Interactions Between Meteorology and Air Quality

by

John G. Watson
Daniel L. Freeman

Desert Research Institute
Reno, NV

presented at

DOE Vertical Transport and Mixing Experiment Workshop
Salt Lake City, UT, September 15, 1999

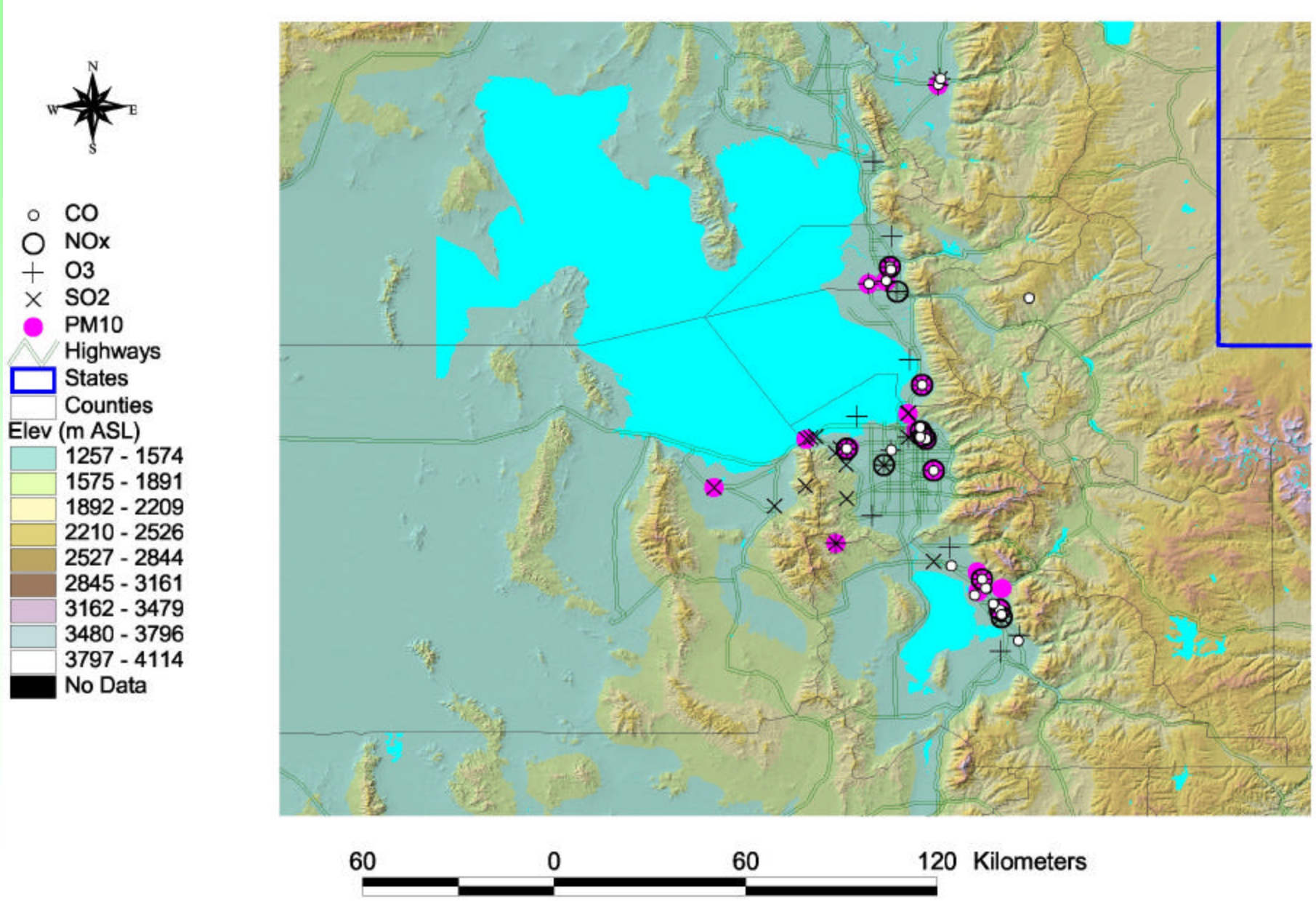
Objectives

- Identify relationships between meteorology and air quality (CO, PM and O_3)
- Test hypotheses relevant to autumn by supplementing existing monitoring network
- Refine conceptual models of MET/AQ interactions

