

Disclaimer: This presentation is preliminary and does not include all the data and analyses planned for the project.



New Jersey Turnpike Air Monitoring

May 2, 2008

MERI

New Jersey Turnpike Traffic Emissions



- Traffic emission is a major anthropogenic source of air toxics in the ambient air.

Objectives

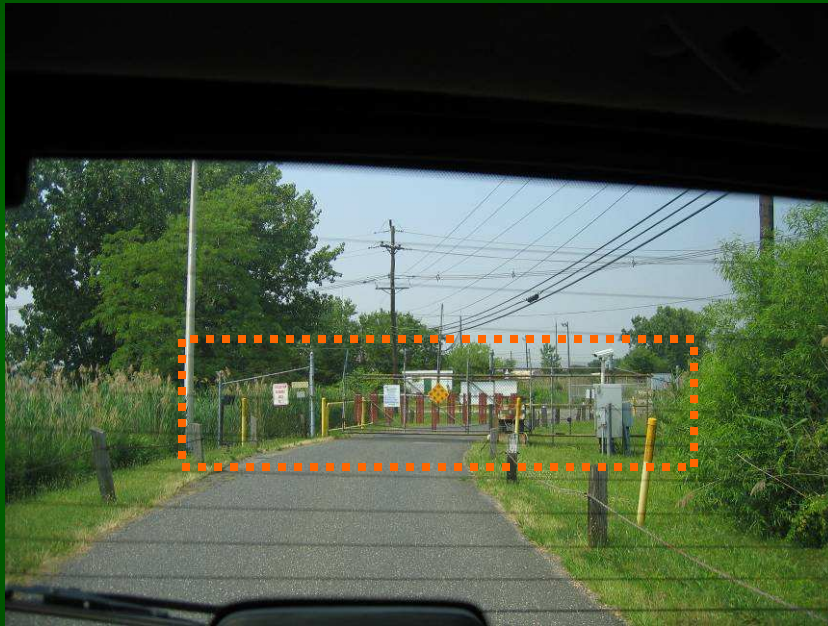
- To measure ambient concentration gradients of $PM_{2.5}$, TSP, and PAHs from NJ turnpike vehicle emissions.
- To determine how particulate concentration from vehicle emission is affected by seasons, day and night, traffic flow variations and meteorological conditions.

Study Design

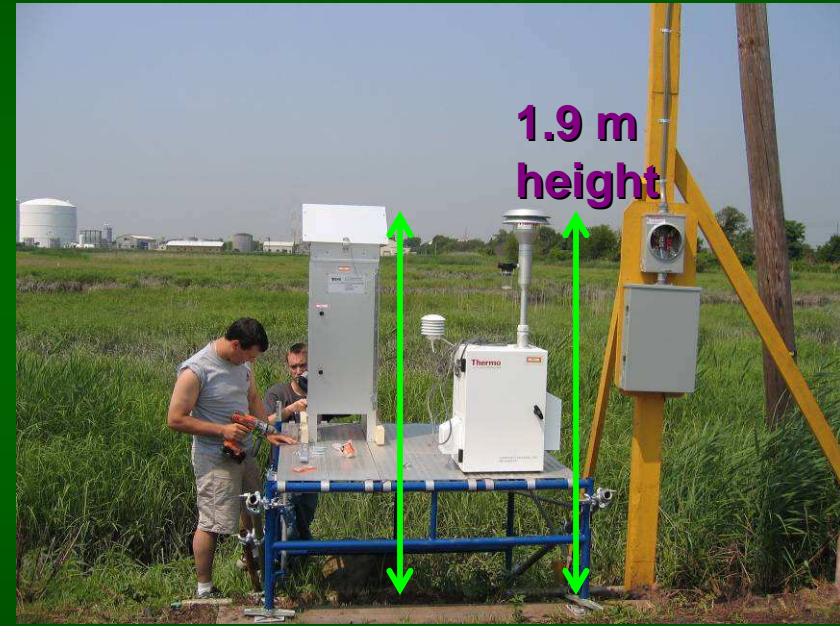
- Periods: September 2007 ~ September, 2008
- Sampling site: 2 miles north of Turnpike exit 16 W (Williams sites)
- Sampling duration: 24 hours
- Sampling distances: 50, 100 and 150 m
- Measurements: PM_{2.5}, TSP, and PAHs



