Evolution of Secondary Organic Aerosol (SOA) from Mexico City

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Doug Worsnop1, **Scott Herndon[1]**, Ezra Wood[1], **Tim Onasch[1]**, **John Jayne**,
Manjula Canagaratna, Charles Kolb[1]
Luisa T. Molina[2], Miguel Zavala[2] Berk Knighton[3], Claudio Mazzoleni[4],
Mavendra Dubey[4], Dwight Thornhill[5] and Lindsey Marr[5]
Peter DeCarlo, Ed Dunlea, **Allison Aiken, Ingrid Ulbrich**, Joel Kimmel,
Alex Huffman, Dara Salcedo, Donna Sueper, **Jose-Luis Jimenez**
Qi Zhang   Larry Kleinman et al

[1]Aerodyne Research, Inc.,
[2]Massachusetts Institute of Technology /
Molina Center for the Energy and the Environment,
[3] Montana State University,
[4]Los Alamos National Laboratory,
[5]Virigina Polytechnic Institute and State University
University of Colorado
SUNY Albany   Brookhaven National Laboratory

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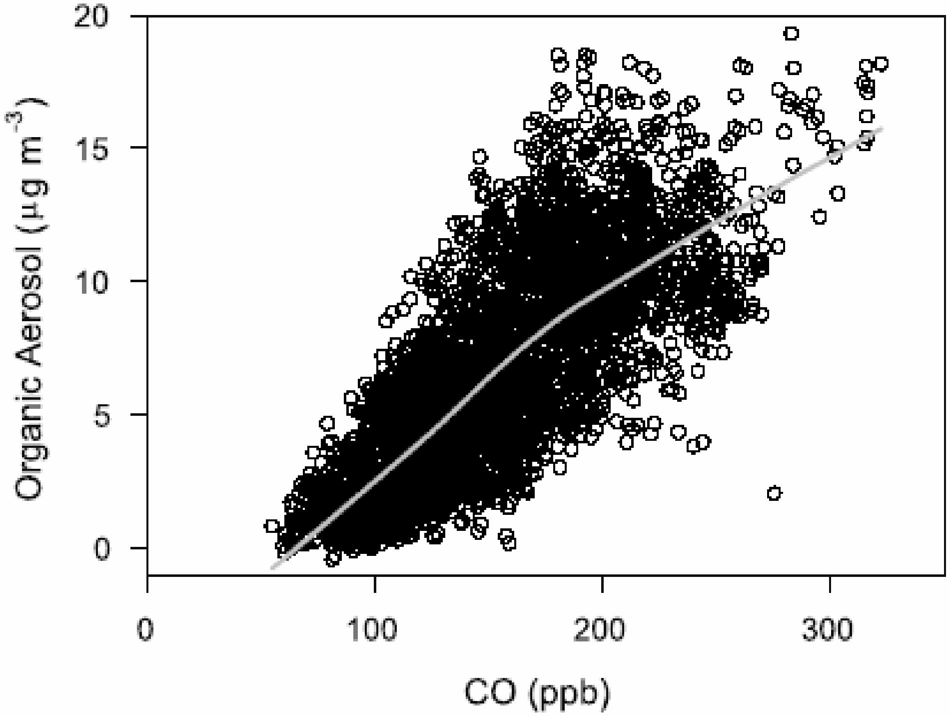
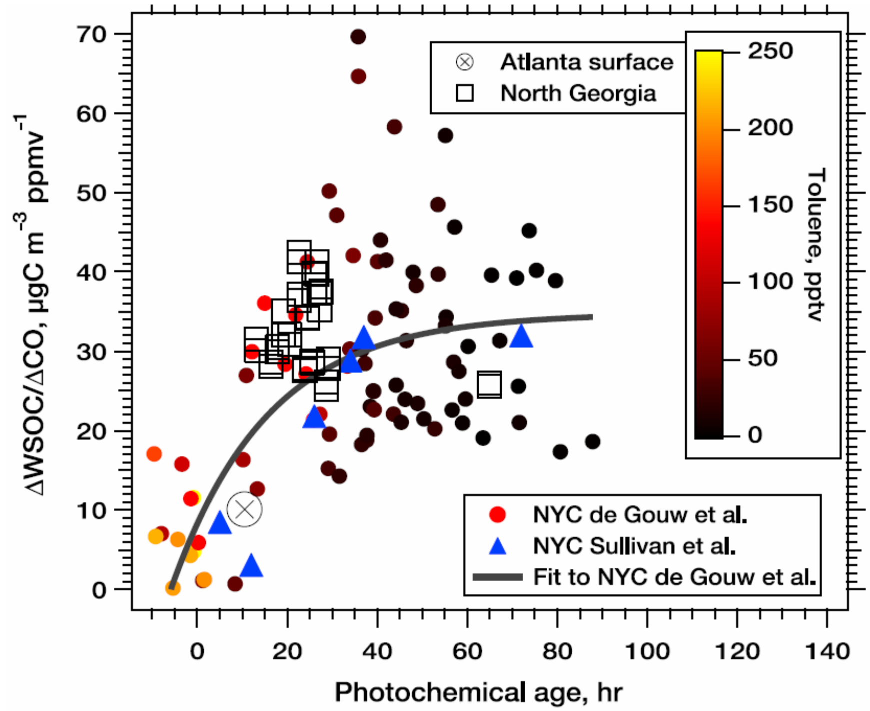
AMS Organic Matter



