

# Biogenic Secondary Organic Aerosol Workshop Series

Amy P. Sullivan  
July 1-4, 2007

# Biography

- *Ph.D. in Atmospheric Chemistry – 2006*
  - Georgia Institute of Technology
  - Advisor: Rodney J. Weber
  
- *Post-Doctoral Researcher – Currently*
  - Colorado State University
  - Advisor: Jeffery L. Collett, Jr.

# Research Interests

- Composition of the aerosol, especially the organic fraction
- Approach is applying new analytical techniques and developing new instrumentation

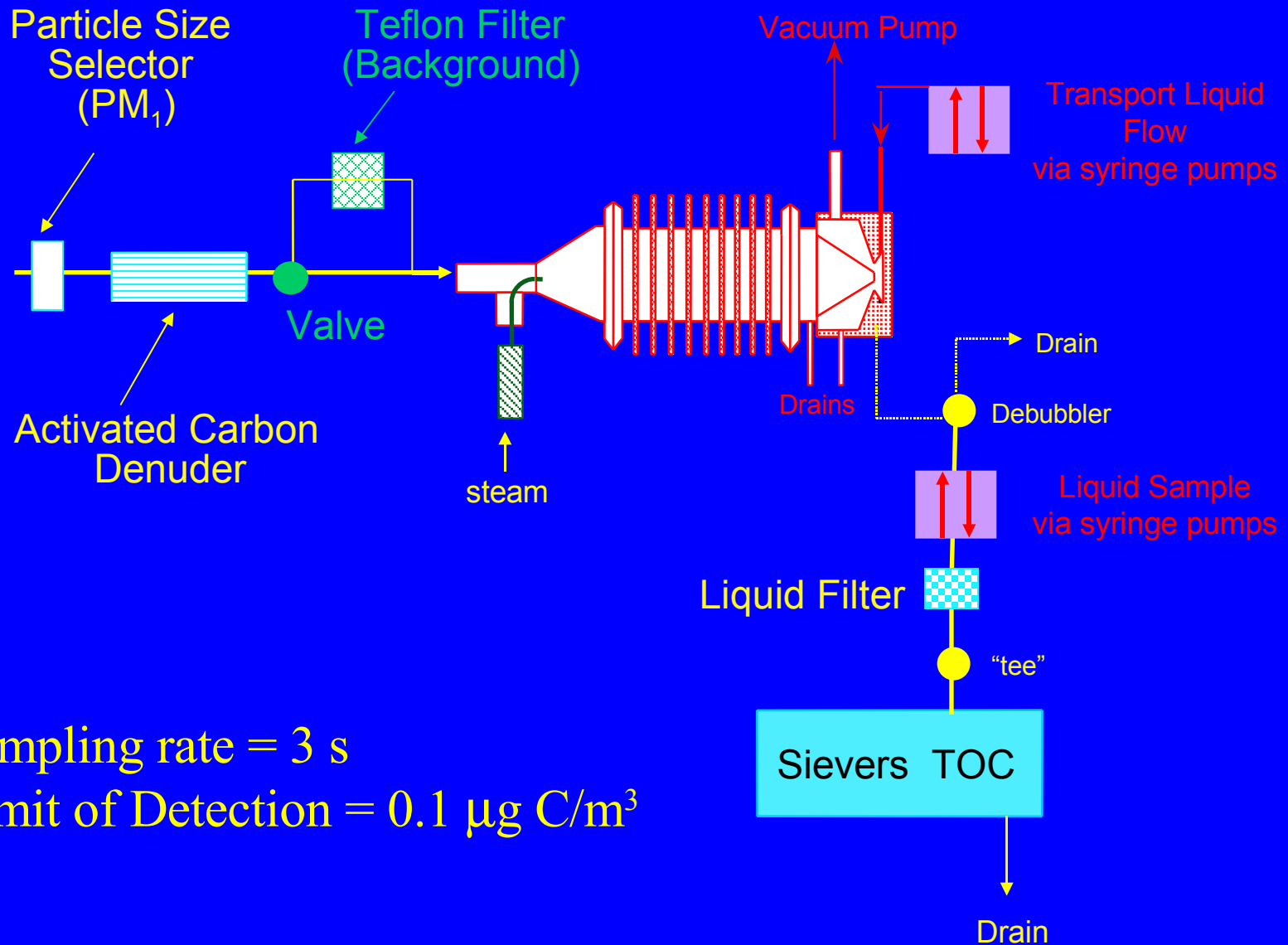
# Water-Soluble Organic Carbon (WSOC)

