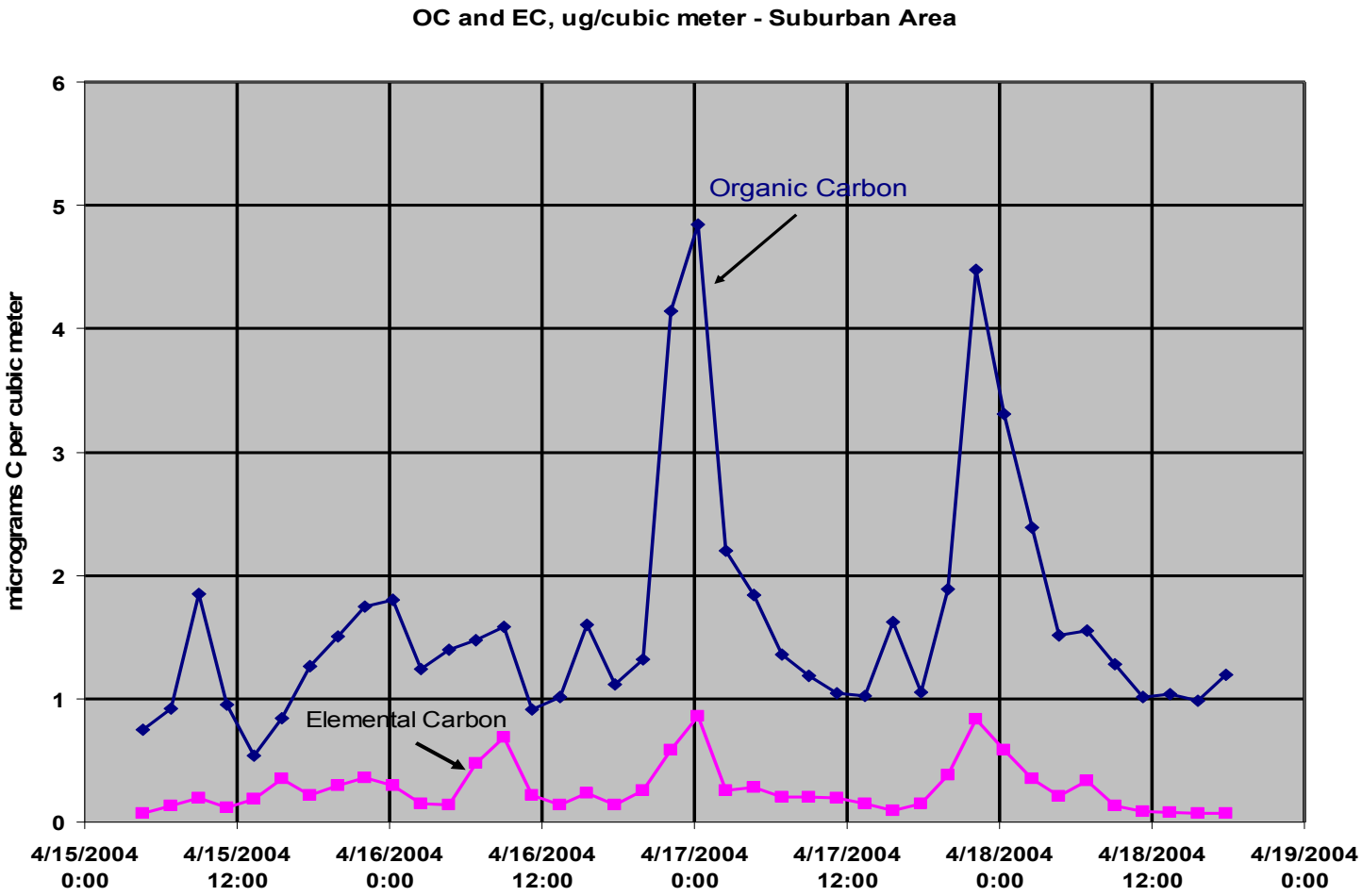
Inlet Requirements

- Pre-Cleaned Metal Tubing Only (Copper or SS)
- Cyclone for size selection
- Denuder for removal of Organic Vapors