Example Hypotheses

- Particle and CO emissions accumulate at night and morning within the surface radiation layer
- Interchange between the Salt Lake and Utah Valleys occurs only after breakup of morning surface layer and ends after sunset when surface layer reforms
- Mixing of surface emissions aloft removes pollutants from the Salt Lake Valley; negligible carryover
- Mixing of surface emissions aloft carries pollutants toward Class I visibility areas

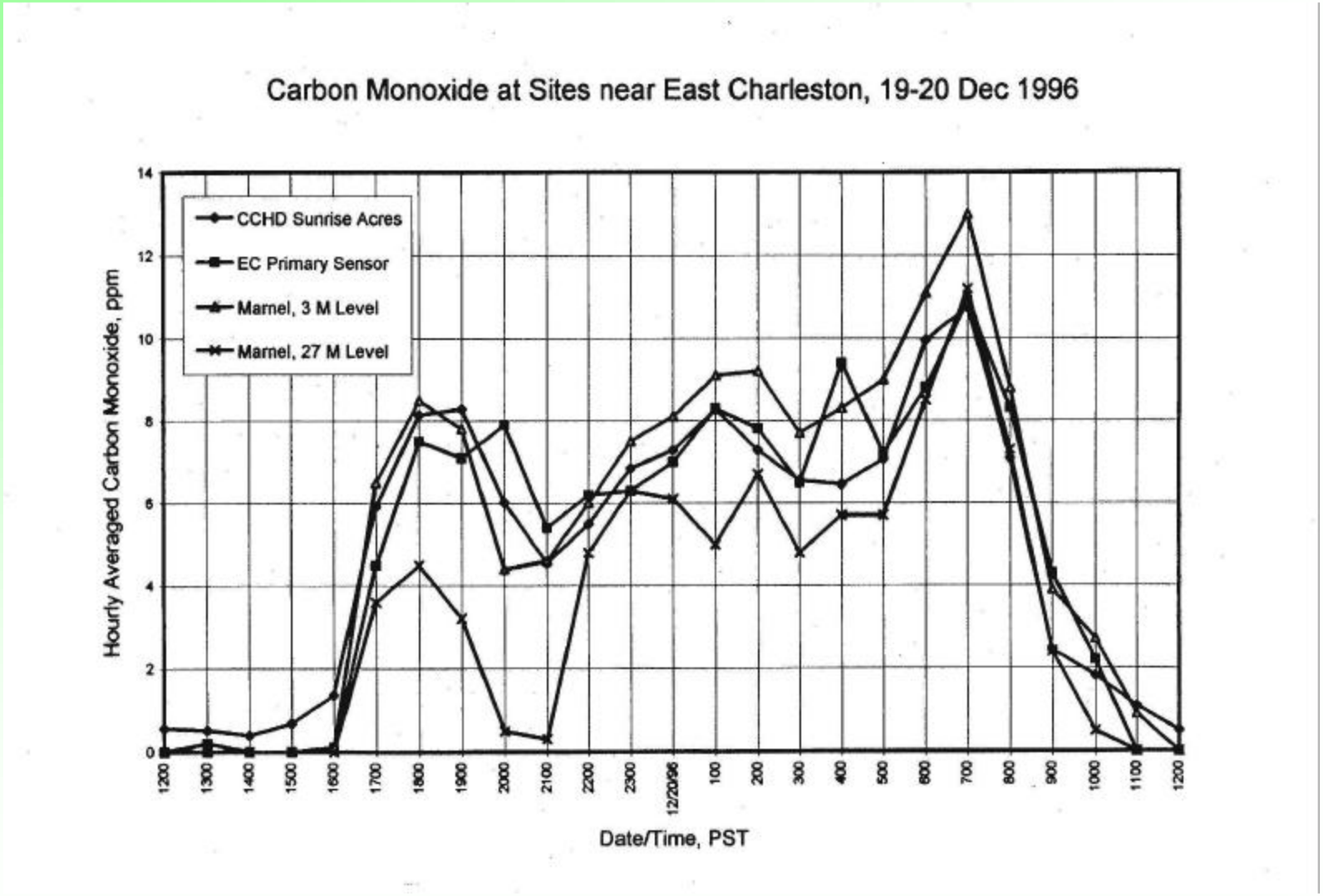
Air Quality Sites



Drager CO Sensor

- Range: 0-2000 ppm
- Resolution: 1ppm
- Averaging Time: 1 second to 15 minutes
- Data Storage: >1,250 hours @ 10 min avg
- Battery Time: 600 hours (alkaline)