Secured Sampling Site



Williams site in Carlstadt



Installation of platform and samplers

Sampling Sites: A, B, and C

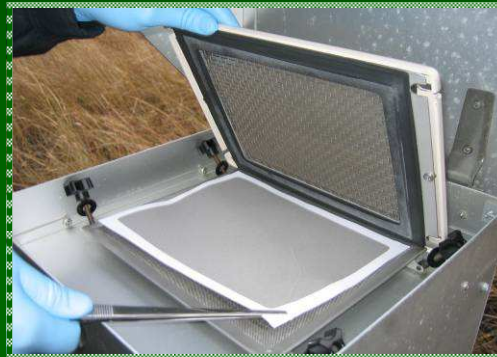


A: 50 m



Turnpike

PM_{2.5}, TSP & PAH Samples



PM_{2.5} Sampler:

- Model: Partisol-FRM 2000
- Flow rate: **16.7 L/min**
- Duration: 24 hours
- Media: PTFE filter (47 mm ID)
- Compounds: **PM_{2.5} and Metals**

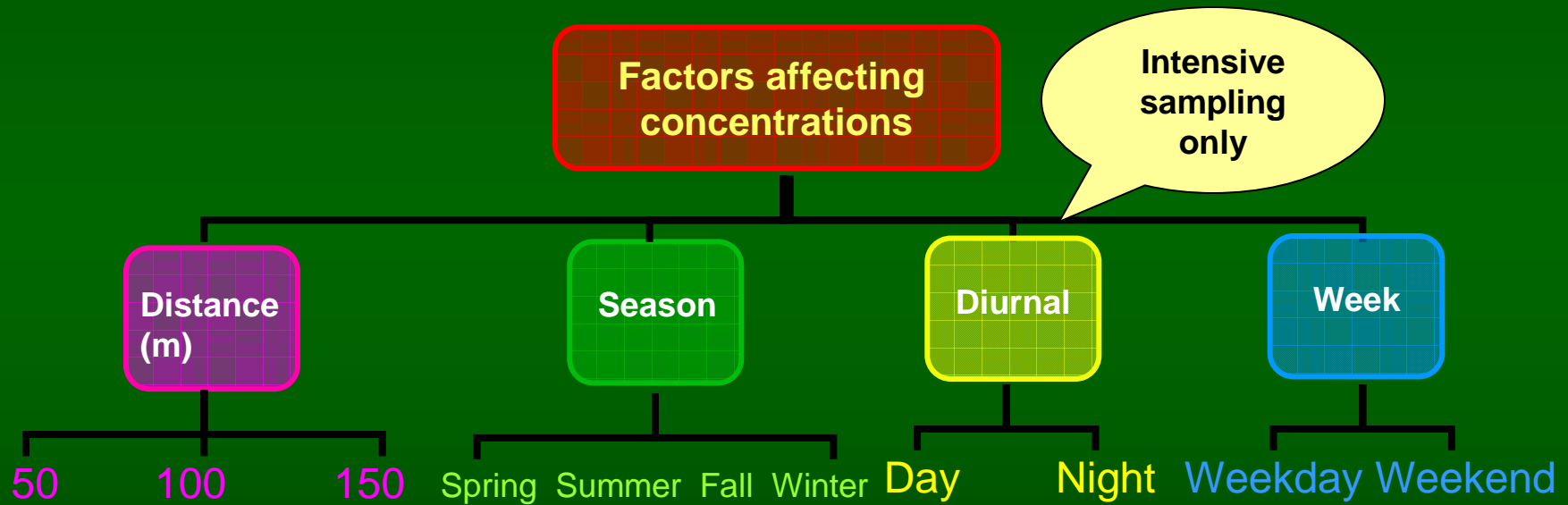
Hi-vol. Sampler:

- Model: PNY1123
- Flow rate: **0.5~0.7 m³/min**
- Duration: 24 hours
- Media: Quartz fiber filter (20.3 cm × 25.4 cm) and 2 PUF (3" height) plugs
- Compounds: **TSP, PAH-particle, PAH-gas**

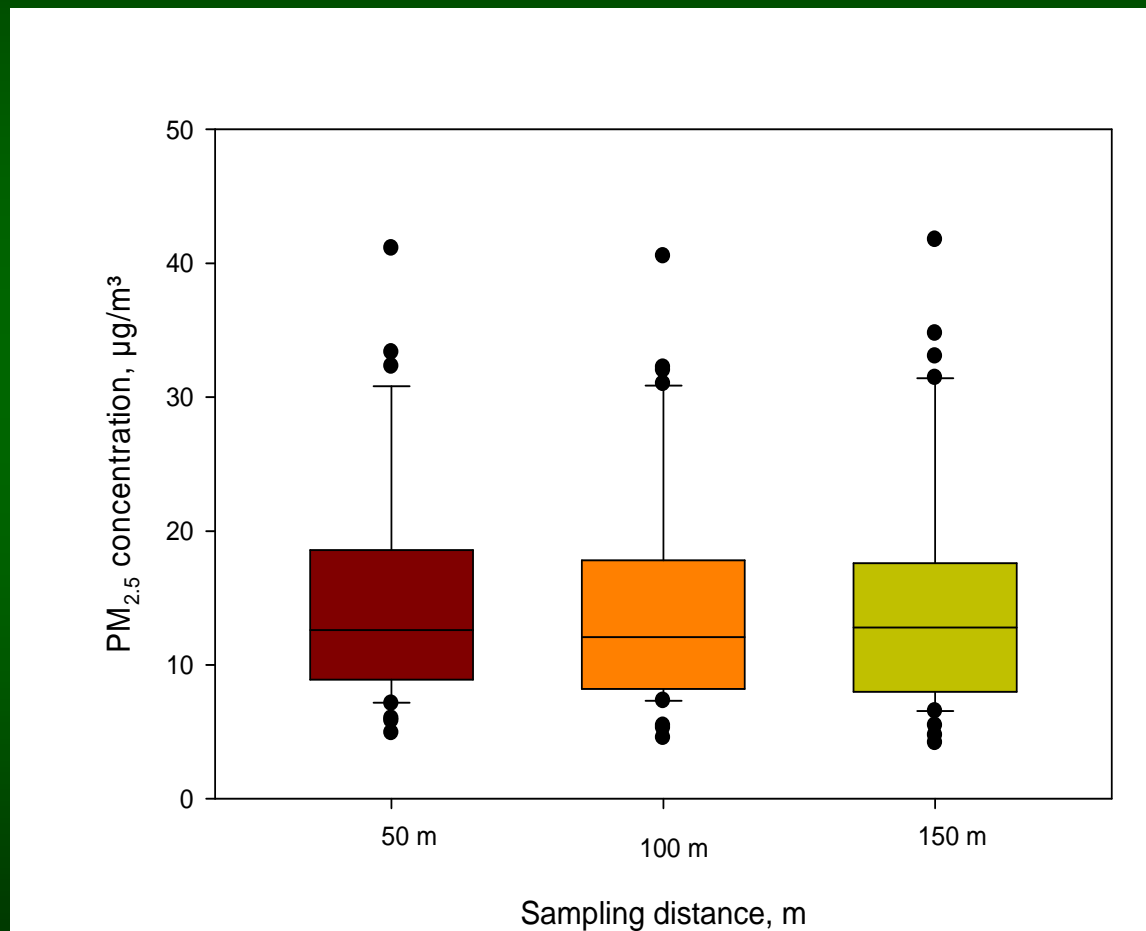
Sample Structure

Compounds	Sampling events (Completed/Scheduled)		# of samples (Completed/Scheduled)		# of invalid samples
	Long-term	Intensive	Long-term	Intensive	
TSP	37/63	12/24	111/189	36/72	2
PAH _p	37/63	12/24	111/189	36/72	2
PAH _g	37/63	12/24	111/189	36/72	2
PM _{2.5}	38/63	12/24	114/189	32/72	15
Total			447/756	140/288	21