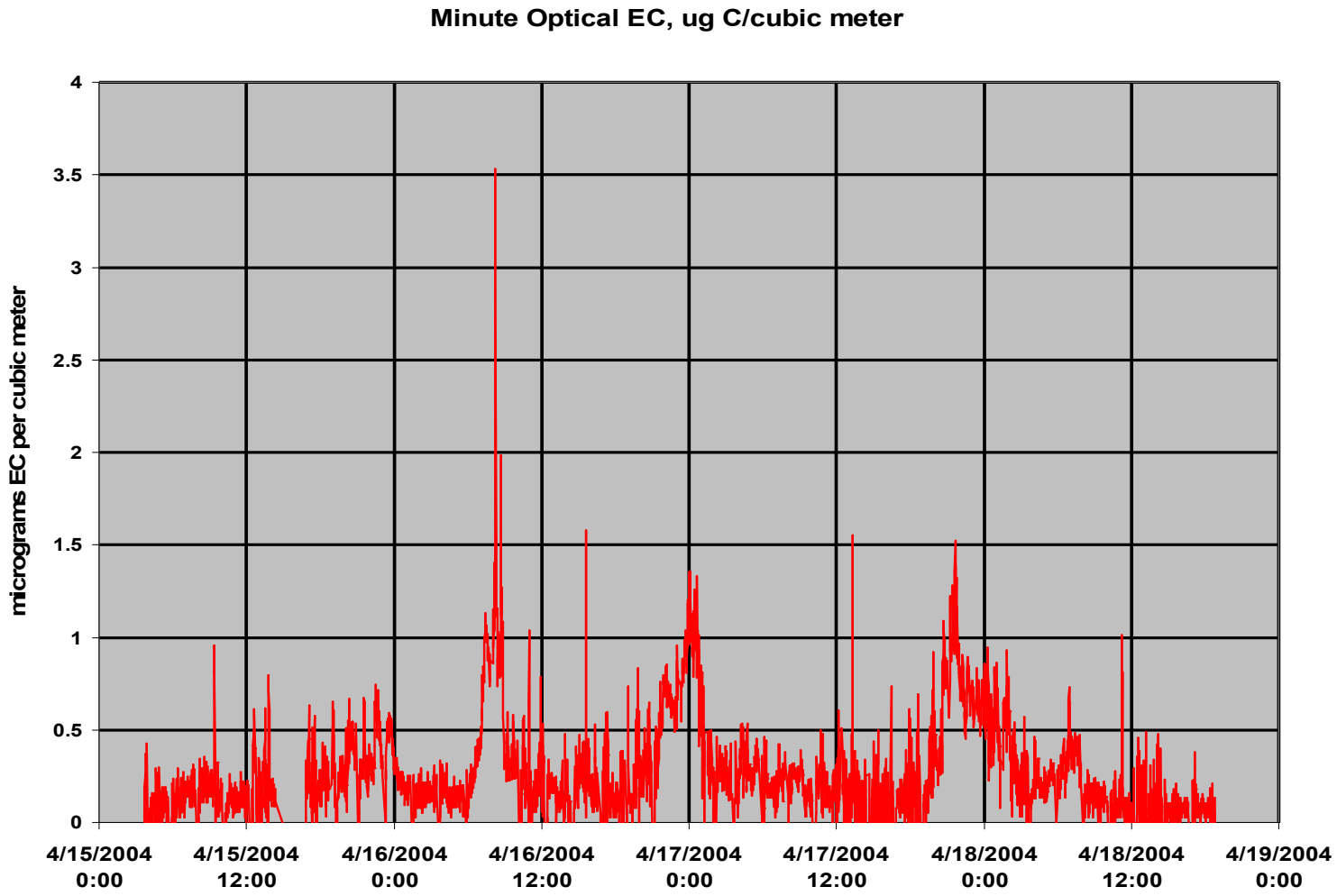
COMMON MAINTENANCE ITEMS

- 1. Gases – 6 months to 2 years
- 2. Filters – Usually changed weekly, though may need to be more often or can be less often
- 3. Heating coils – need to be replaced when they burn out. 1-2 Years

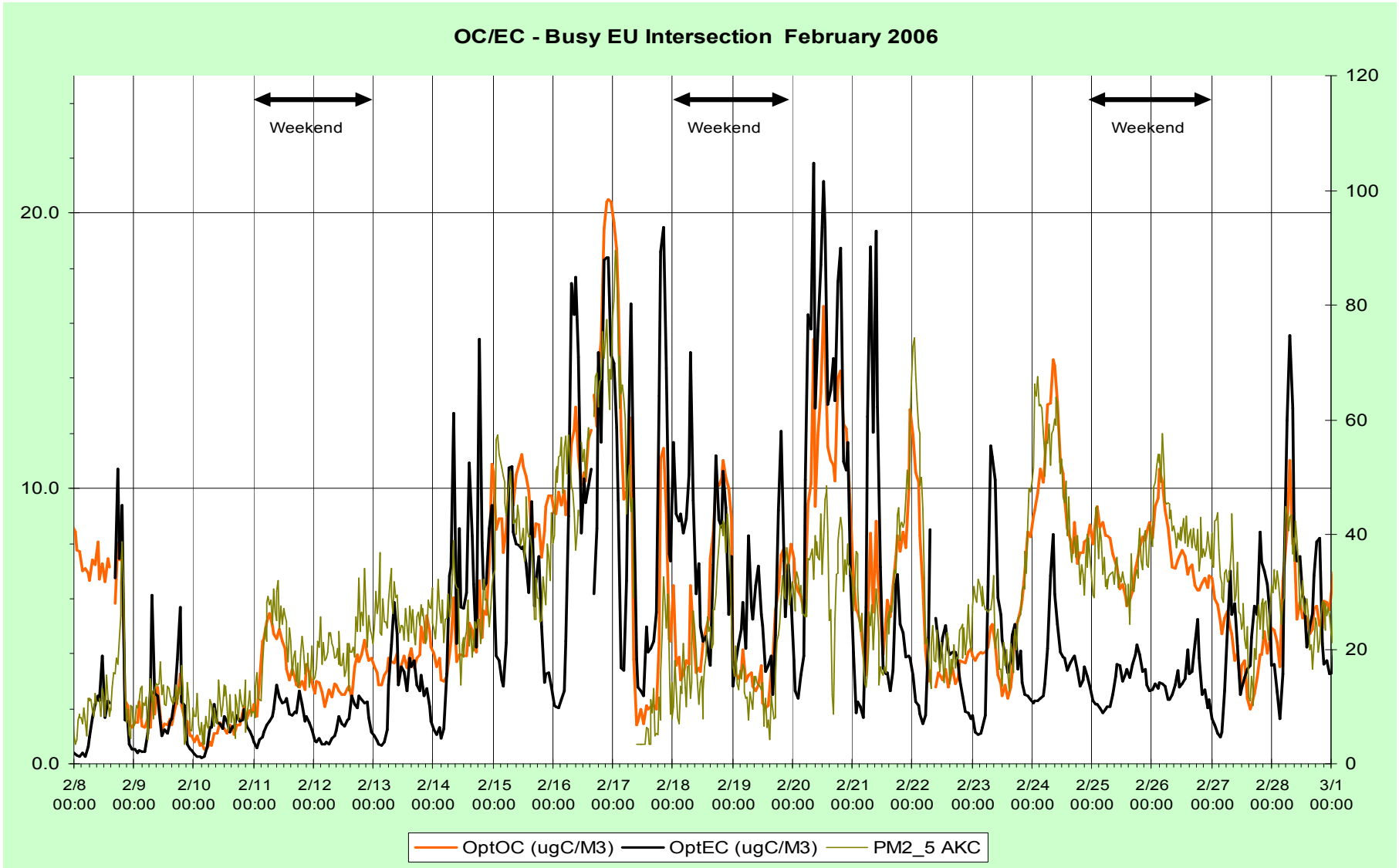
OC and EC – Suburban Area Two Hour Samples