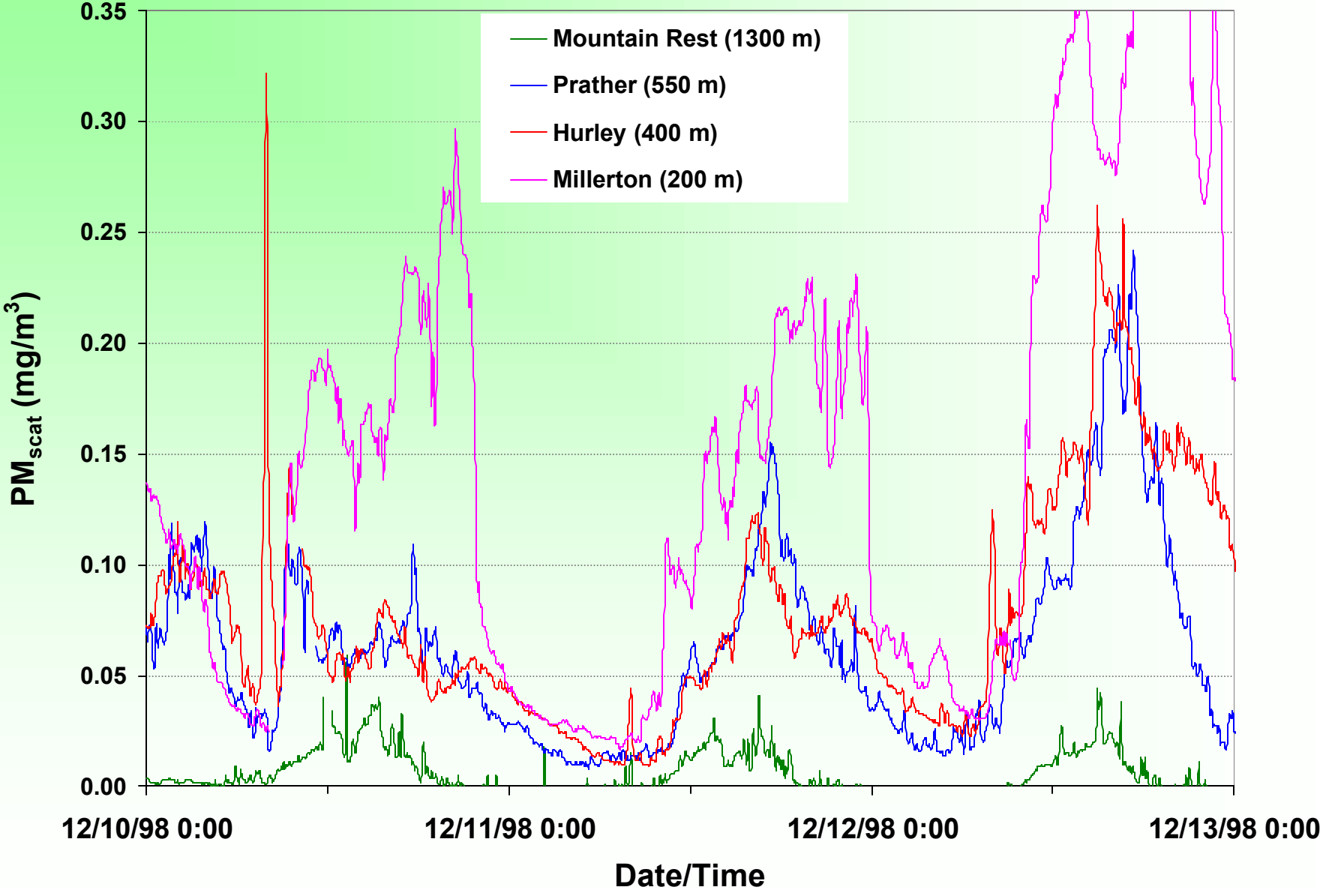
CO at Nearby Las Vegas Sites



Dustrak Aerosol (PM_{scat}) Monitor

- Range: 0.001 - 100 mg/m^3
- Resolution: 0.1 % or 0.001 mg/m^3
- Averaging Time: 1 second to 1 hour
- Data Storage: 21 days @ 1 record/minute
- Battery Time: 18 hours