- Secondary Organic Aerosol (SOA) formation believed to be one of its major sources
- Implies that methods developed for separation and analysis of WSOC could be used to investigate SOA products

# Example of WSOC in Atlanta

- Airborne measurements from NEAQS/ITCT 2004
  - Compare Atlanta results to Northeastern U.S.
- Ground-based integrated filter measurements during summer 2004

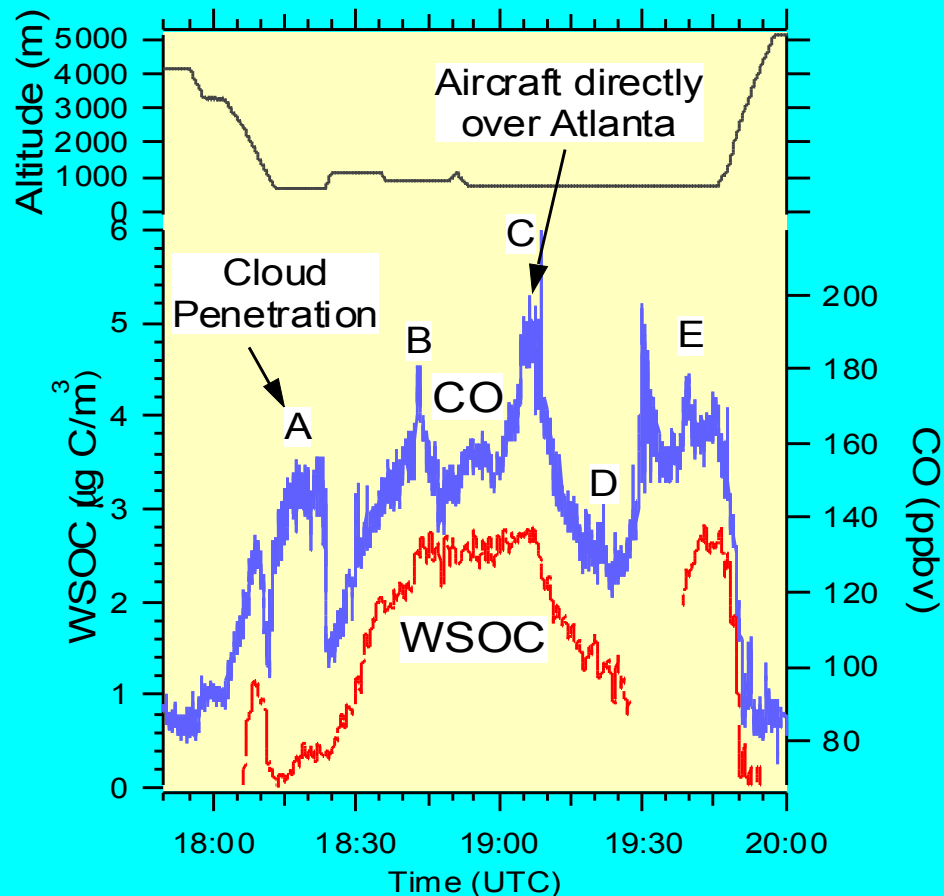
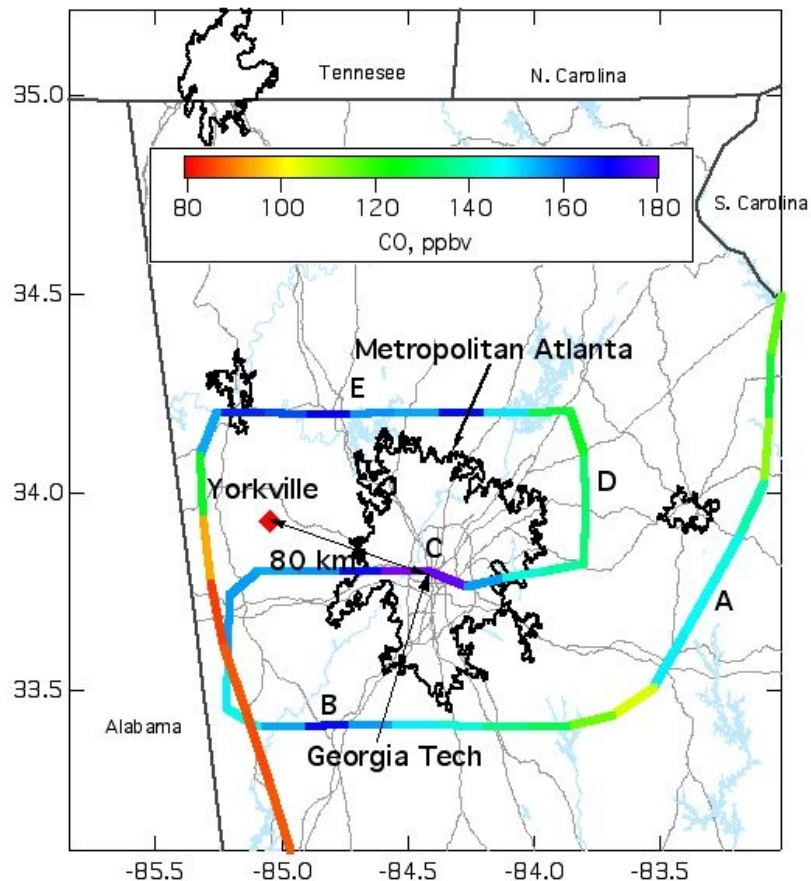
# Schematic of PILS-TOC



