

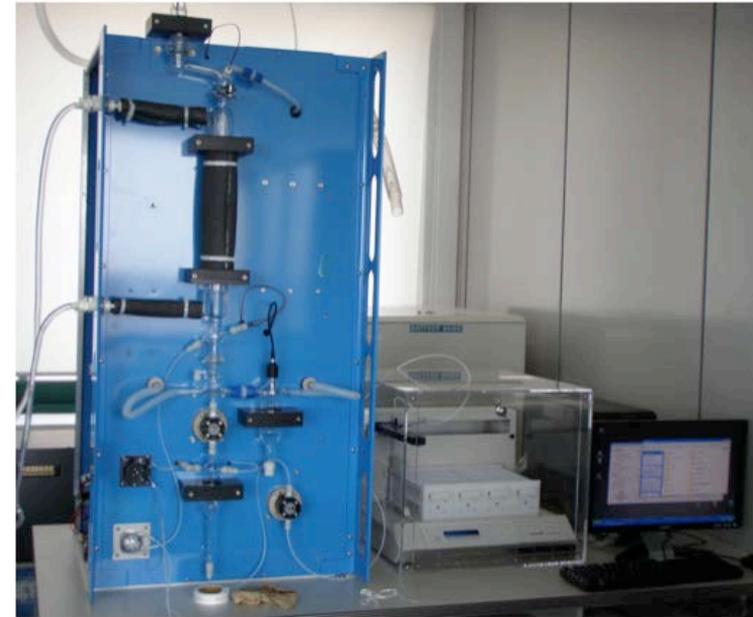
High Time Resolution PM Multi-Metals Measurement

Field sampling, laboratory analysis

- Serial collection of filter samples
- Davis Rotating-drum Unit for Monitoring (DRUM)
- Semicontinuous Elements in Aerosol Sampler (SEAS)

Online, semi-continuous measurements

- Single particle mass spectrometry (e.g. TSI ATOFMS)
- Aerosol mass spectrometer (Aerodyne AMS)... no refractory elements
- **Cooper Environmental Services field x-ray fluorescence (XRF) analyzer**