Sierra Nevada Foothills Dustrak Data



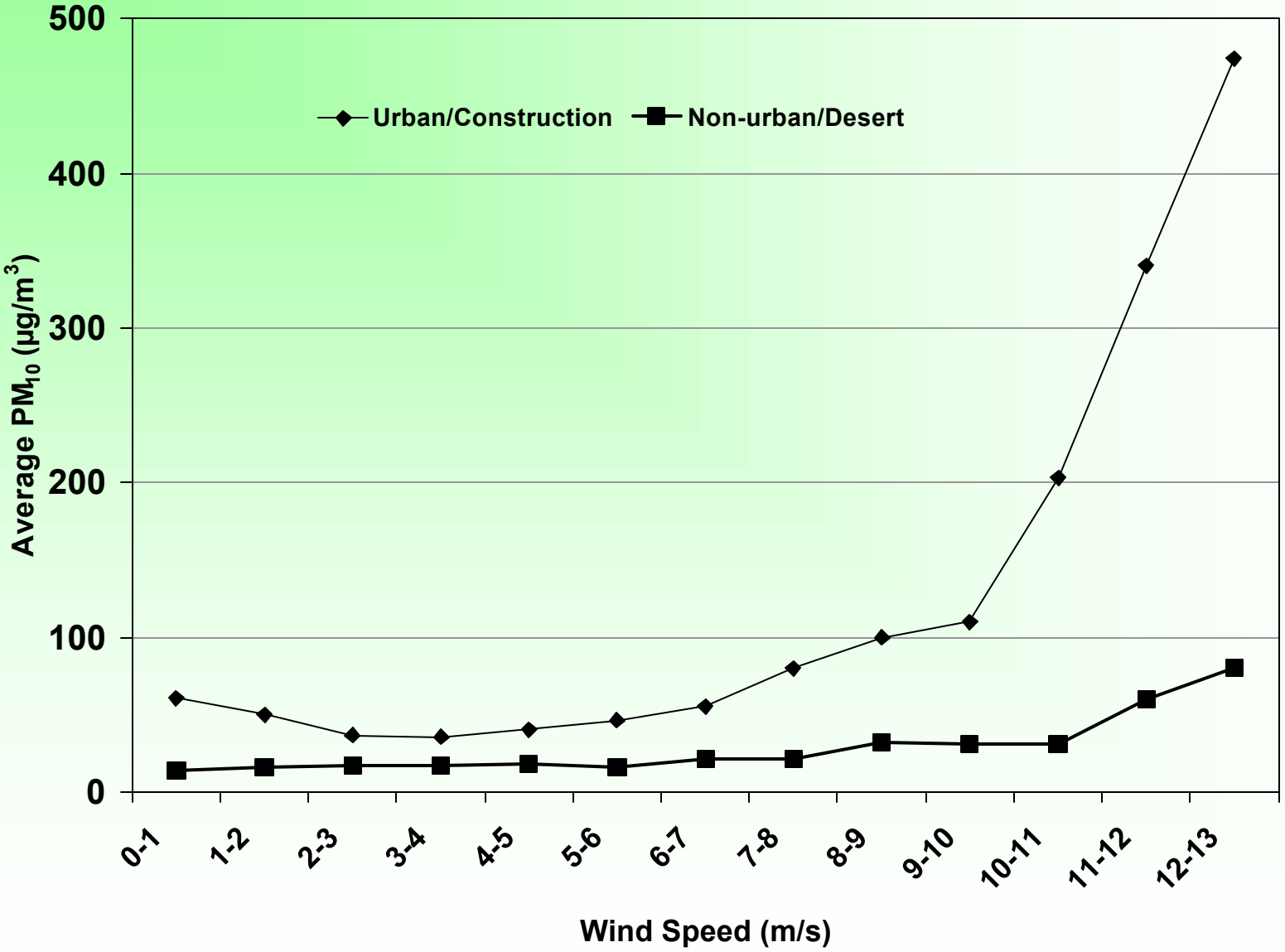
Types of Monitor Locations

- In street canyons and on tall buildings
- Mountain passes between air basins
- Mountain slopes and canyons
- Meteorological towers
- Over the Great Salt Lake
- Within and around urbanized areas and neighborhoods