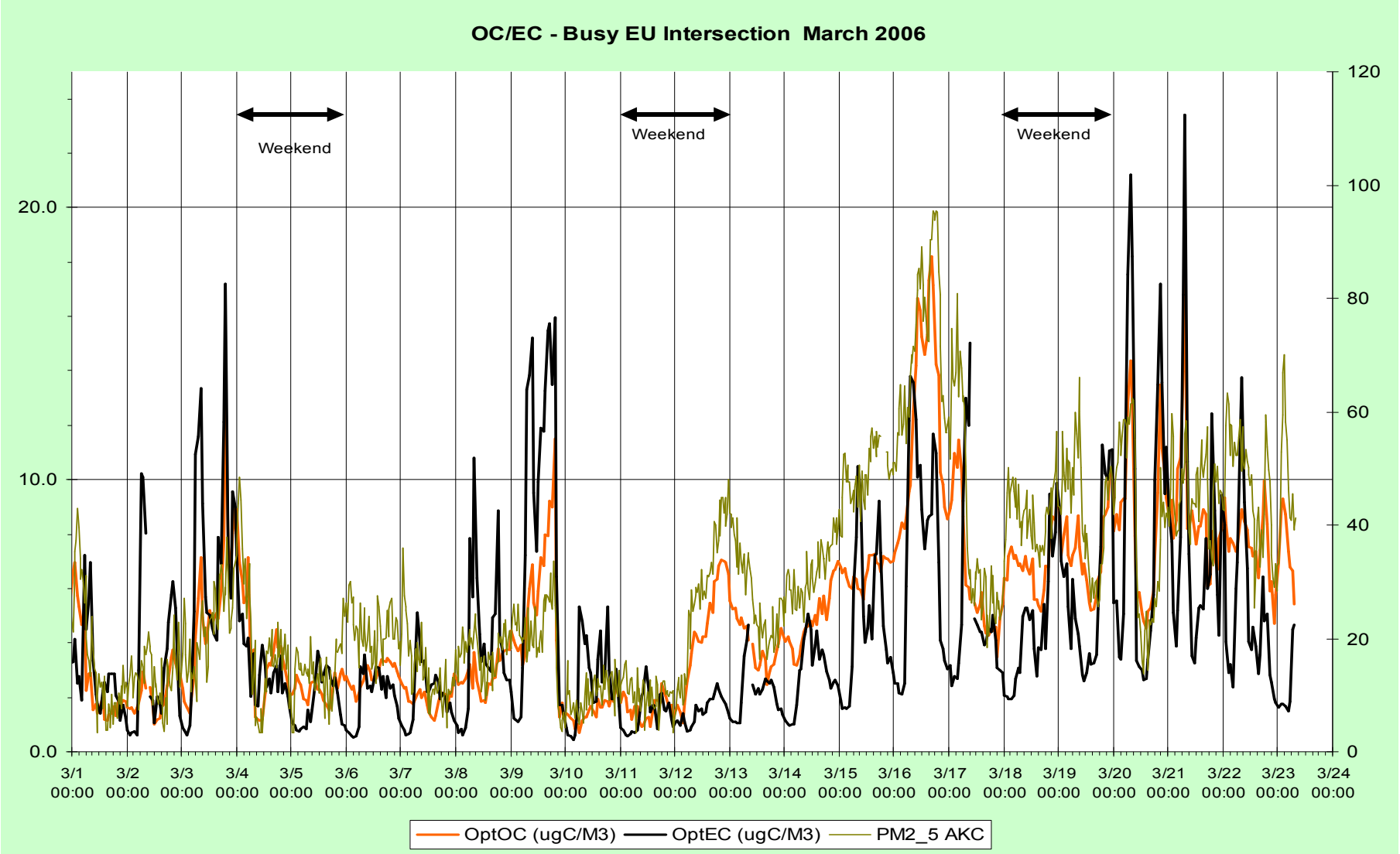
Minute Optical EC – Suburban Area



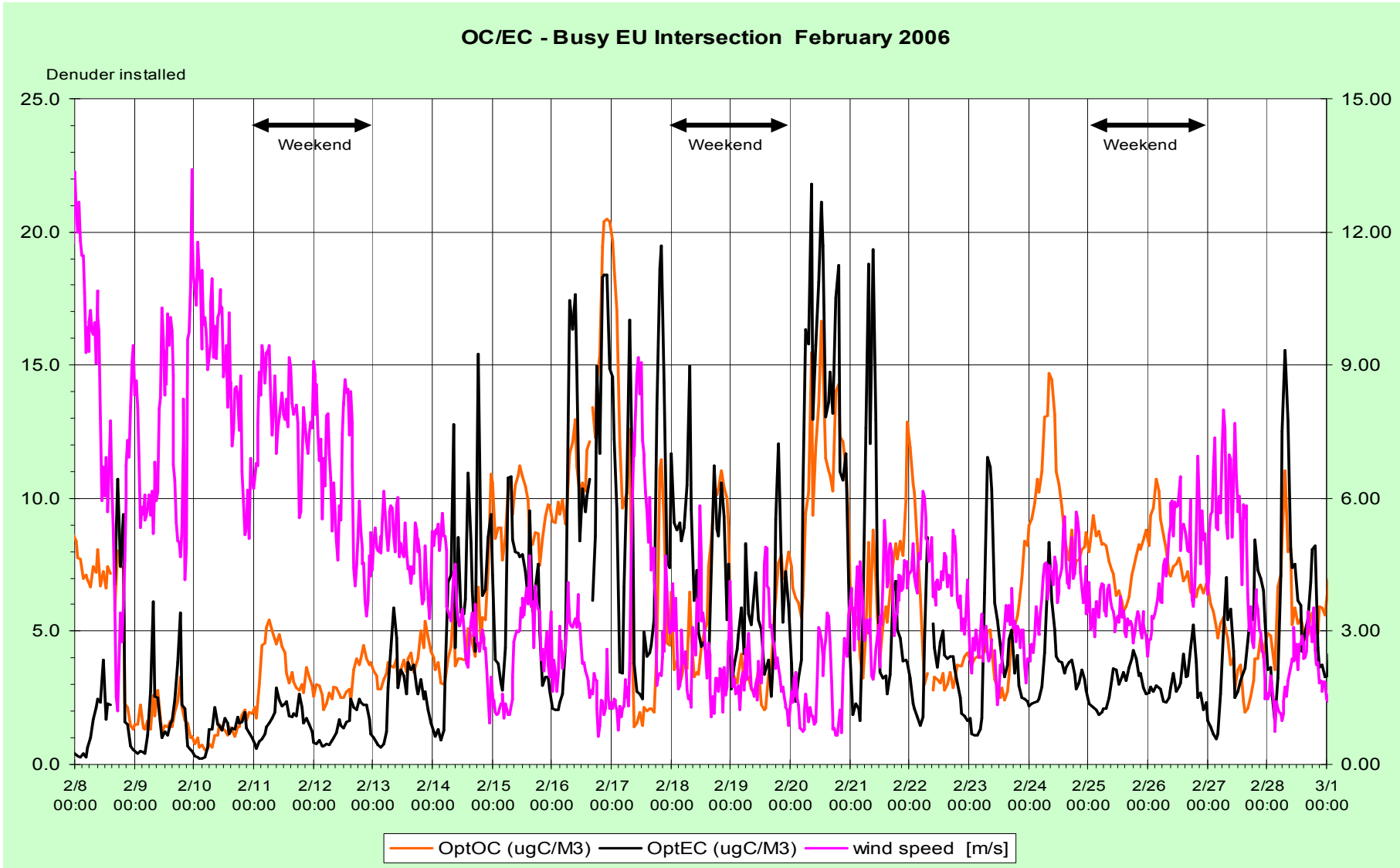
OCEC with PM2.5 Vienna - February