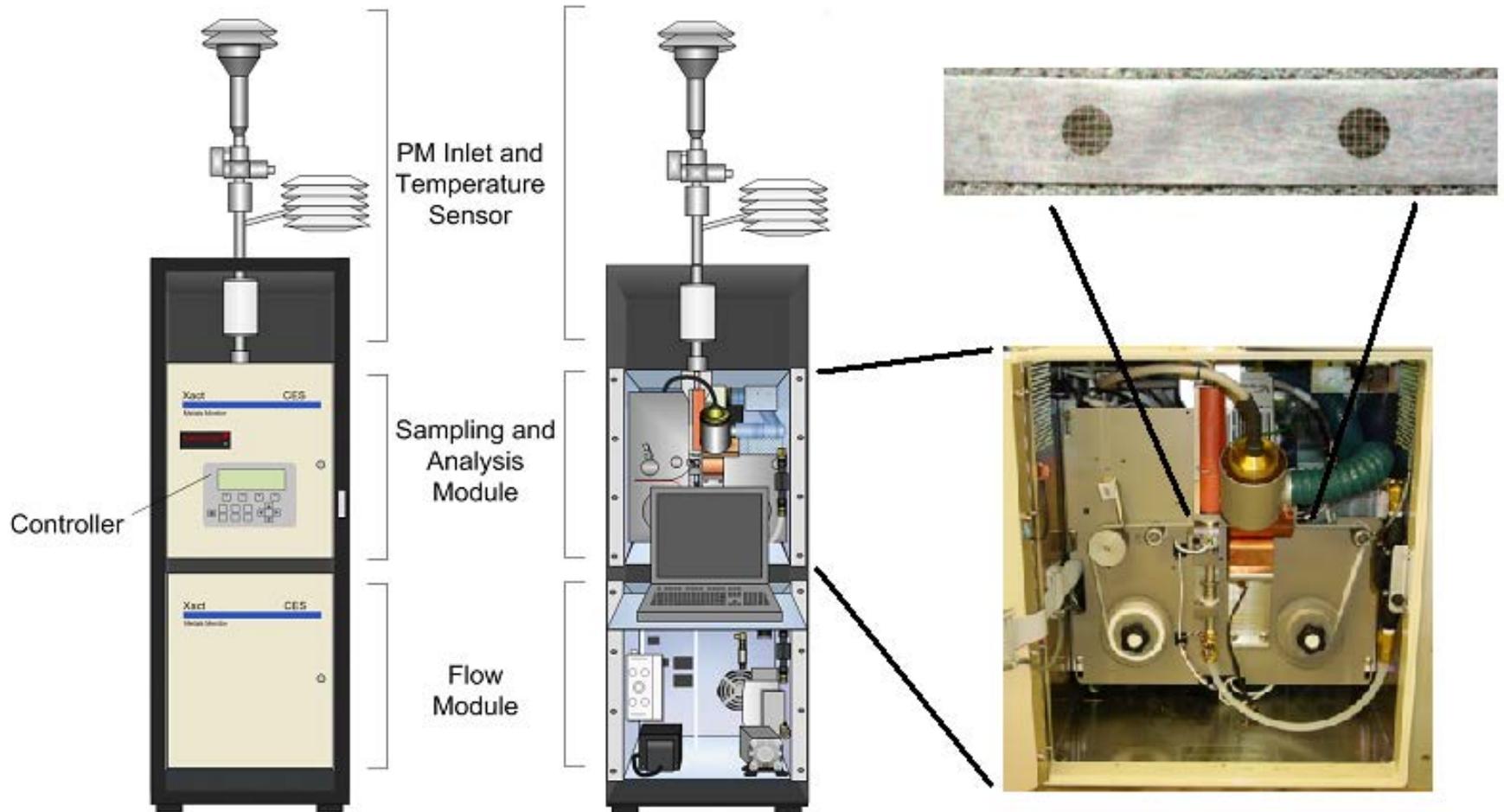
SEAS Version IV

Cooper Environmental Services (CES) Xact

- Xact series
 - I: stack sampling
 - II: fence line monitoring
 - III: ambient monitoring
- particle collection on a reel-to-reel filter tape
- analysis by x-ray fluorescence (XRF)
- continuous data series at user-defined time intervals
- model 625 most common for ambient monitoring
- this version (Xact 620) optimized for As, Hg, and Pb at low concentrations

