Brief Presentation to Near-Field Chemistry Working Group

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Univ. of Colorado-Boulder

2nd MILAGRO Science Meeting
Mexico City17-May-2007

Some Topics for Discussion

- Aerosol Nitrate
  - evaporates in afternoon and away from city
    - Is that understood: dilution, "denuding" of HNO_3 by surface? Do models capture it?
  - Does NO_x from fires produce nitrate efficiently?
    - Lower NH_3 /NO_x between city and fires?
- POA and BBOA evaporation?
- Biomass burning contribution
  - Urban burning vs. wildfires
- OOA / SOA
  - Evolution vs. regional background

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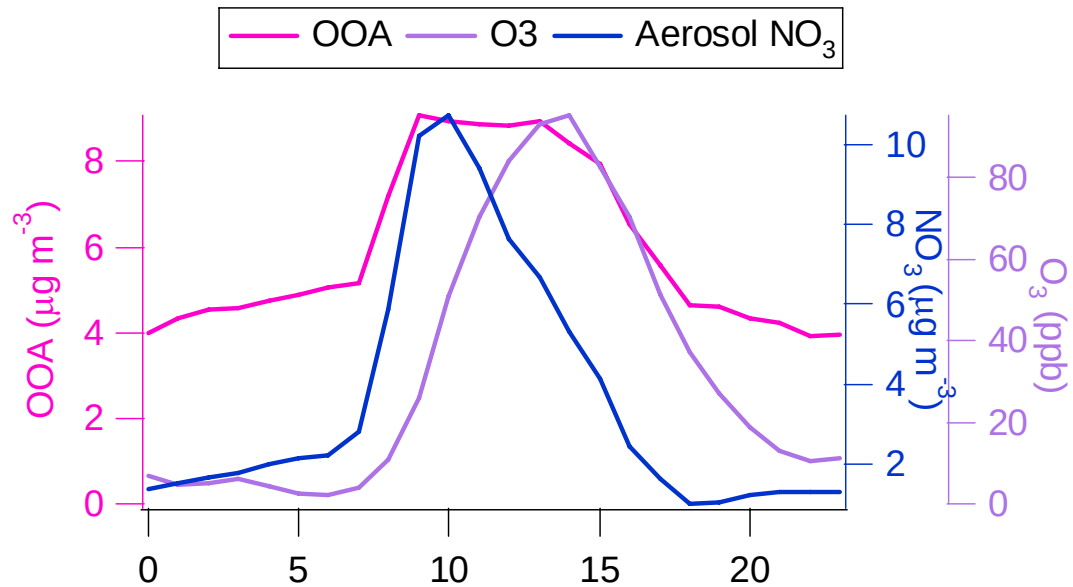
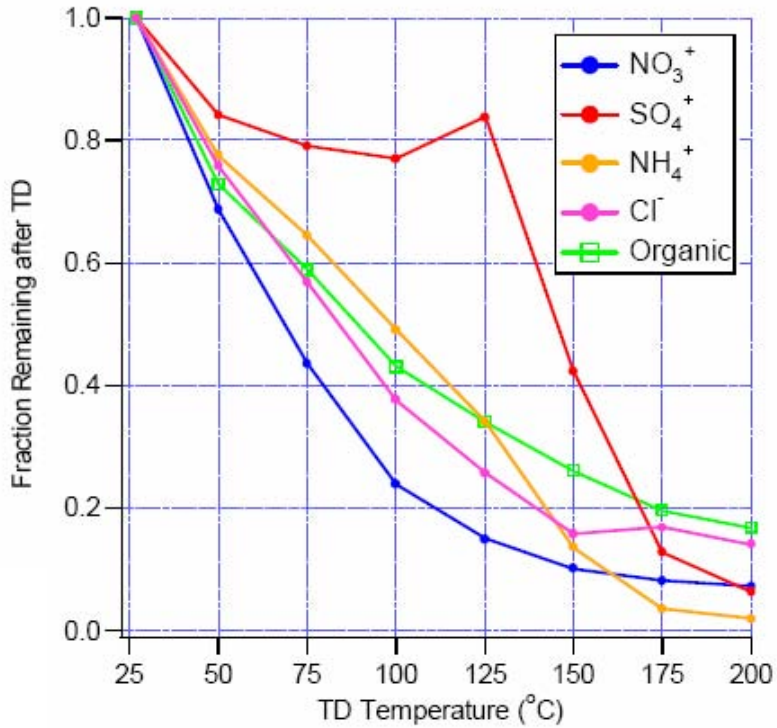
Nitrate Volatility & Evaporation