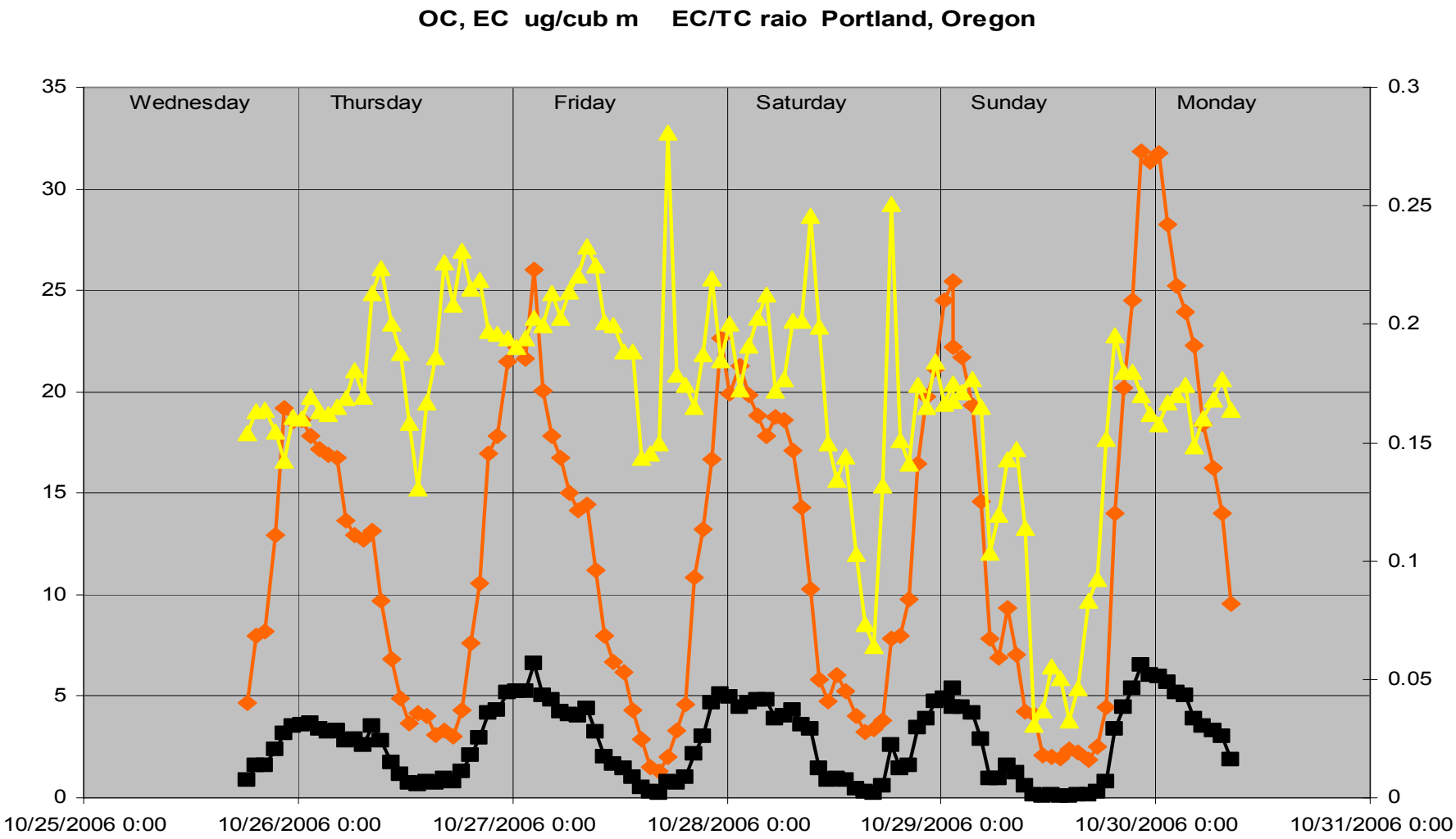
OCEC with PM2.5 Vienna - March



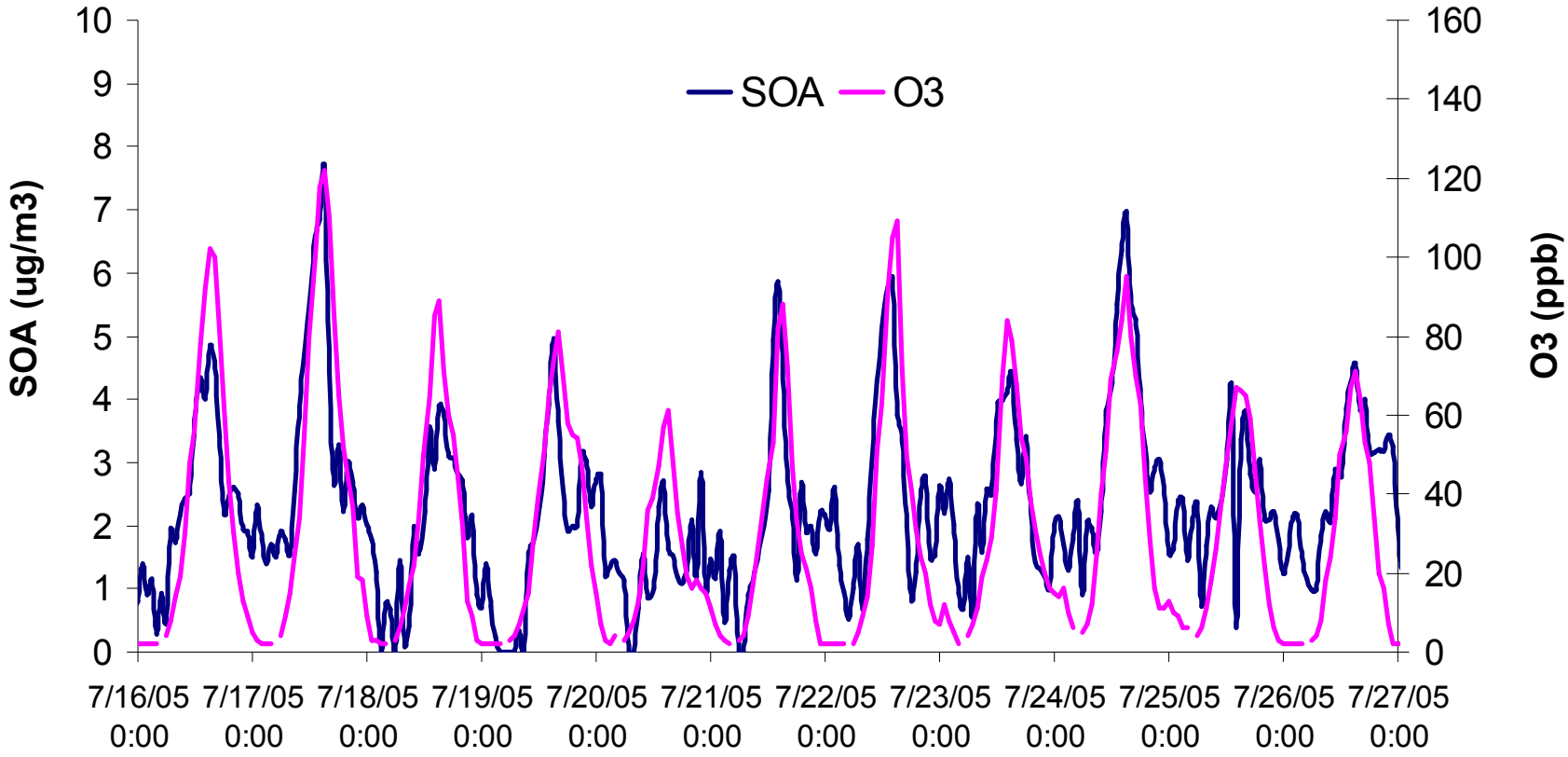
OCEC and Windspeed - Vienna



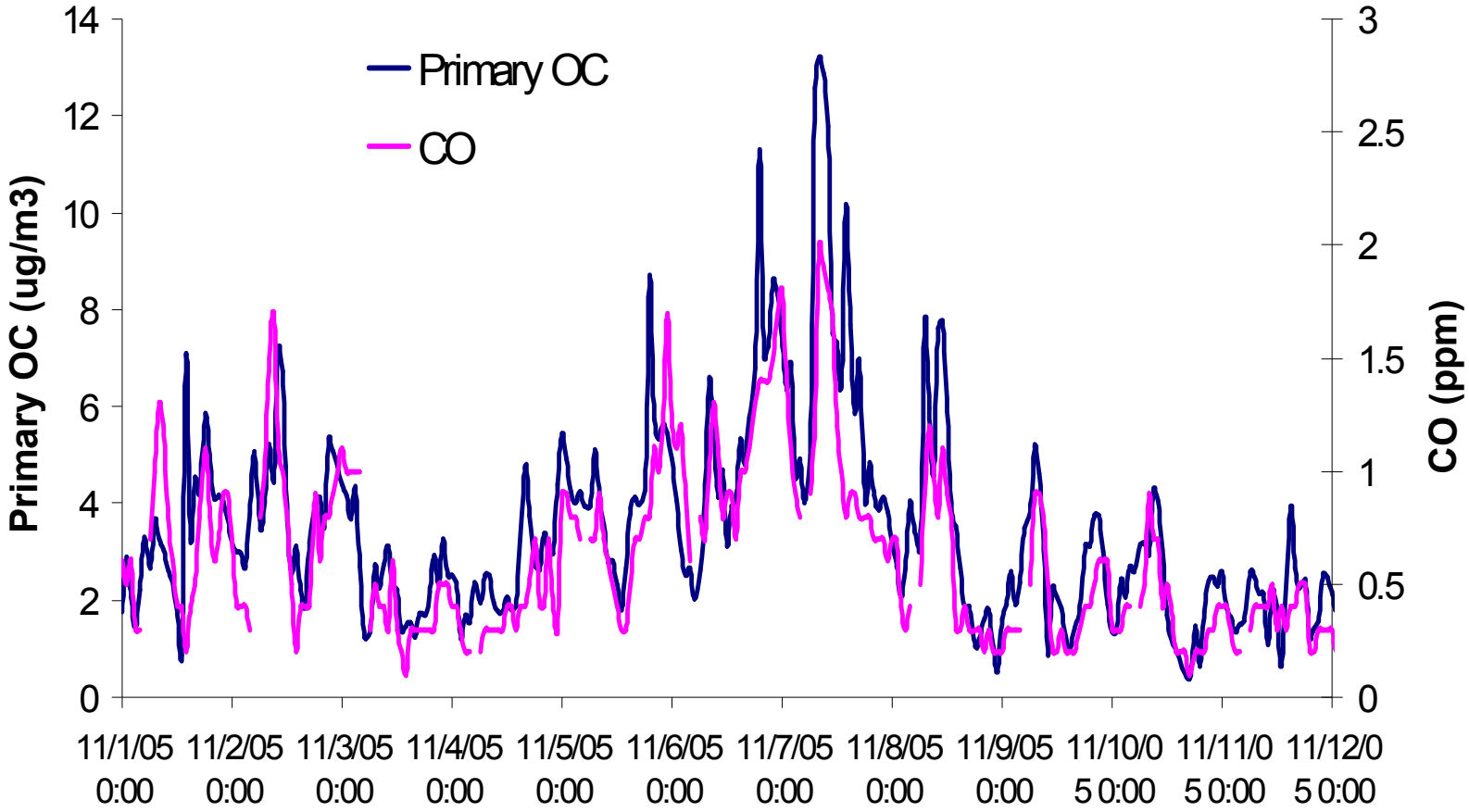