-Sampling rate = 3 s

-Limit of Detection =  $0.1 \mu\text{g C/m}^3$

# Atlanta Flyby



-Wide spread elevated CO and WSOC in boundary layer

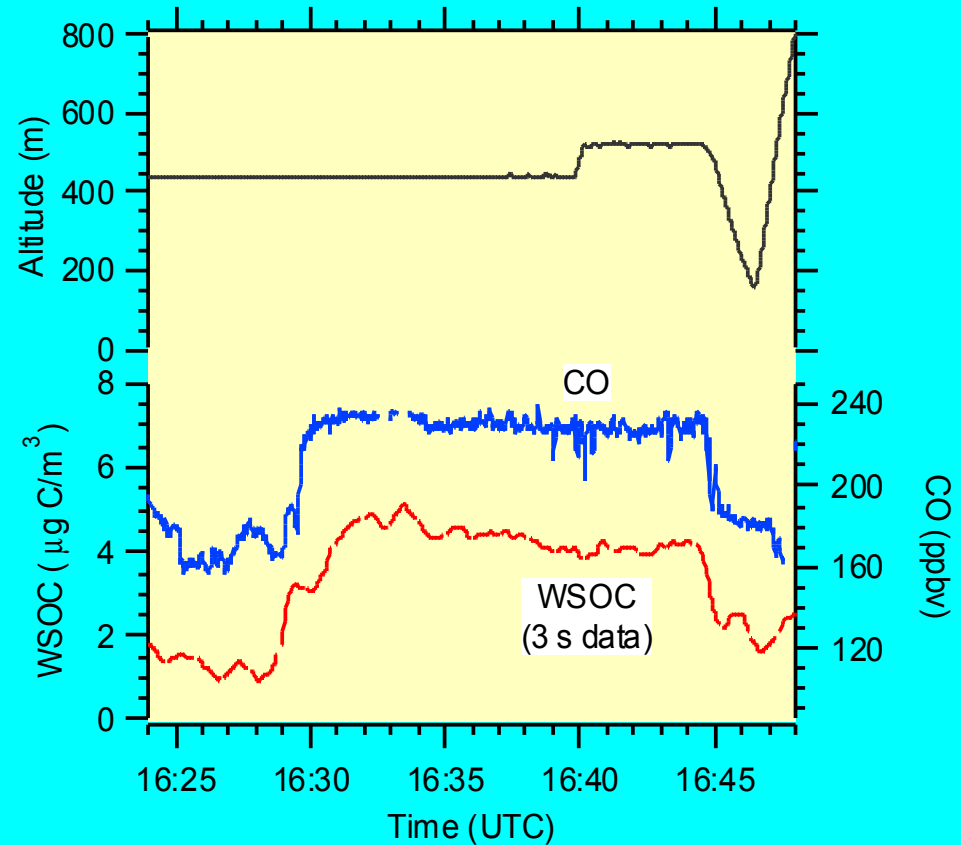
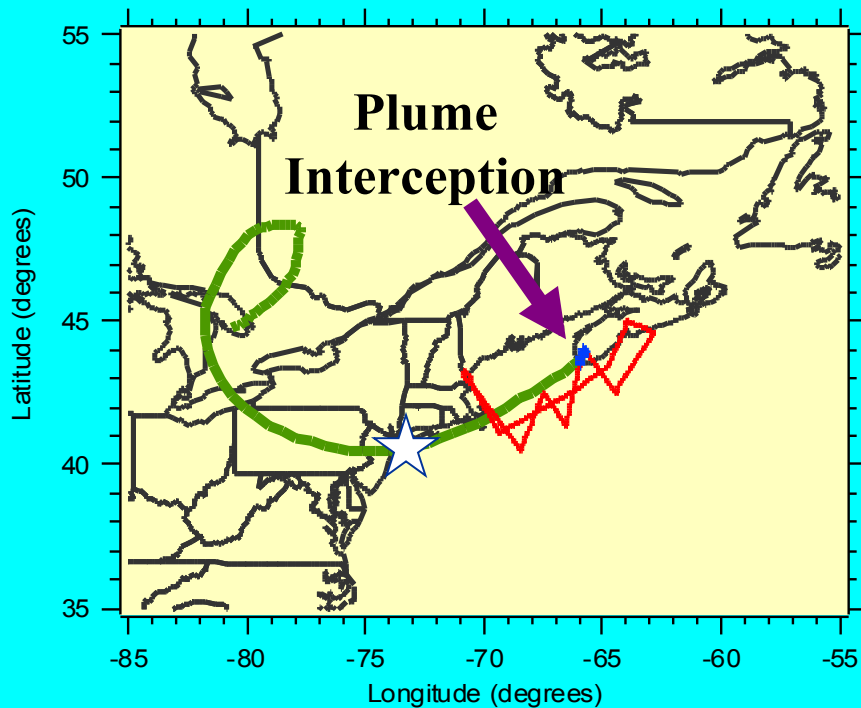
-WSOC-CO  $R^2 = 0.80$

(excluding in-cloud)