PILS WSOC



~60-70 μg/m³ / ppm **OM/CO**

New England

DoE G-1 NEAQS 2002

Kleinman et al, 2007

~35 μg/m³ / ppm **OC/CO**

Atlanta and New York

NOAA P3 ITCT 2K4 *(2004)*

Weber et al, 2007; deGouw et al, 2005

OM/OC ~ 1.6 – 2.2

Pico Tres Padres

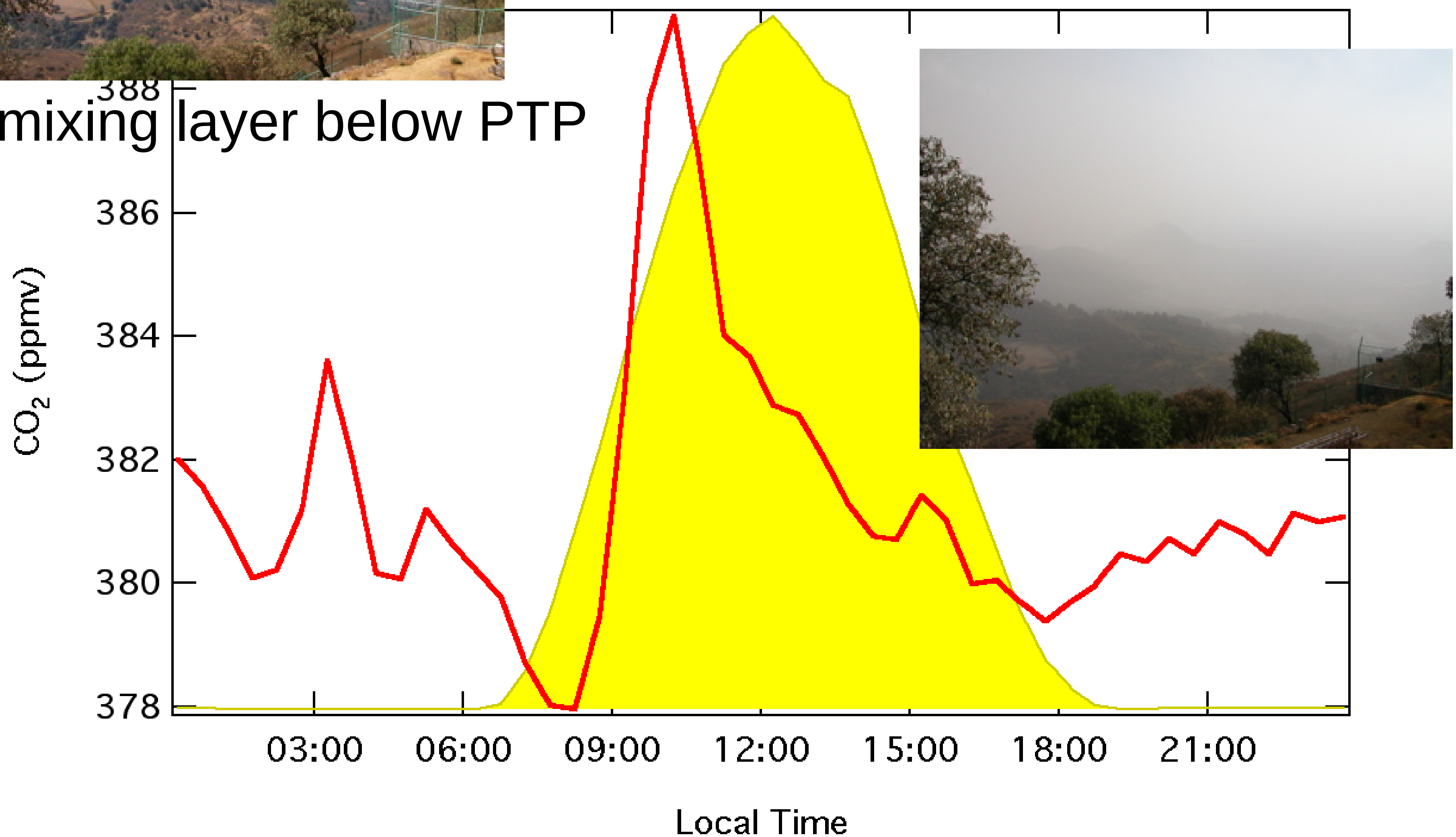
- Photochemical processing of city emissions and secondary aerosol generation
- Source-specific wind-advected plumes and particle nucleation and growth