Nightly OCEC Events in Portland



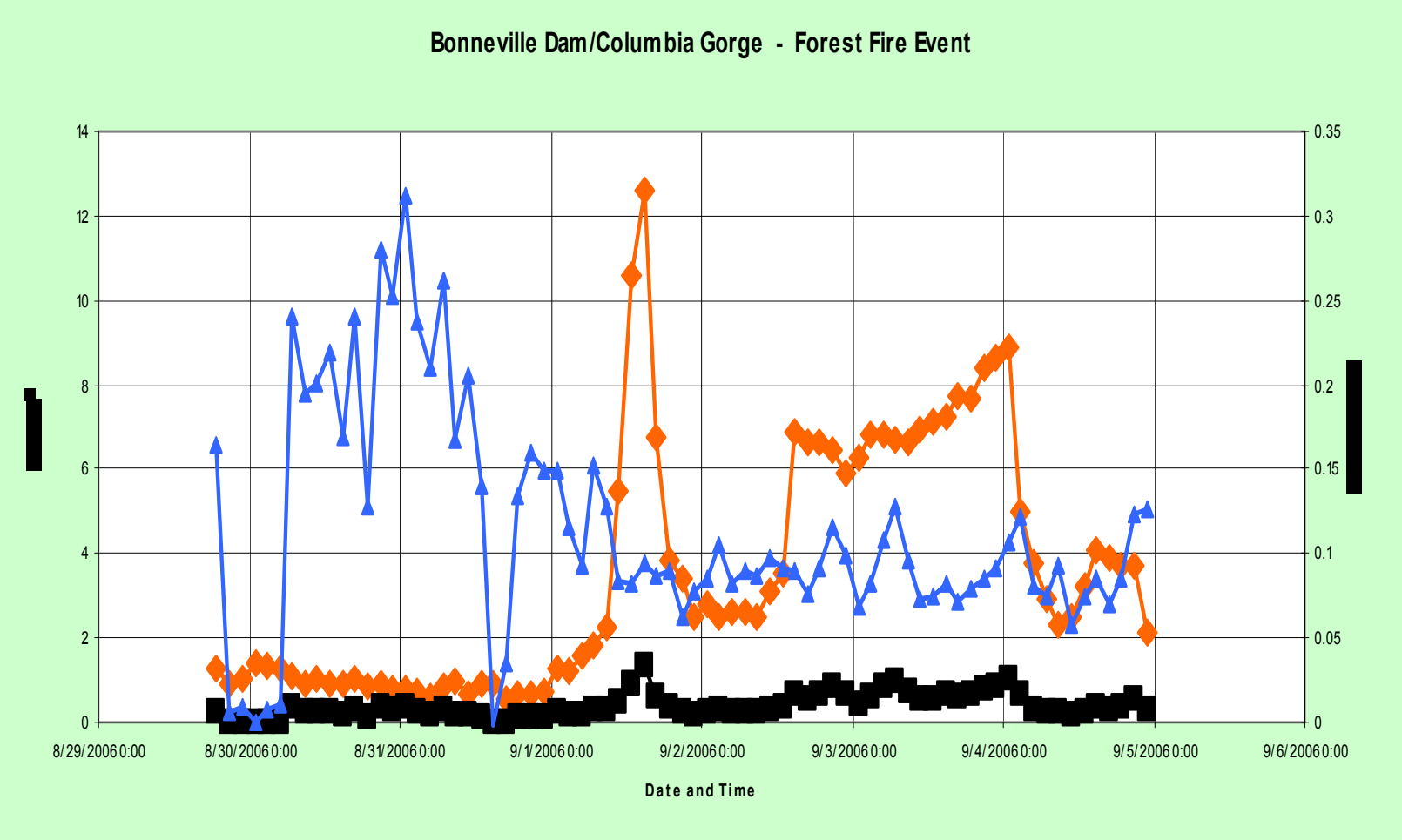
Los Angeles SOA and Ozone



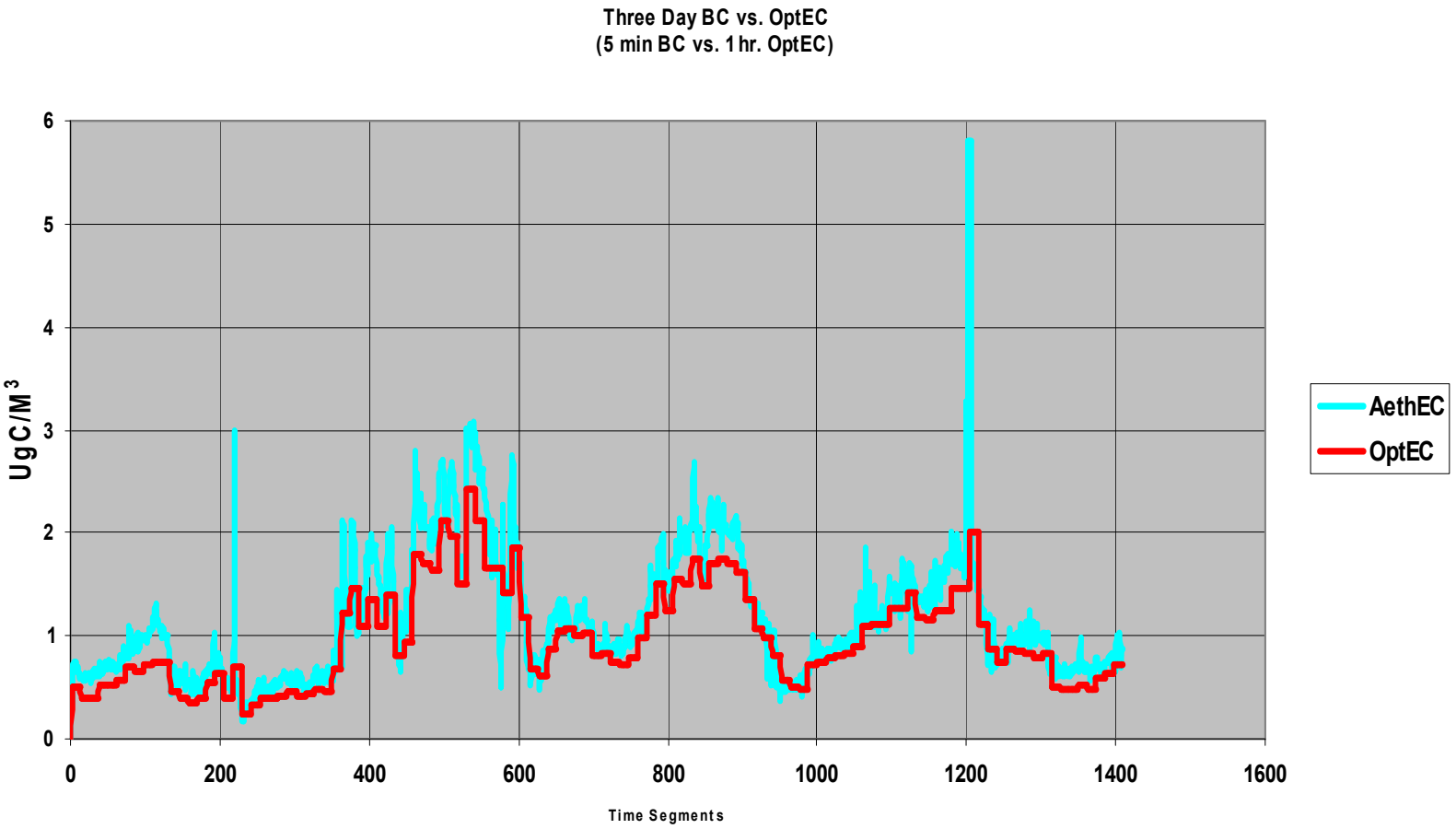
Primary OC Correlation with CO