-WSOC doesn't track in fresher CO plumes

# Specific Plumes in NE U.S.

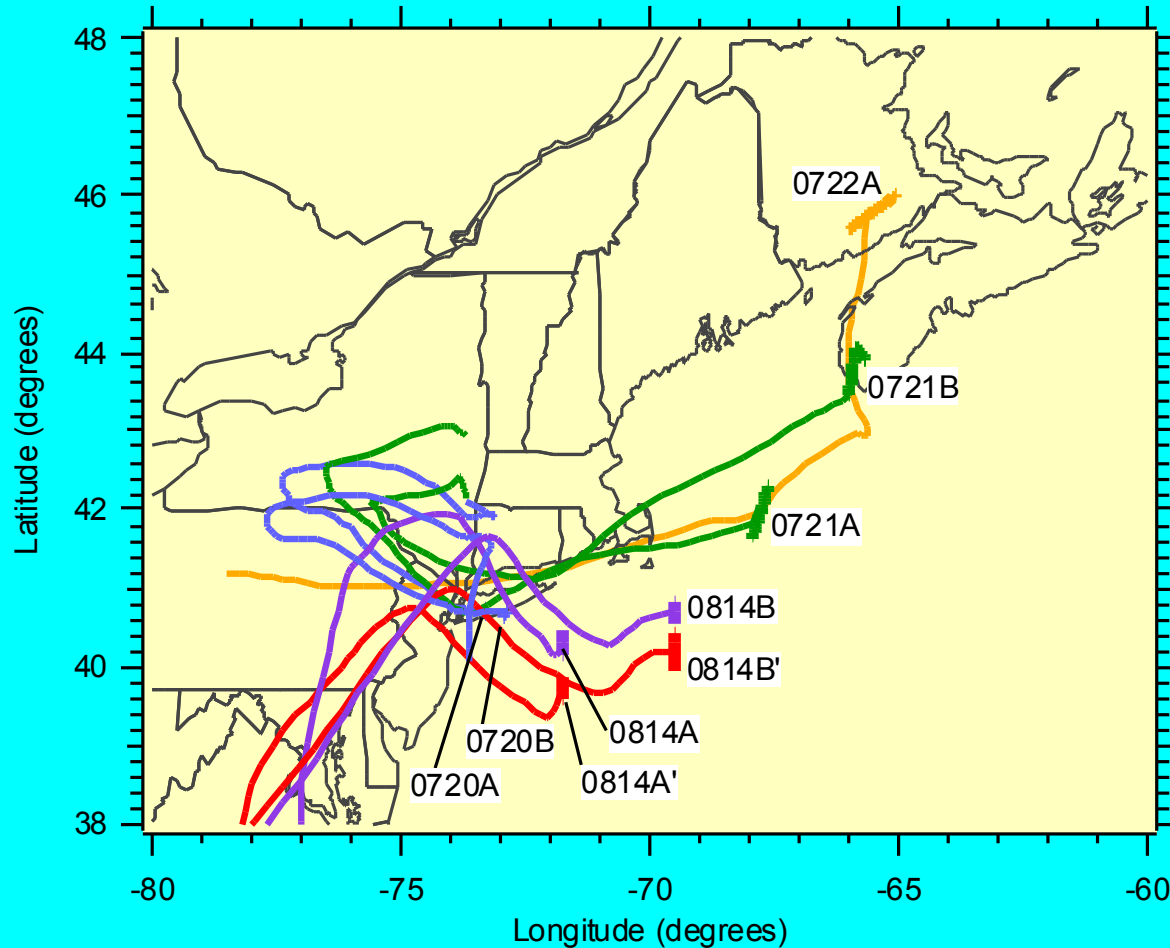
## New York City Plume



-WSOC-CO  $R^2 = 0.82$ , highly correlated in specific urban plumes

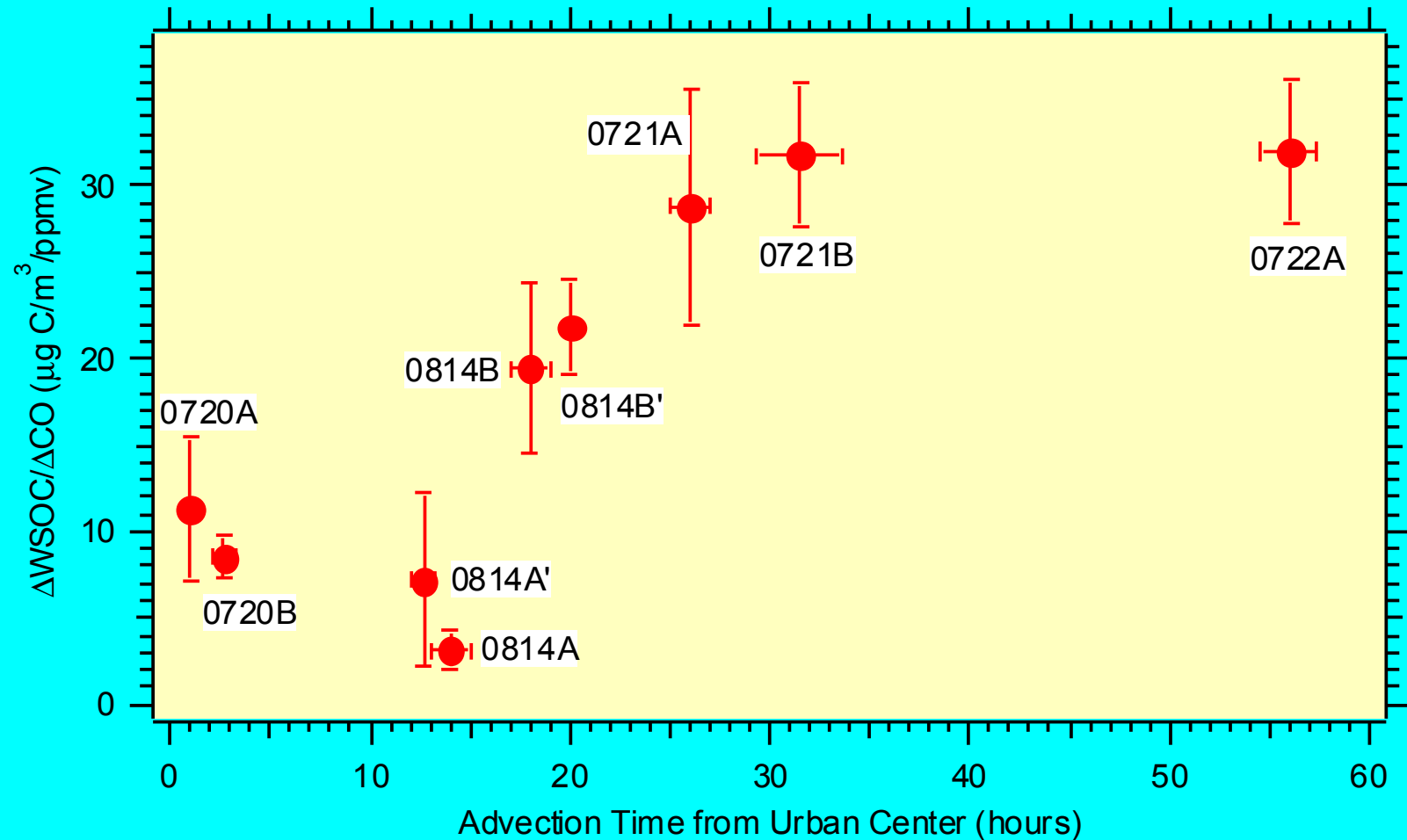


# WSOC Evolution in Urban Plumes



-Backtrajectories of plumes that intercepted New York City

# WSOC Evolution in Urban Plumes



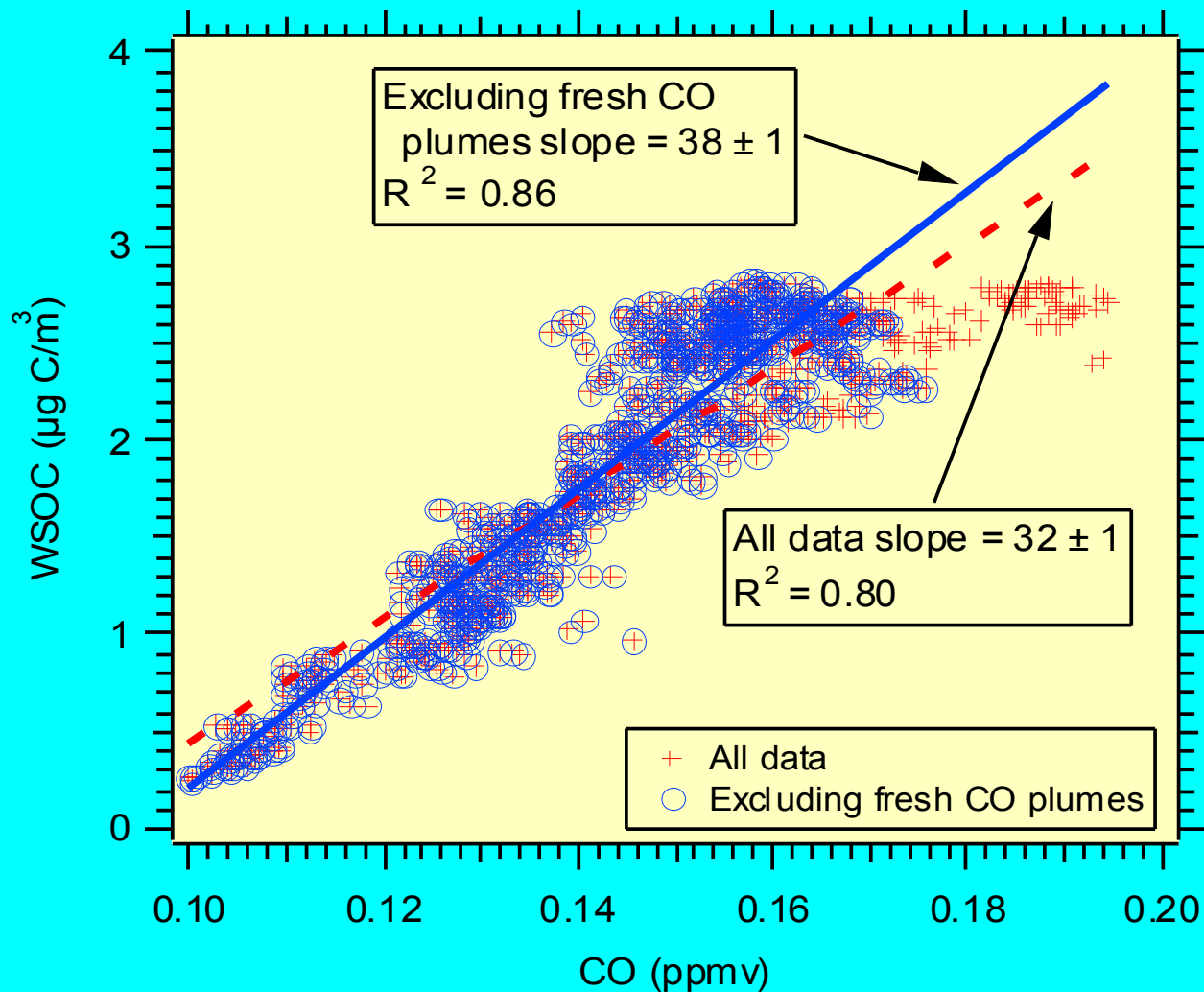
-Lowest near city

-Ratio level off after  $\sim 1$  day to  $32 \pm 4 \mu\text{g C}/\text{m}^3/\text{ppmv}$

# Comparison of Atlanta to NE U.S. Cities

	Source	Atlanta/Northeastern
WSOC		0.55