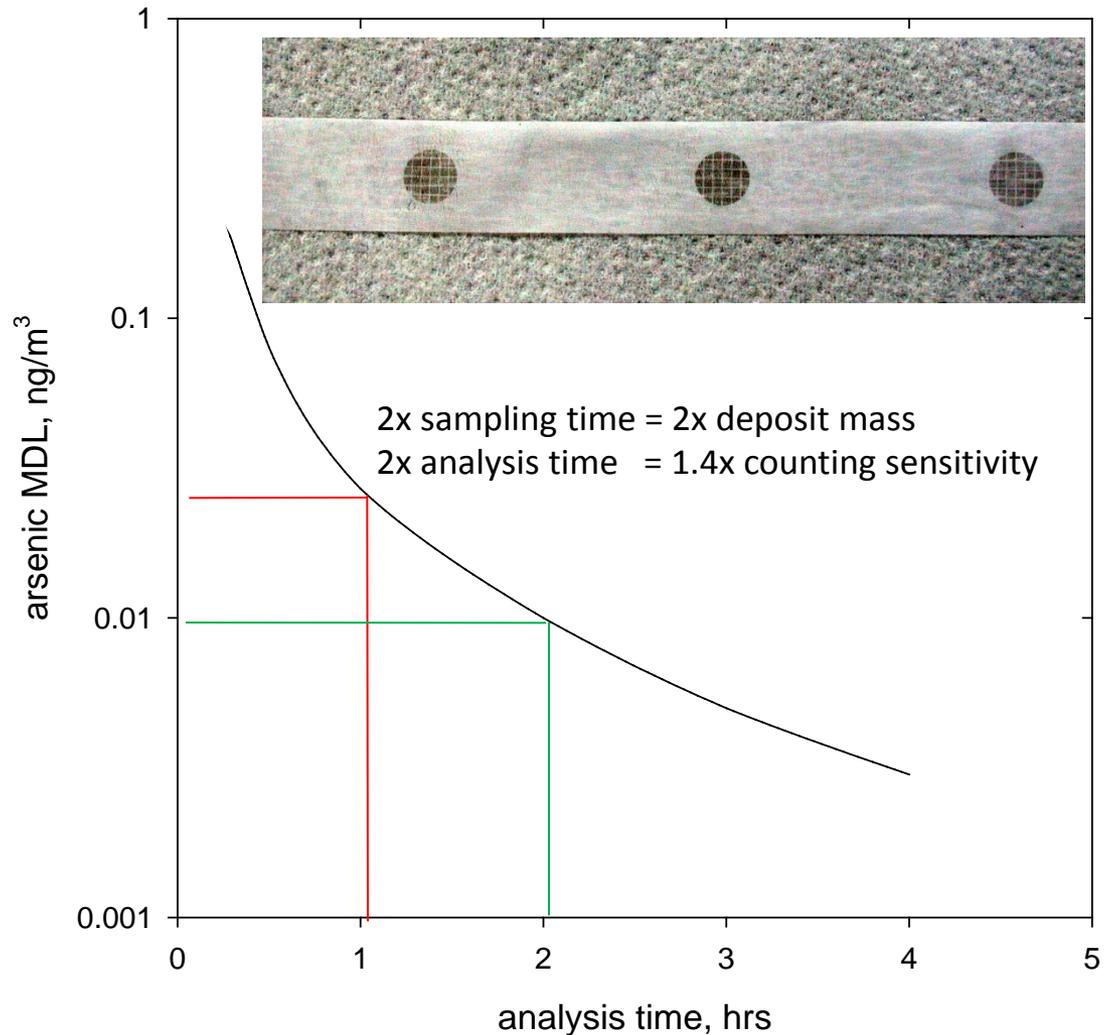


Cooper Environmental Services (CES) Xact

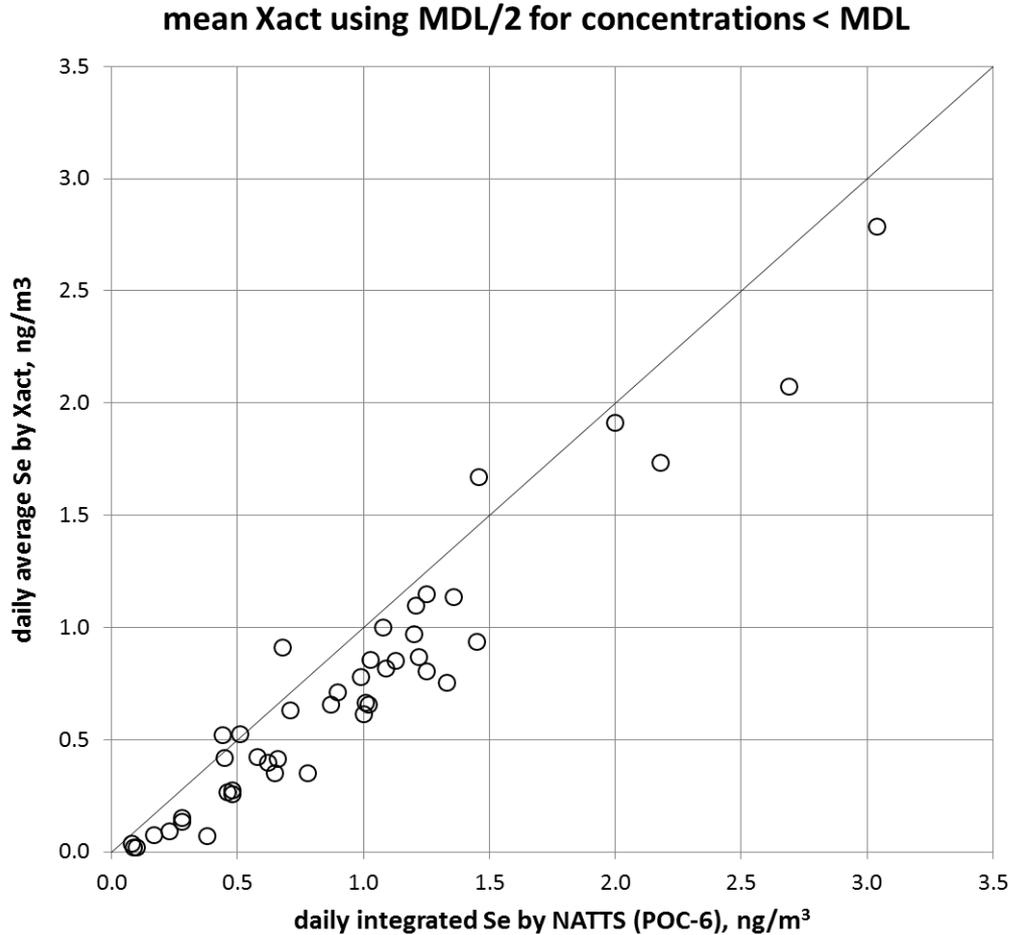


Optimizing the Xact Sampling Time Interval

- depends on study objectives
- trade-offs between time resolution and frequency above method detection limit (MDL)
- e.g. PM_{10} As in St. Louis
 - 1-hour: 56% > MDL
 - 2-hour: 86% > MDL