Herndon, Onasch et al

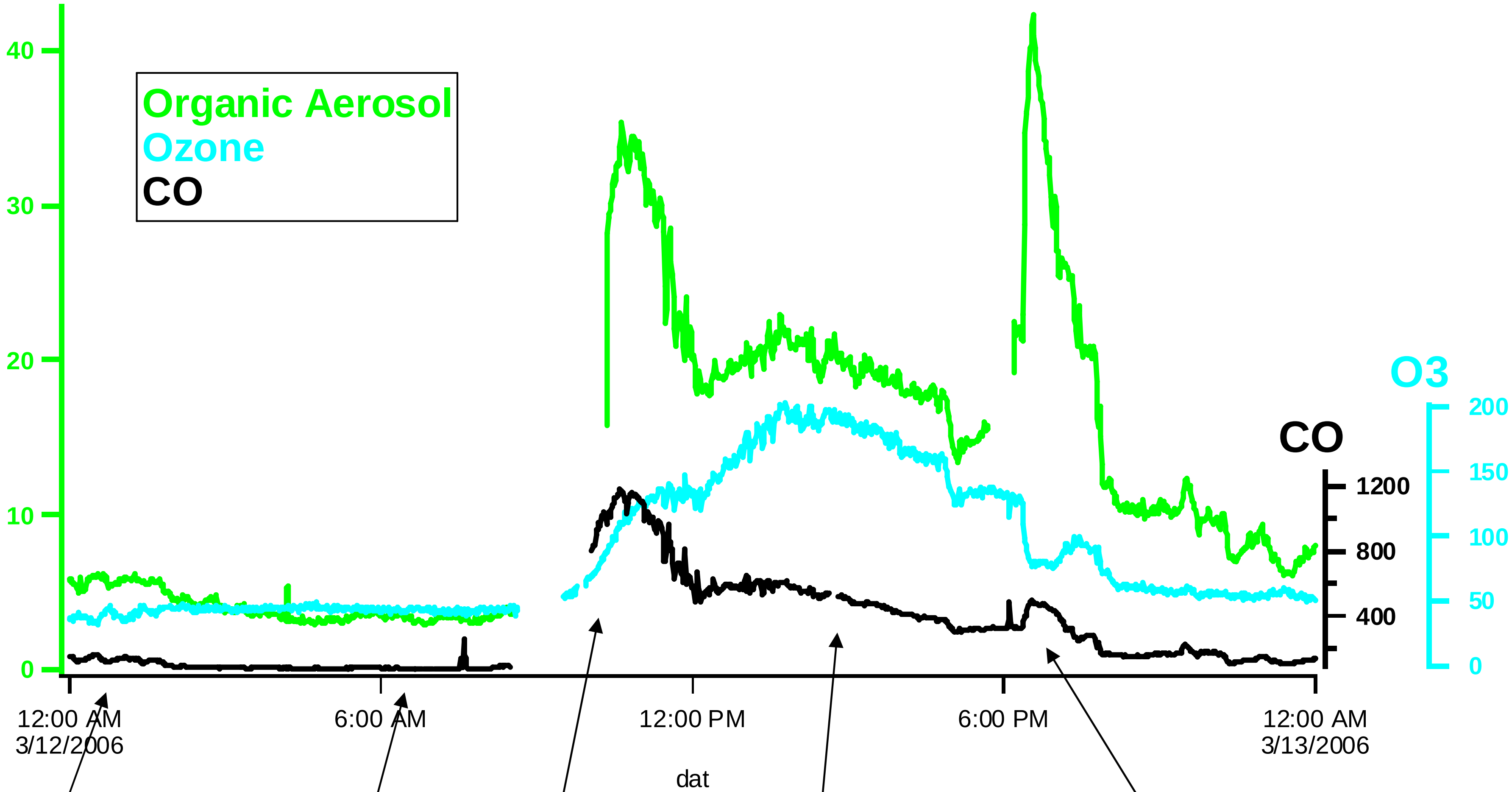
Emissions and Boundary Layer Height: Influence on Mixing Ratios