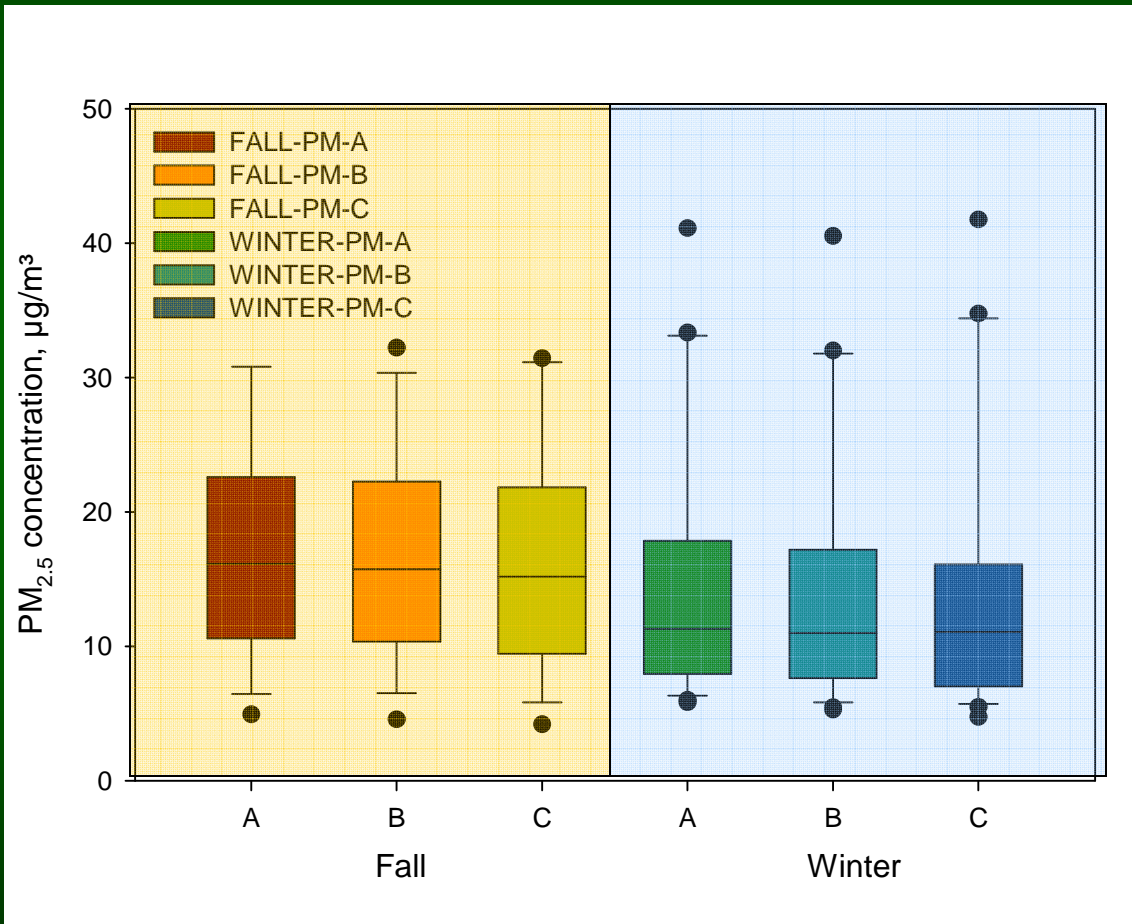
Analysis Factors



PM_{2.5} Conc. Profile by Distance

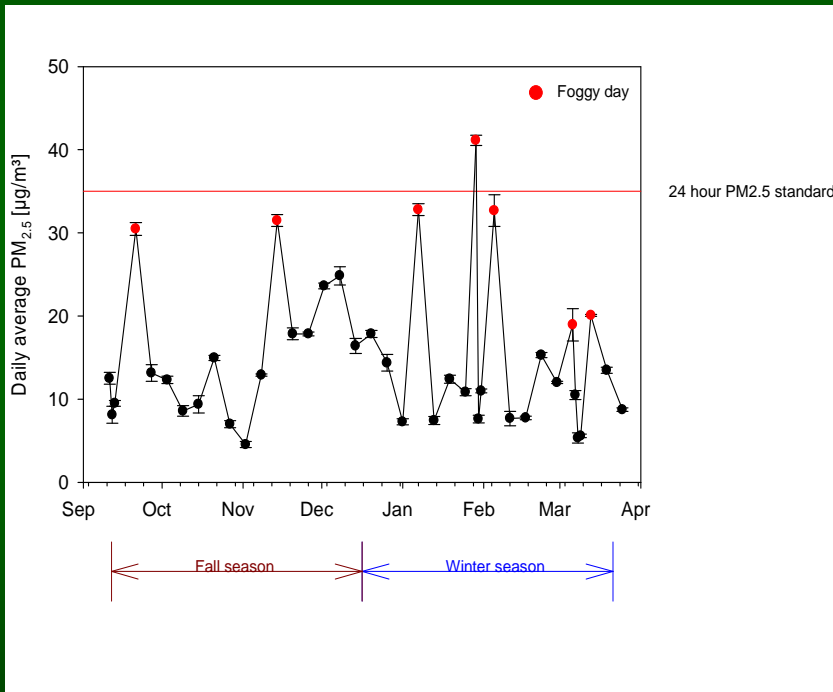