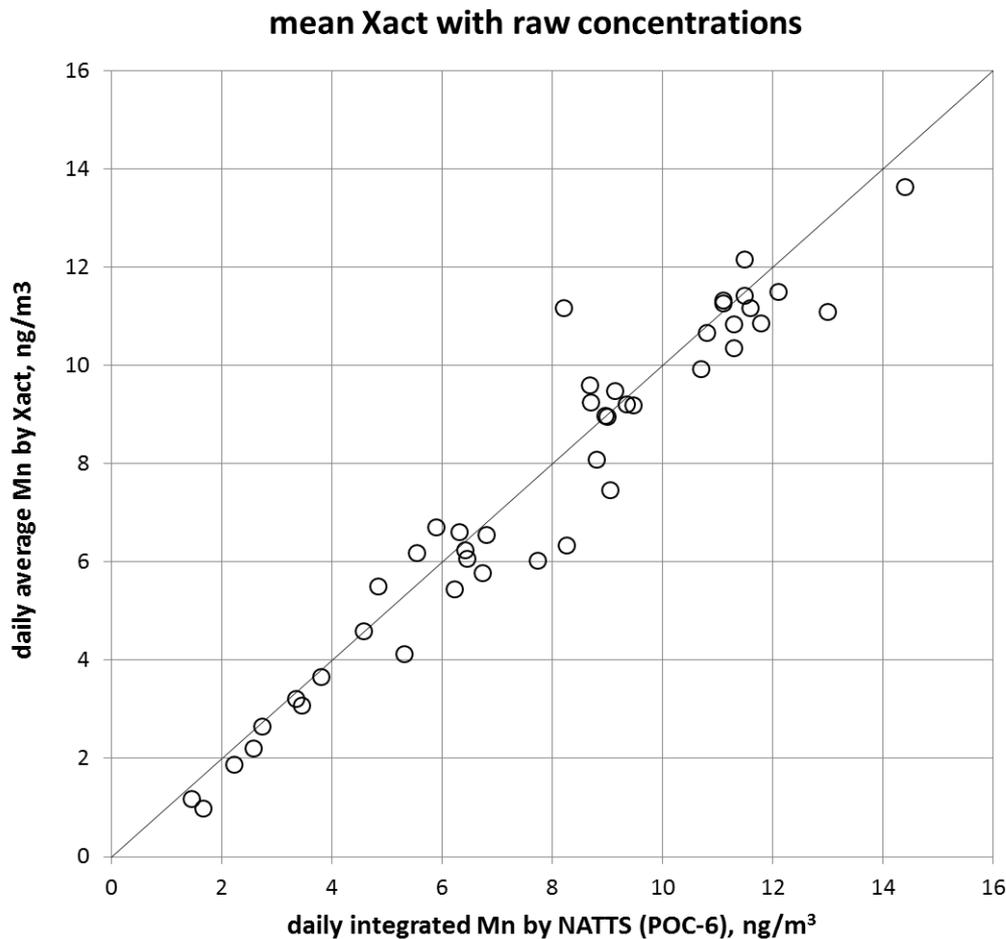
24-hour average Xact vs. 24-hour integrated filter -- selenium --



PM₁₀ year 2013 data
Blair Street station
City of St. Louis, Missouri

PM₁₀ filter data from
National Air Toxics Trends
Station (NATTS) network

24-hour average Xact vs. 24-hour integrated filter -- manganese --



PM₁₀ year 2013 data
Blair Street station
City of St. Louis, Missouri

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City of St. Louis: Blair Street Station