CO		0.61
Acetylene	<b>anthropogenic</b>	0.84
Iso-propyl nitrate	<b>anthropogenic</b>	0.57
$\alpha$ -pinene	<b>biogenic</b>	29
$\beta$ -pinene	<b>biogenic</b>	7.4
Isoprene	<b>biogenic</b>	100
Methyl vinyl ketone	<b>biogenic</b>	14
Methacrolein	<b>biogenic</b>	11

# $\Delta\text{WSOC}/\Delta\text{CO}$ for Atlanta



$-\Delta\text{WSOC}/\Delta\text{CO}$  similar to NYC ( $32 \pm 4 \mu\text{g C}/\text{m}^3/\text{ppmv}$ )

# Radiocarbon Data from Atlanta

Date	OC ( $\mu\text{g C/m}^3$ )	WSOC ( $\mu\text{g C/m}^3$ )	WSOC Biogenic Fraction (g/g)	WSOC Fossil Fraction (g/g)
6/14/04	3.84	2.59	0.81	0.19
6/17/04	4.18	2.16	0.70	0.30
6/23/04	2.59	1.77	0.76	0.24
6/29/04	2.59	2.57	0.67	0.33

-70 to 80% WSOC biogenic

-Suggests biogenic VOCs involved in most of SOA formation

# Why?

- Is the contribution of biogenic VOCs inferred from the radiocarbon measurements too large?
- Is it possible that the SOA is formed from condensation of biogenic VOCs through a process that is linked to anthropogenic precursors?

# Future Goals

- Compare to measurements in completely rural area or urban area with little biogenic
- Interesting samples for LC-MS (liquid chromatography-mass spectroscopy) methods developing to further speciate WSOC