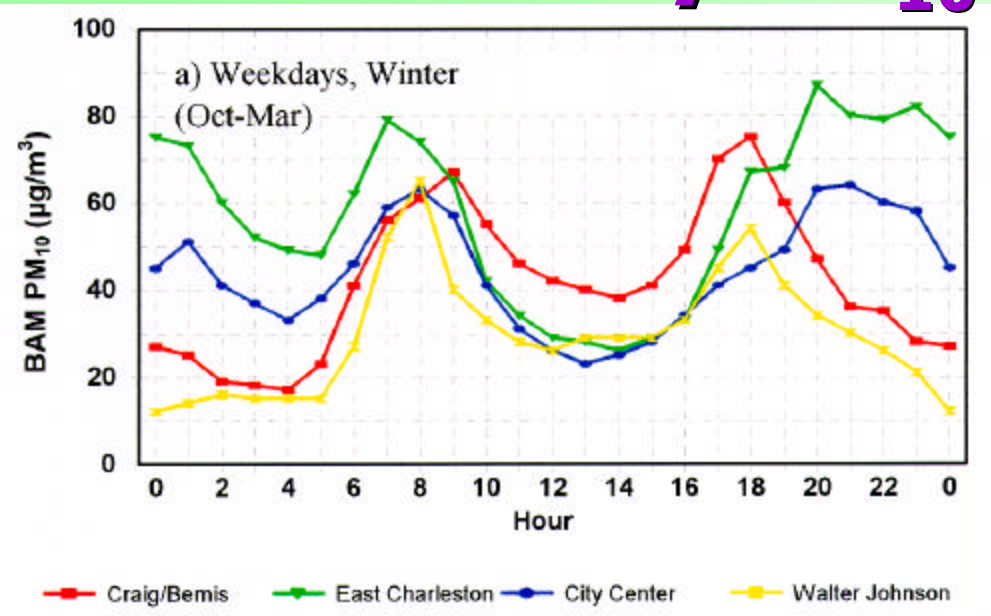
DRI VTMX Tasks

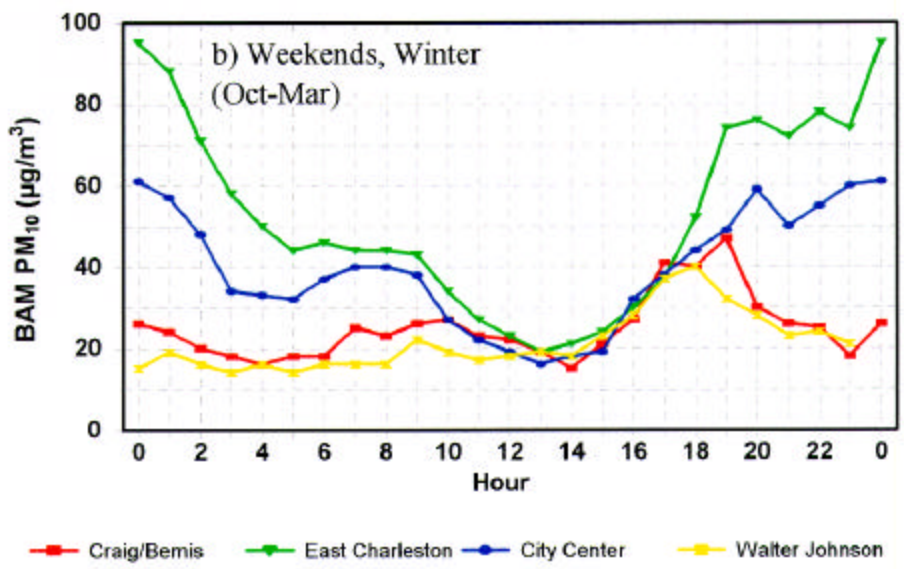
- Assemble and analyze existing AQ and MET data (1995-2000)
- Define supplemental monitoring network, consistent with data analysis results and VTMX monitors
- Deploy and operate supplemental AQ network
- Analyze data and refine hypotheses