MDNR - Blair

Jay Turner presentation to Maharashtra Air Pollution Control Board, 10

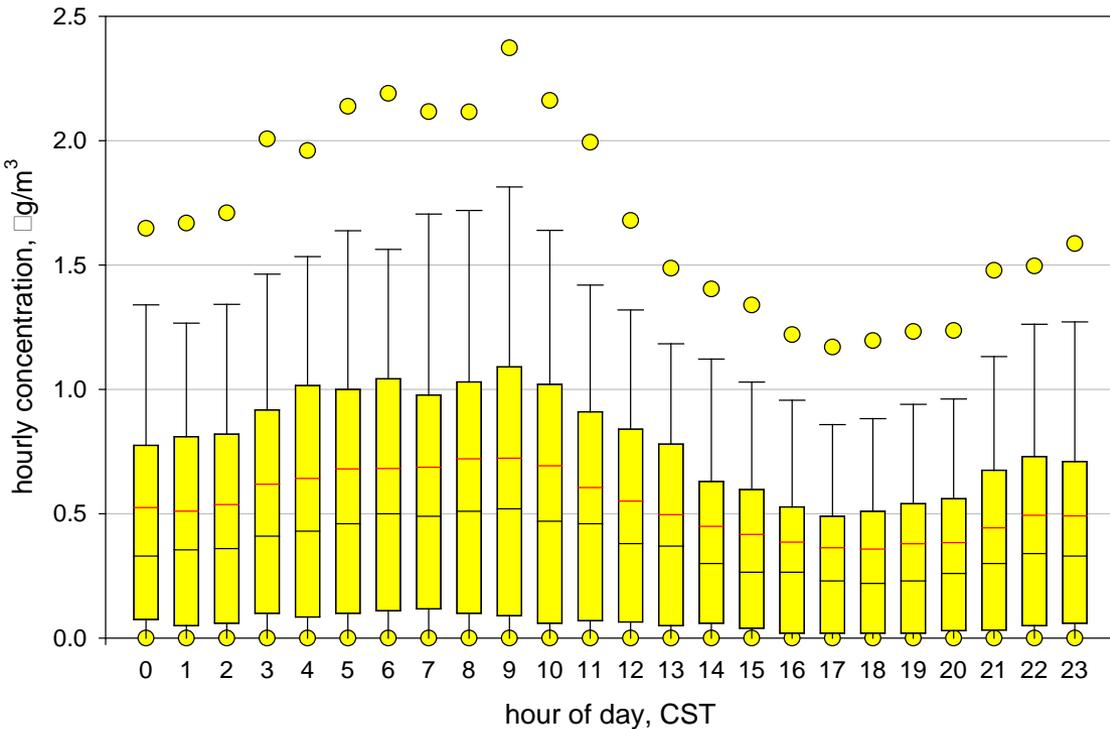
March 2015

Google earth

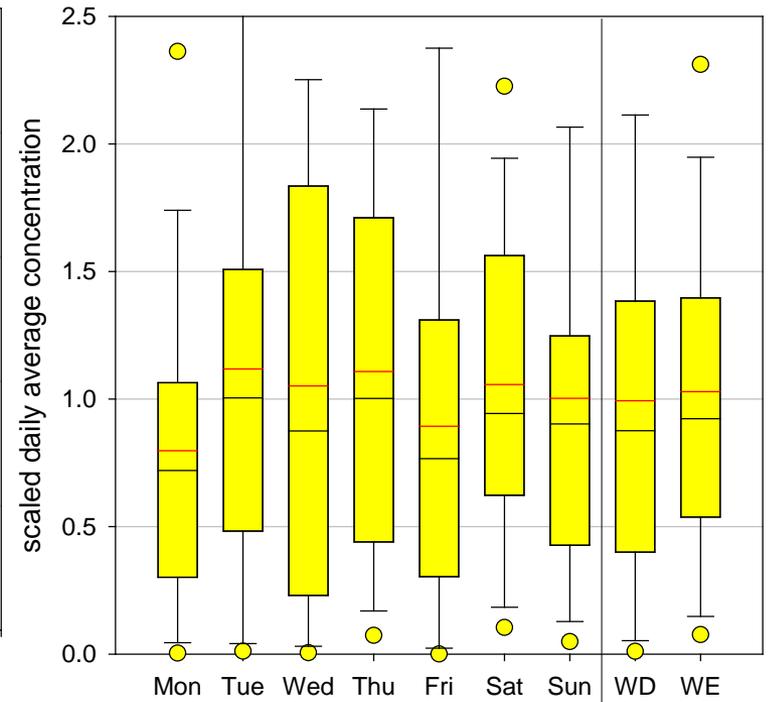
Imagery Date: 11/12/2013 38°39'25.56" N 90°10'44.29" W elev 406 ft eye alt 44670 ft