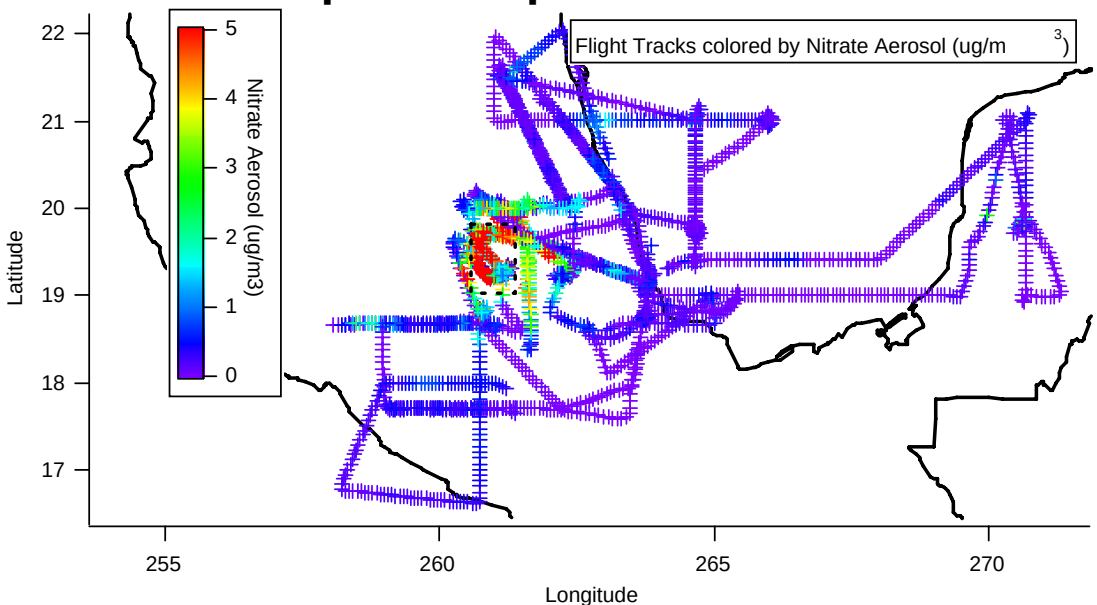
Diurnal Cycles at T0



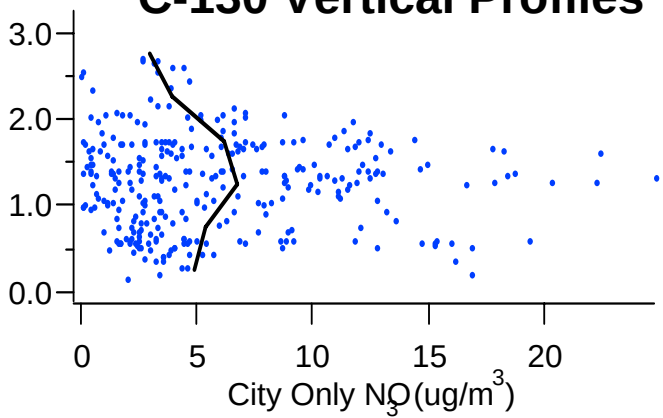
Thermal Denuder at T0