- mixing layer below PTP

- mixing layer above PTP



PTP March 12 *Herndon, Onasch et al*



Residual City Mixed Layer

Residual Regional Layer

Rising Boundary Layer

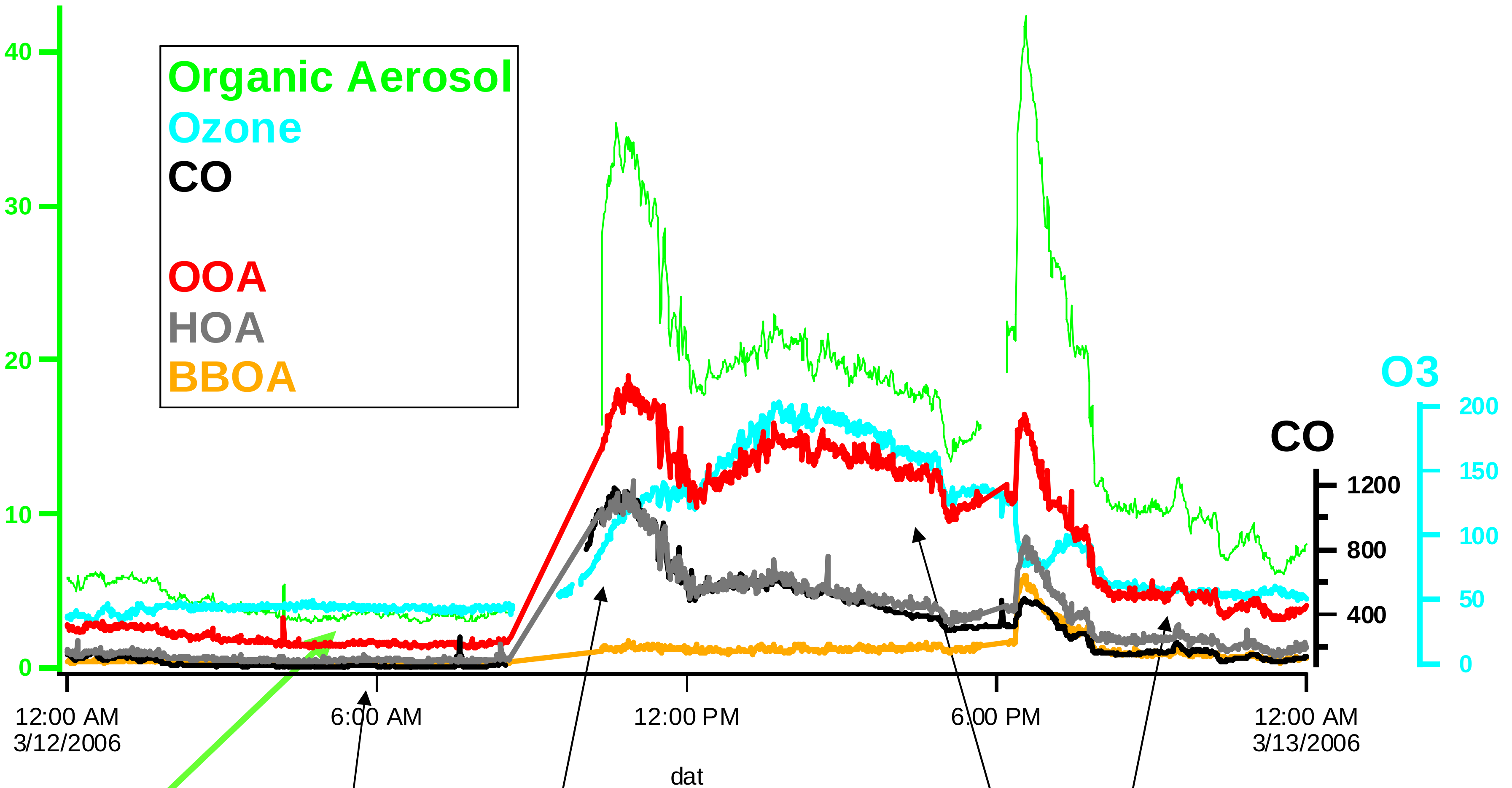
Mixed Boundary Layer

Biomass Burning Plume

50 **70** **30** **40-60** **105**

ORG/CO (μg/m3 / ppm)

PTP March 12 *Herndon, Onasch et al*



HOA High
In Urban Plume

OOA Fraction Increases with mixing and photochemistry

3-4 μg/m³ OOA Regional Background ?