PM₁₀ Selenium - 2013

hour of day profile



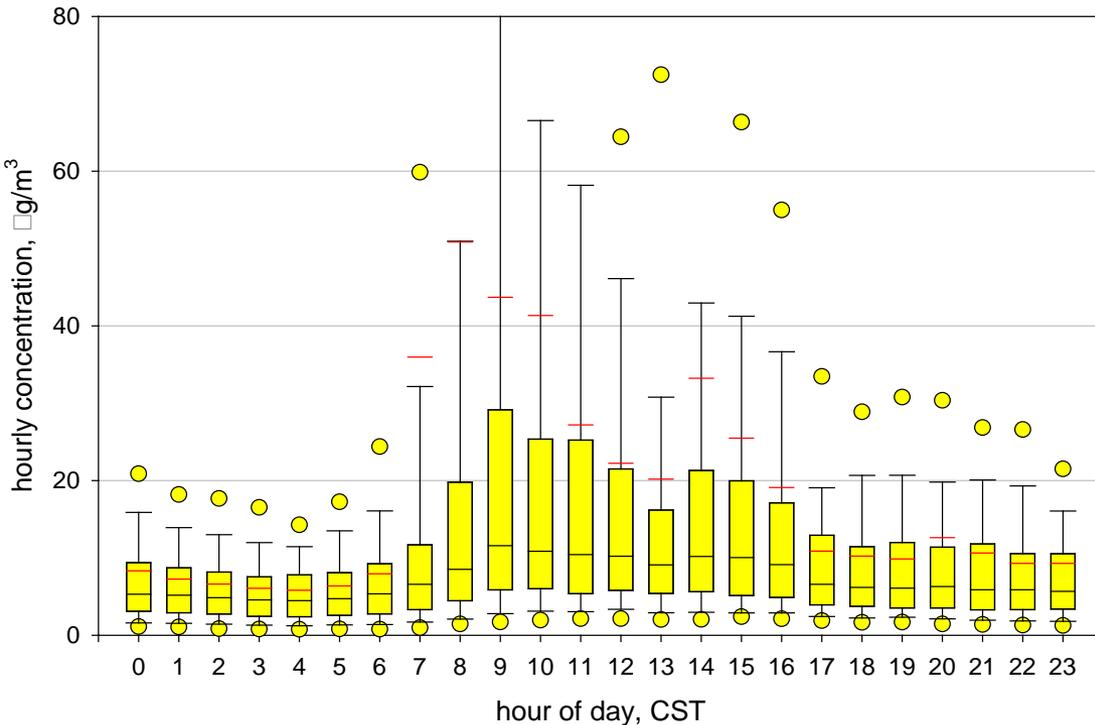
day of week profile



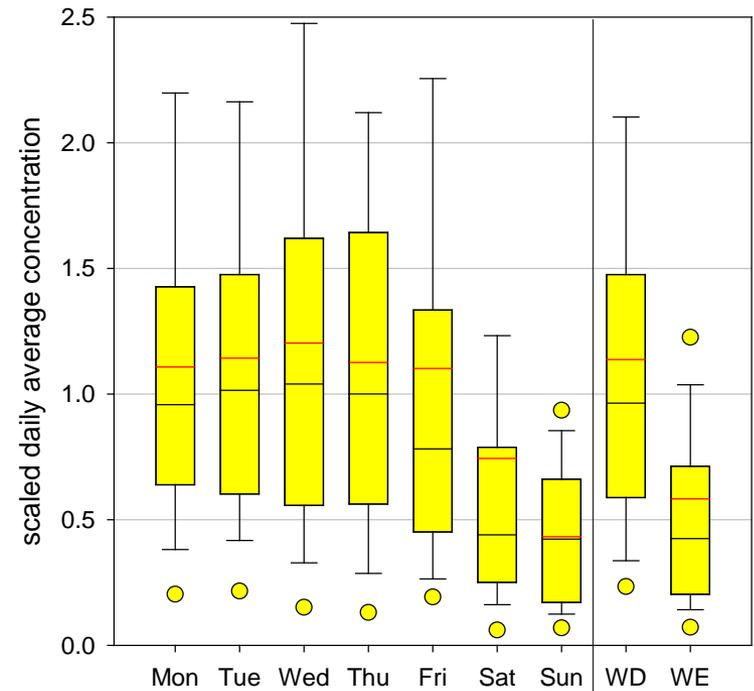
- Temporal patterns consistent with regional transport
 - Similar conclusion *inferred* from a four-site filter-based network (Yadav and Turner, 2014)
- Selenium typically a marker for coal combustion