Urban Wind Erosion

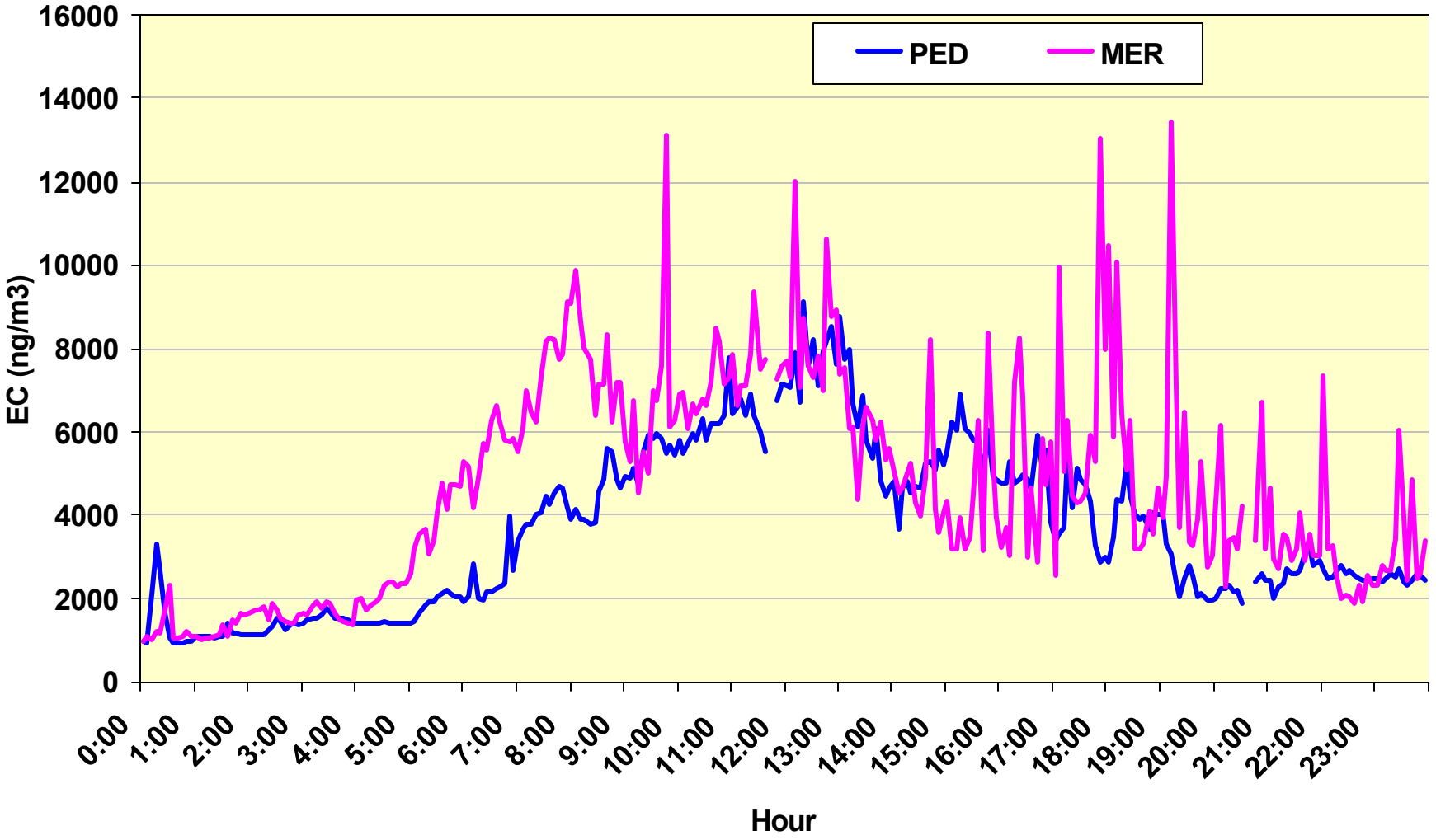


Hourly PM_{10} Variations





Instantaneous Variability



Wind Speed Variability with Elevation and Time of Day