OOA Dominates regional air

AMS (PMF) Factors

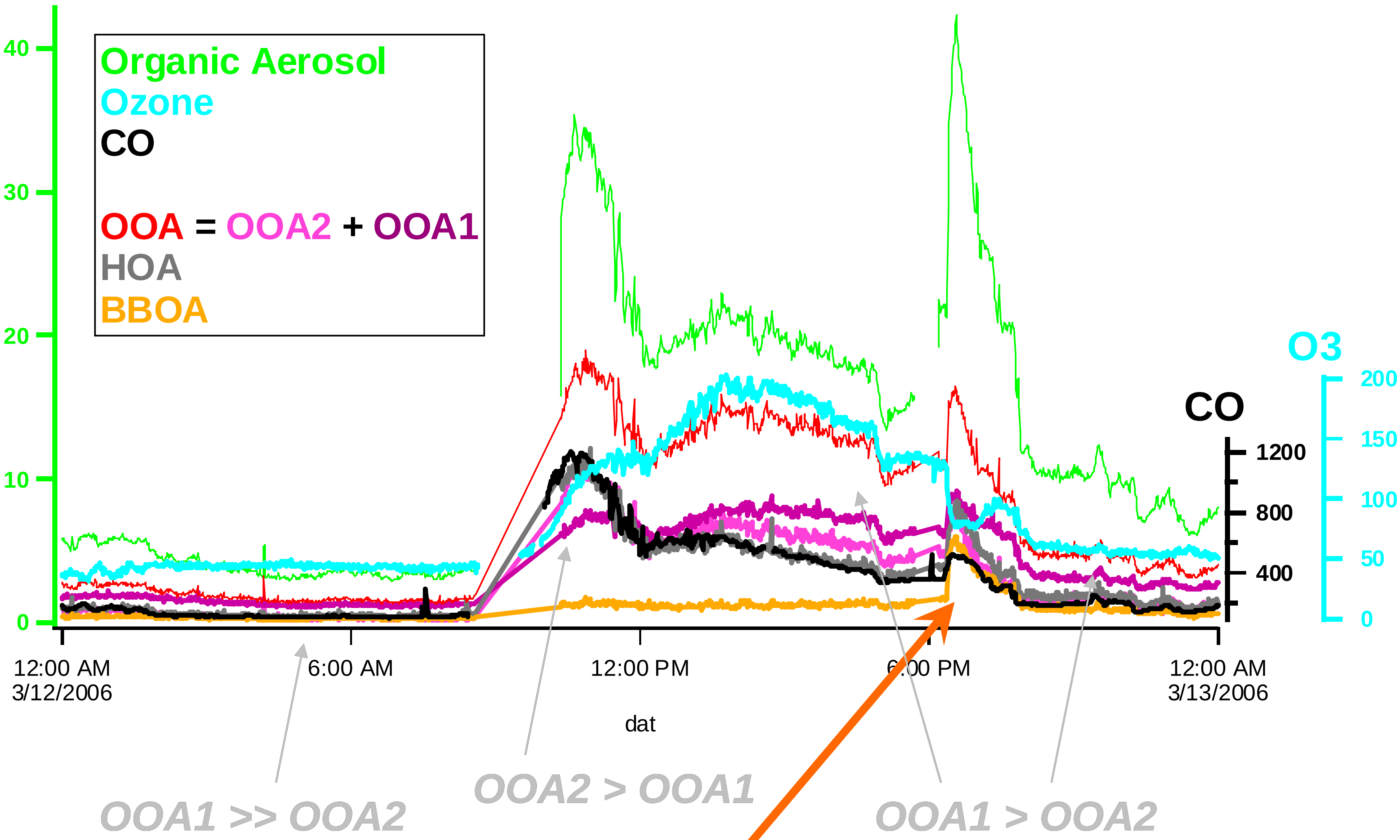
	600C, e-			*m/z*
HOA:	C_nH_m	→	$C_{n-x}H_{m-y}^+$	27,29,41,43,55,57,69,71,…
OOA2	C_nH_mO	→	$C_2H_3O^+$, $C_3H_3O^+$, R'+	43,55, …
OOA1	$C_nH_mO_2$	→	CO_2^+, HCO_2^+ , R'+	44,45, …
BBOA	R	→	R'+, $C_2H_4O_2^+$, $C_3H_3O_2^+$	60,73, …. *levoglucosan*