Seasonal Effect on PM_{2.5} Concentration



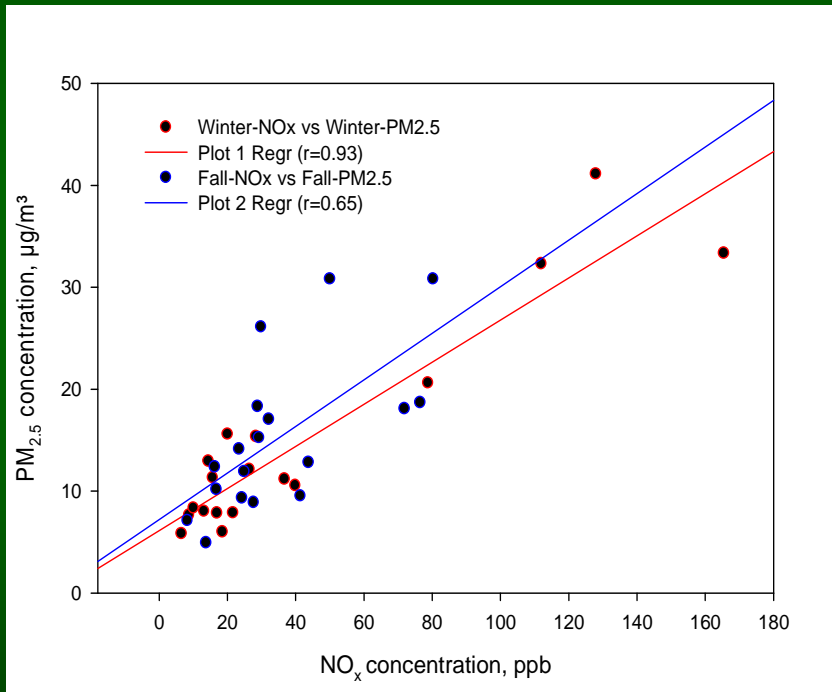
Association between PM_{2.5} and NO_x & Fog Day