PM₁₀ Manganese - 2013

hour of day profile

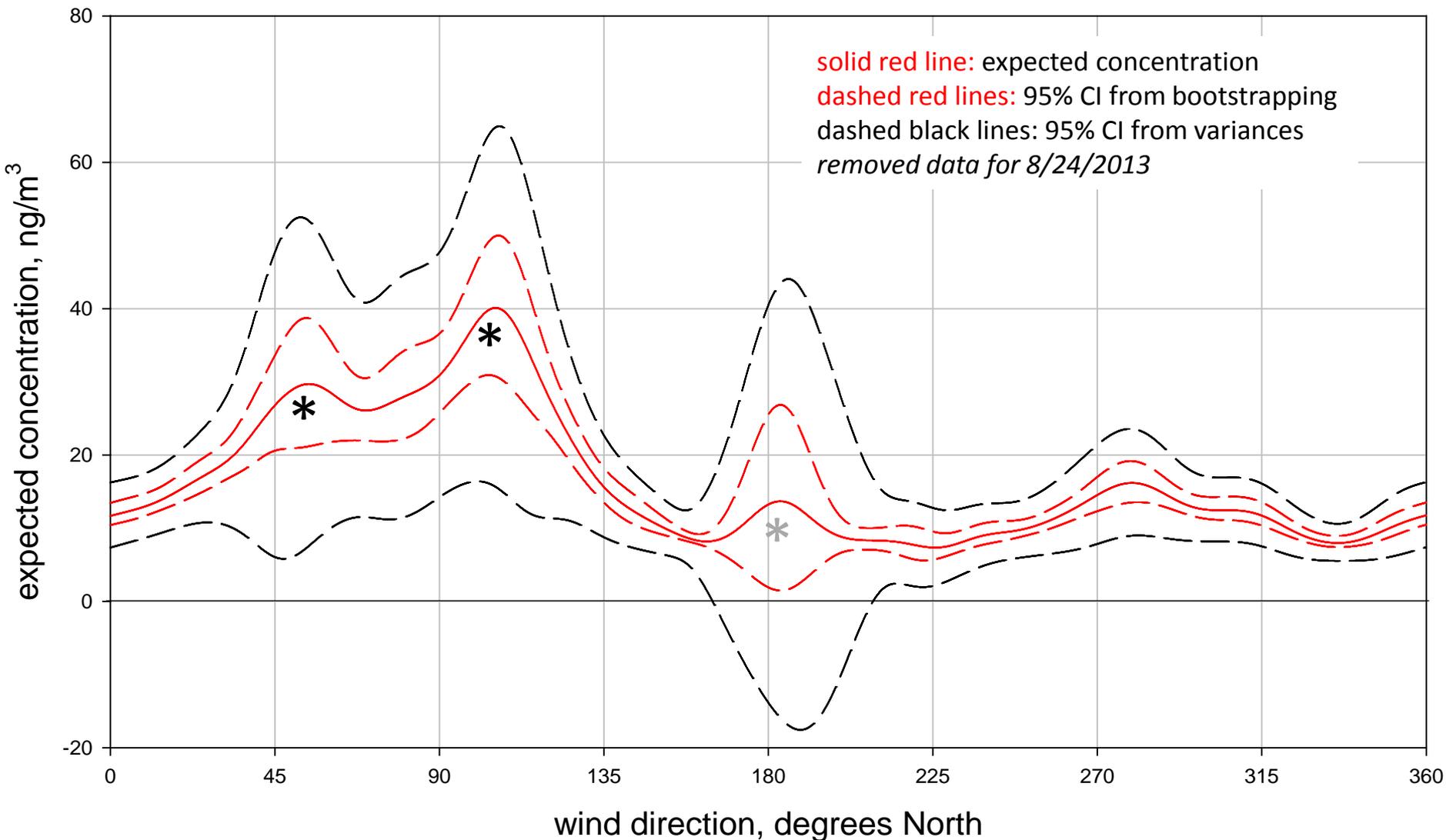


day of week profile

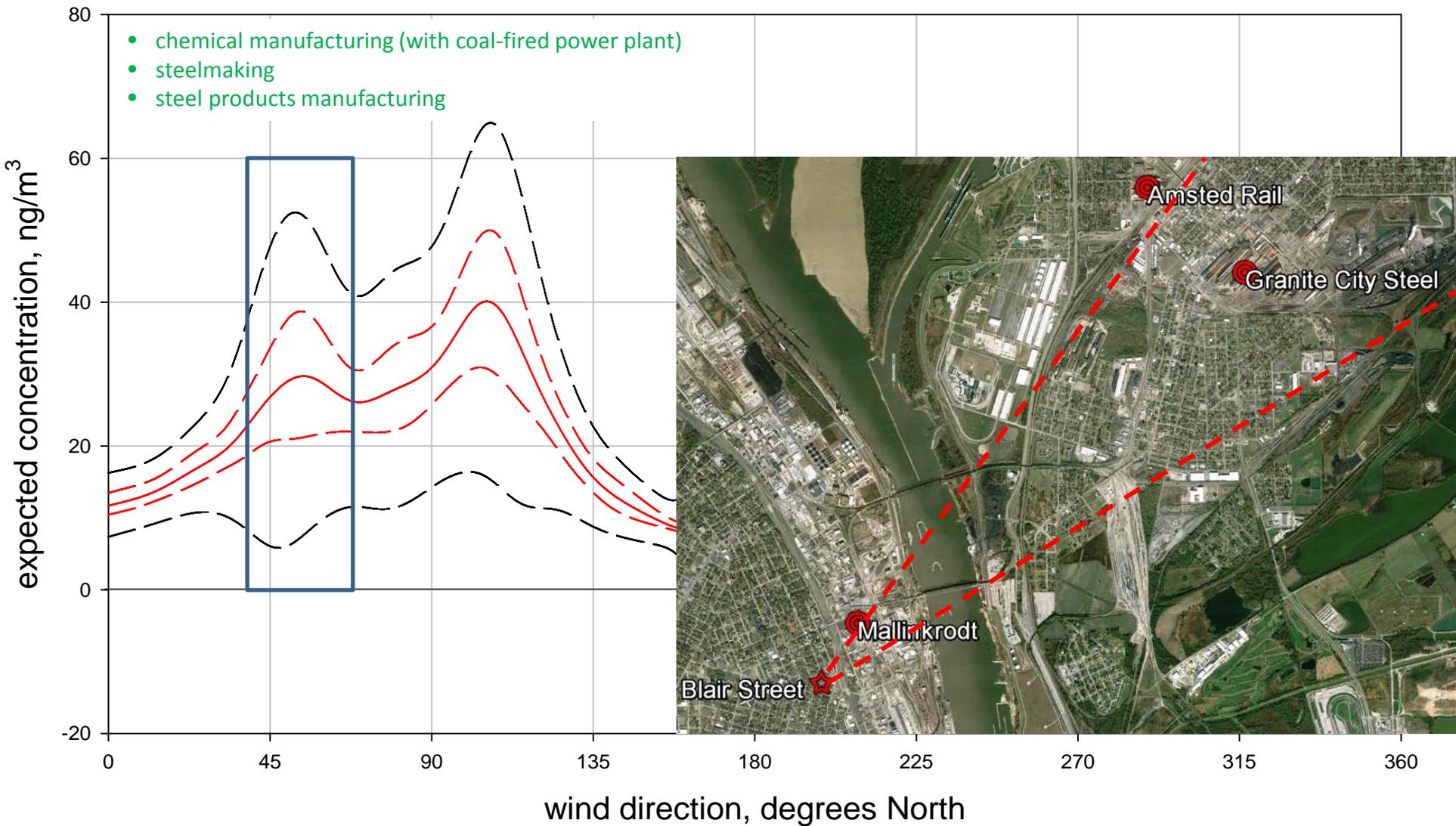


- Temporal patterns consistent with local source(s)
 - Similar conclusion *inferred* from a four-site filter-based network (Yadav and Turner, 2014) but could not identify sources

Variation of Hourly PM₁₀ Mn with Wind Direction



Variation of Hourly PM₁₀ Mn with Wind Direction



Variation of Hourly PM₁₀ Mn with Wind Direction