O:C ratio: HOA << OOA2 ~ BBOA < OOA1

Factors are not unique or identical among campaigns, platforms

CONSISTENT TRENDS

O:C ratio increases with processing *(and dilution)*



In this case,

Biomass Burning Plume ~ BBOA + HOA + OOA

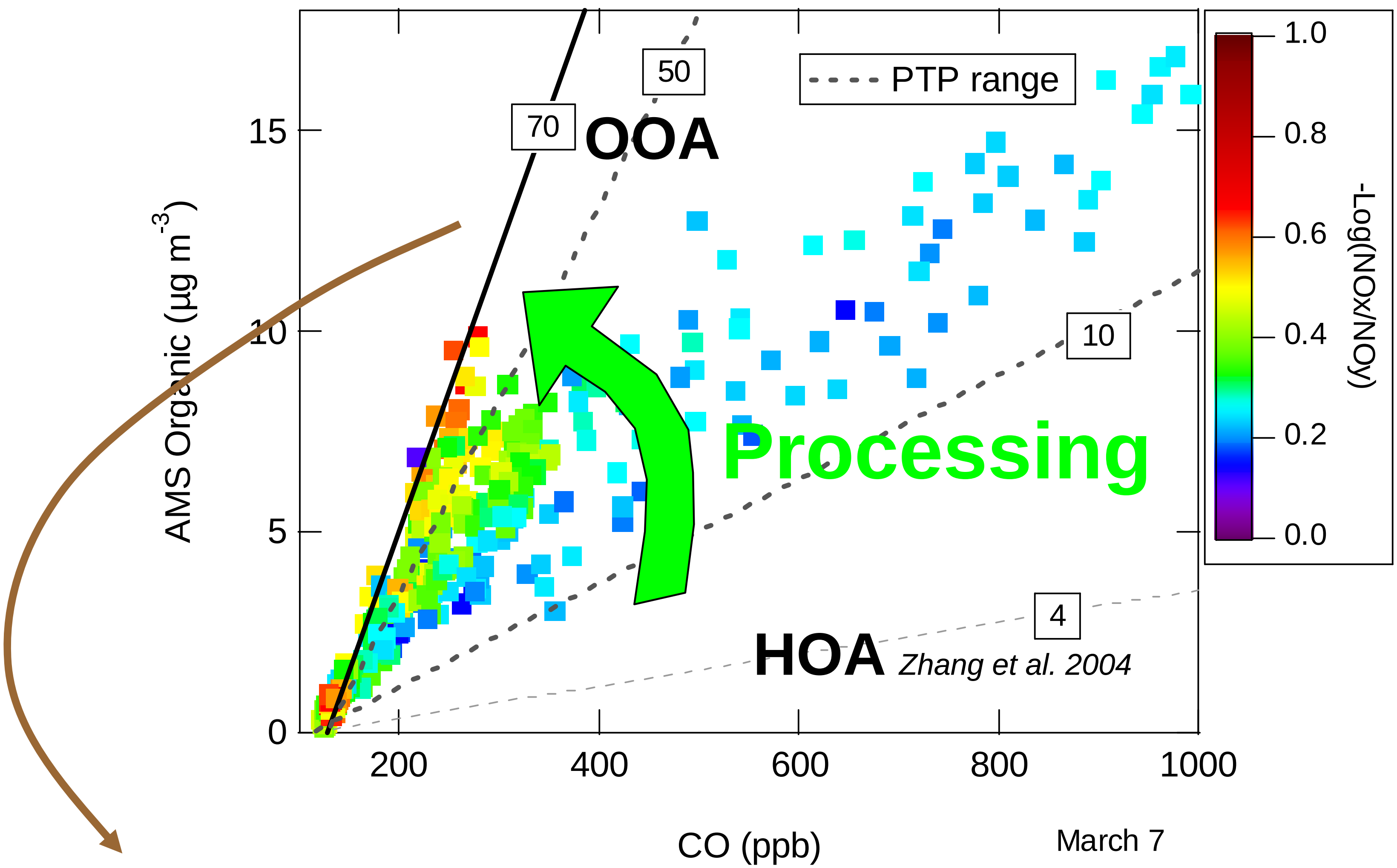
G-1 Flights *Jayne et al.*

The G1 sampled the urban plume…

the regional air…

and fire plumes

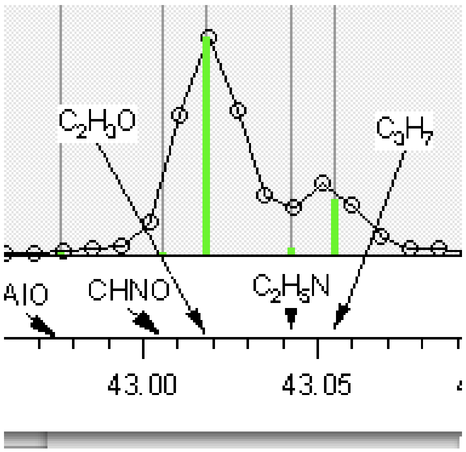
AMS Organic - CO "Emission Ratio"