PM_{2.5} concentration, µg/m³



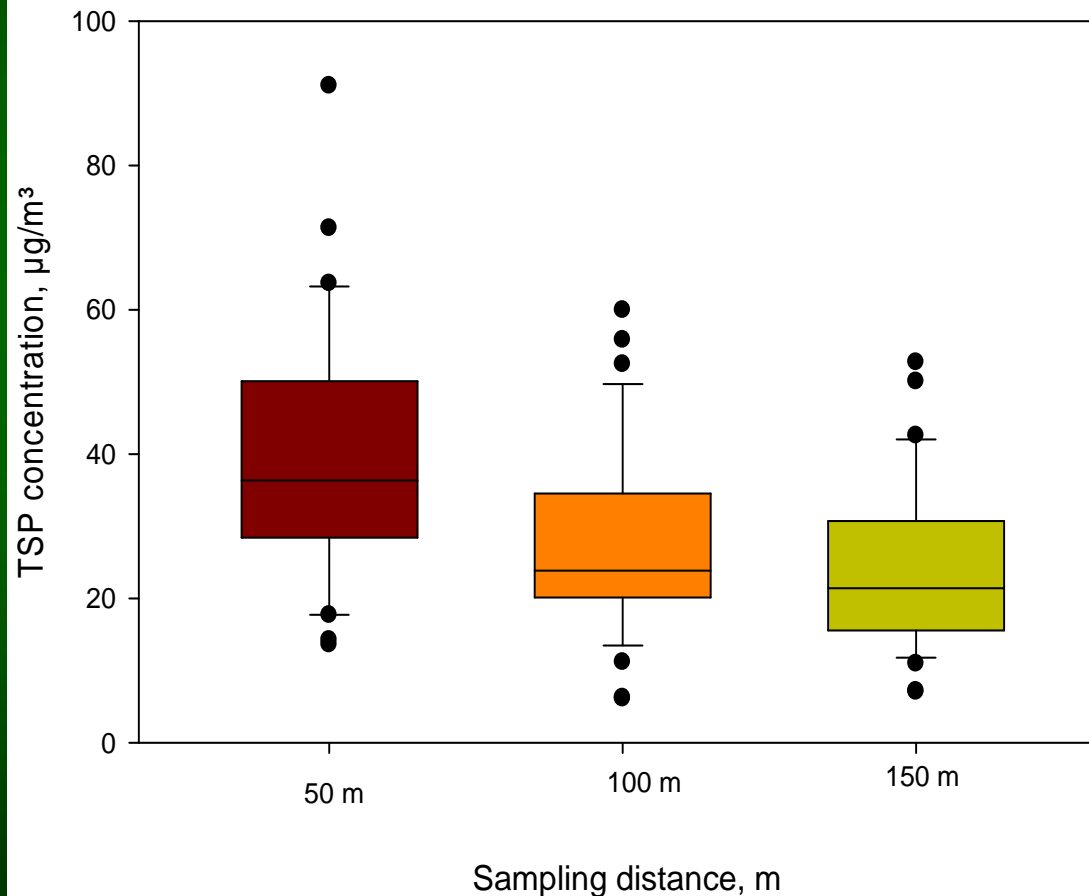
Fog Day

Cloud based on grounds; 100% humidity

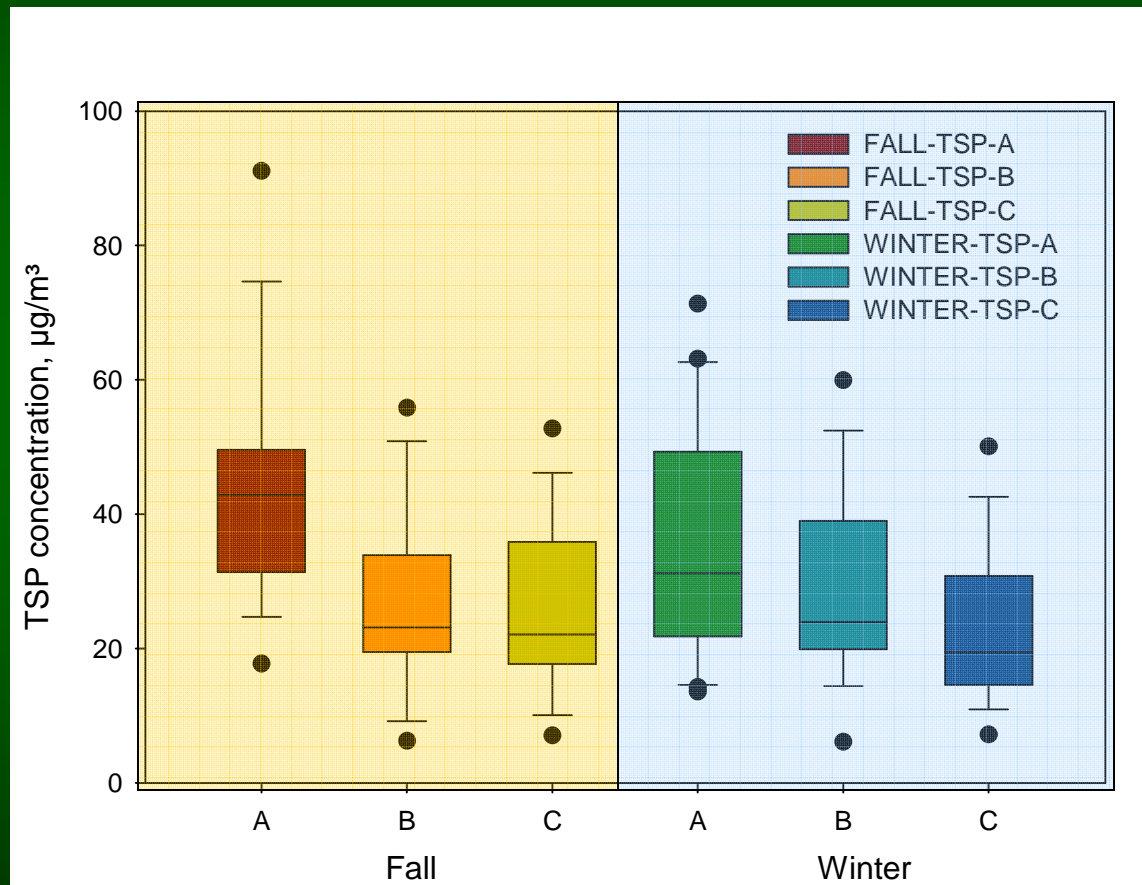


NO_x concentration

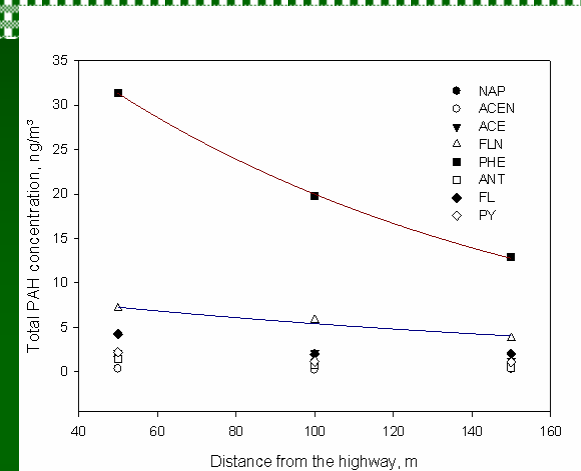
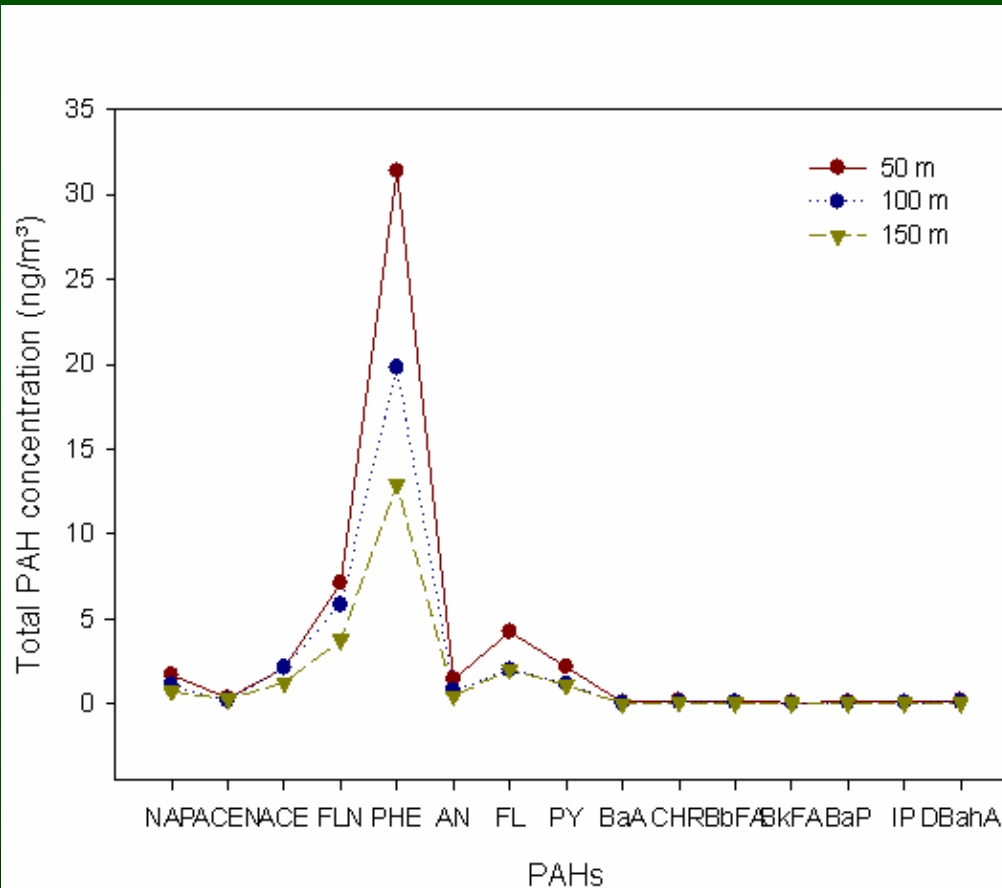
TSP Conc. Profile by Distance



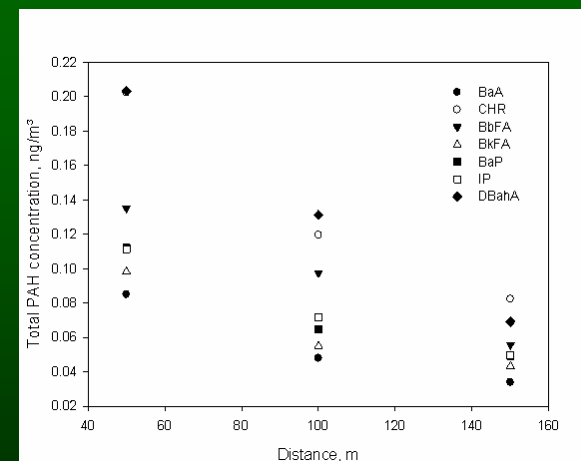
Seasonal Effect on TSP Concentration



PAH Conc. Profile by Distance



Lighter PAHs ($128 \leq M.W. \leq 202$)



Heavier PAHs ($228 \leq M.W. \leq 278$)

Conclusions-I

- There was no difference in $PM_{2.5}$ concentration by distance ($p > 0.05$).
- The concentrations of TSP at 50 m were higher than at 100 and 150 m ($p > 0.05$).
- The concentrations of Total PAHs at 50 m were higher than at 100 and 150 m ($p > 0.05$).

Conclusion-II

- There was a noticeable seasonal variation of $PM_{2.5}$ concentration with lower levels in the winter.
- There was no seasonal variation in TSP concentration.
- Higher $PM_{2.5}$ concentration occurred as a result of high NO_x and fog.

Future Work

- Complete the Spring and Summer (2008) Data collection.
- Analyze metal concentration associated with $PM_{2.5}$ (Fall, Winter, Spring and Summer).
- Complete Summer intensive sampling (2008).
- Build statistical models that predict $PM_{2.5}$, TSP and PAH concentration based on weather, NO_x , distance, season, day of week and traffic volume.

Participants

- Dr. Francisco Artigas
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