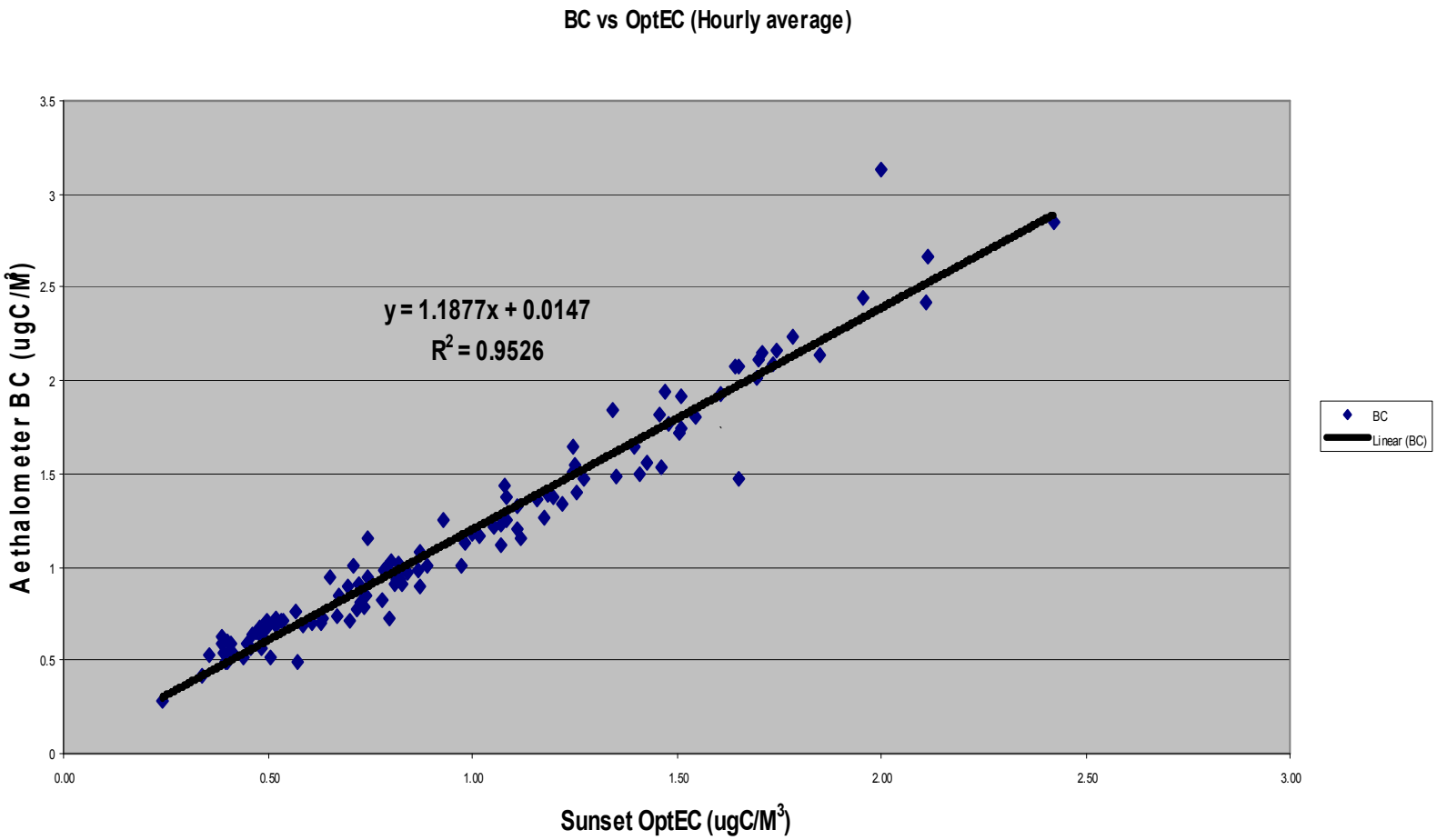
Forest Fire Event in Columbia Gorge



Optical EC and Aethelometer® BC



Optical EC vs. Aethelometer® BC



Applications

- Ambient air quality and environmental exposure measurements
- Indoor air exposure assessment monitoring
- Long term environmental research such as studying the effects of regulatory changes implemented
- Workplace assessments
- Natural/man-made disaster effects over temporary periods such as extreme weather patterns, seasonal temperature inversions, or large fires