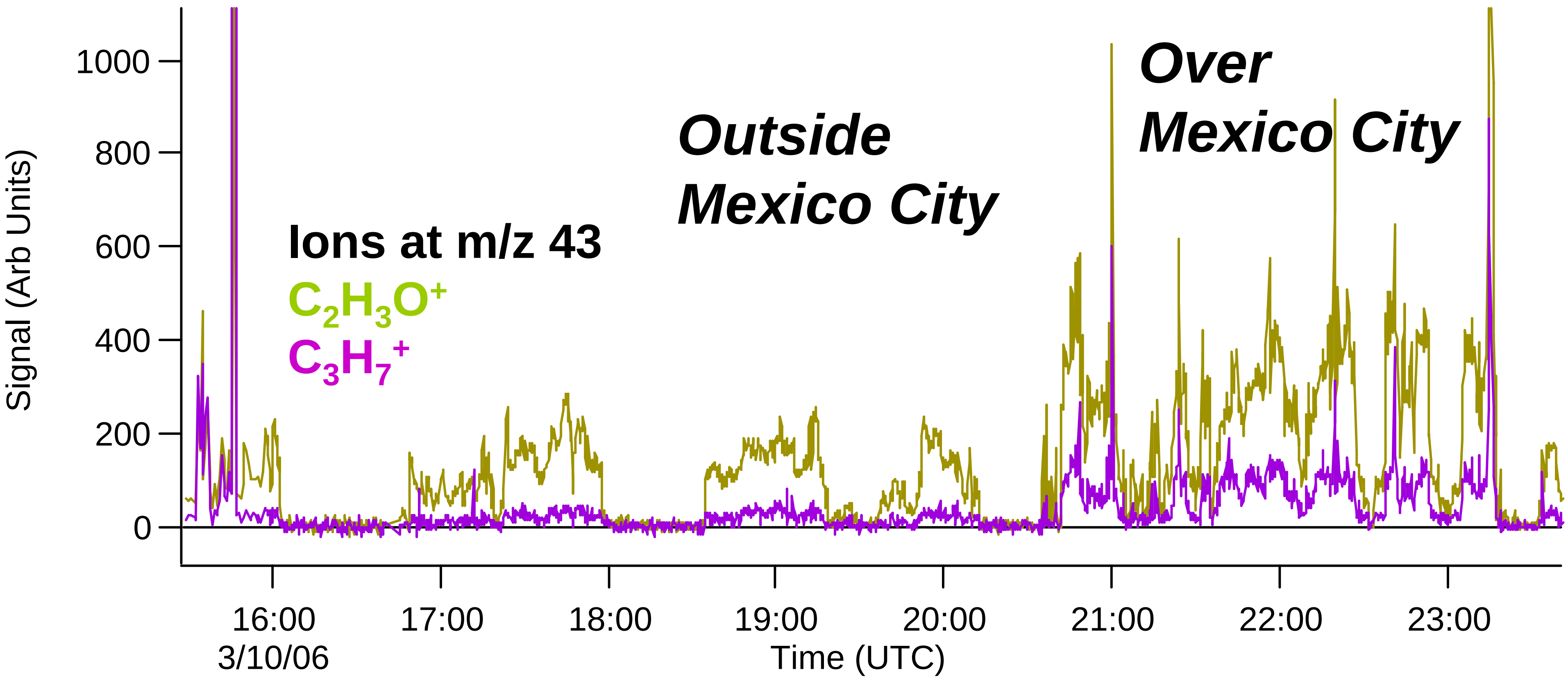
- BBOA Org-CO Ratio is highly variable. Fuel type, fire type (flaming, smoldering..), age.
- Fresh biomass emissions have a larger slope.
- All ERs tend toward OOA line with processing

High Mass Resolution AMS Data *C-130*

Decarlo et al, U Colorado

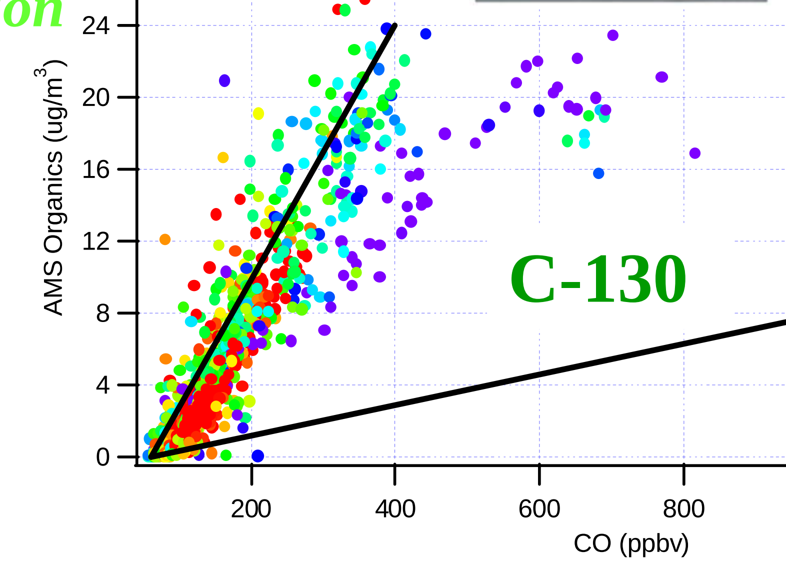


- V-Mode of AMS provides
  - Ability to separate major ions at same nominal m/z
  - More chemical resolution
  - Calculation of elemental ratios (O:C)



Organic to CO Ratios

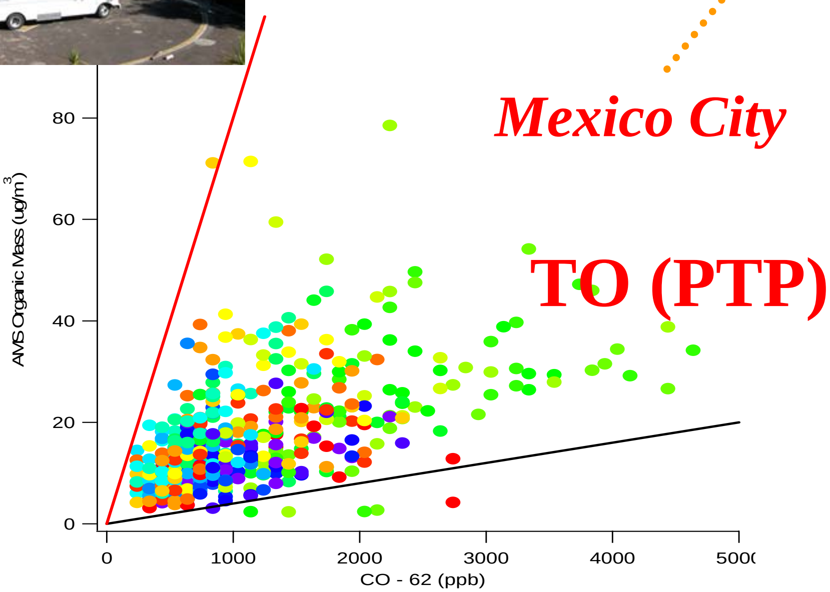
Region

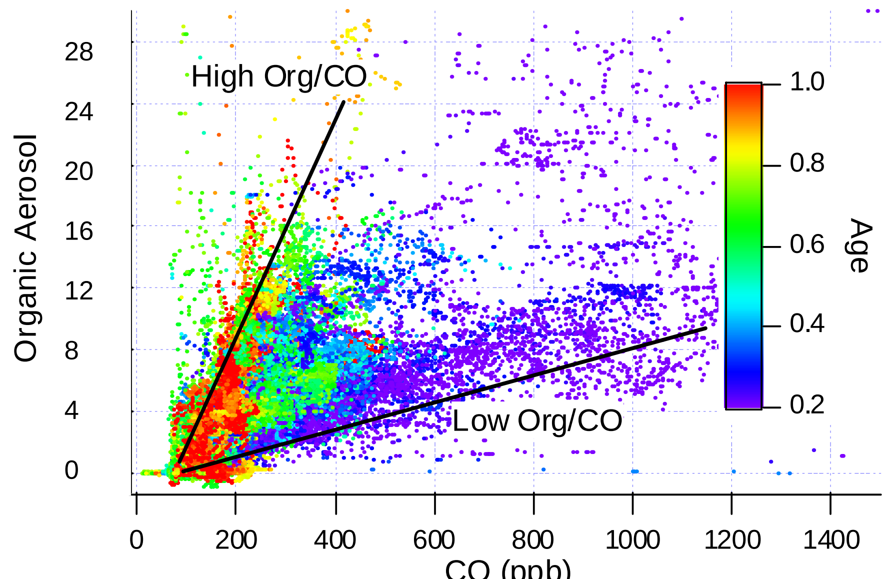


OM /CO: HIGH ~60 μgm^{-3}/ppm

LOW ~5-8

(ca. Pittsburgh, Zhang et al, 2005)





G-1