Spatial Map from C-130



C-130 Vertical Profiles



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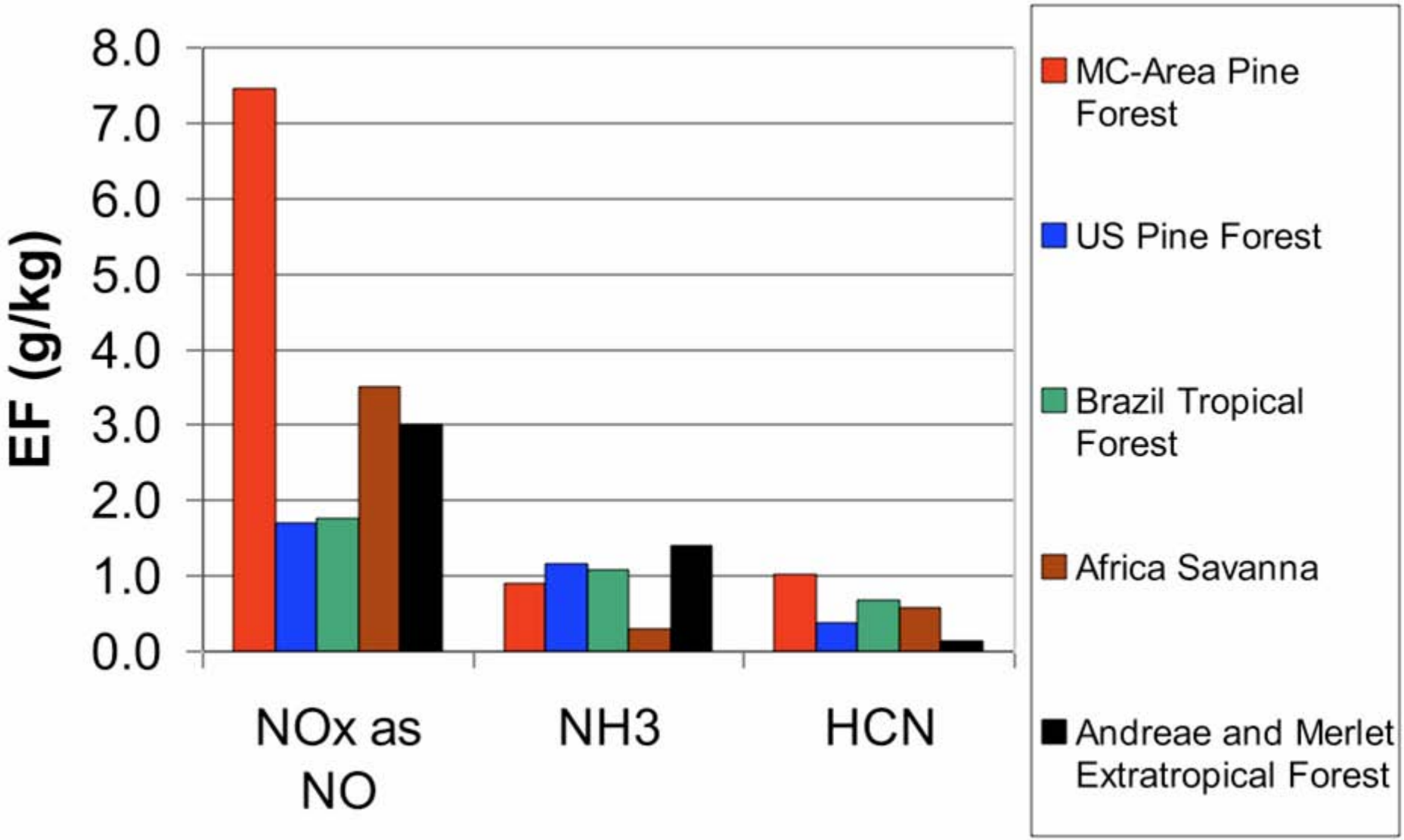
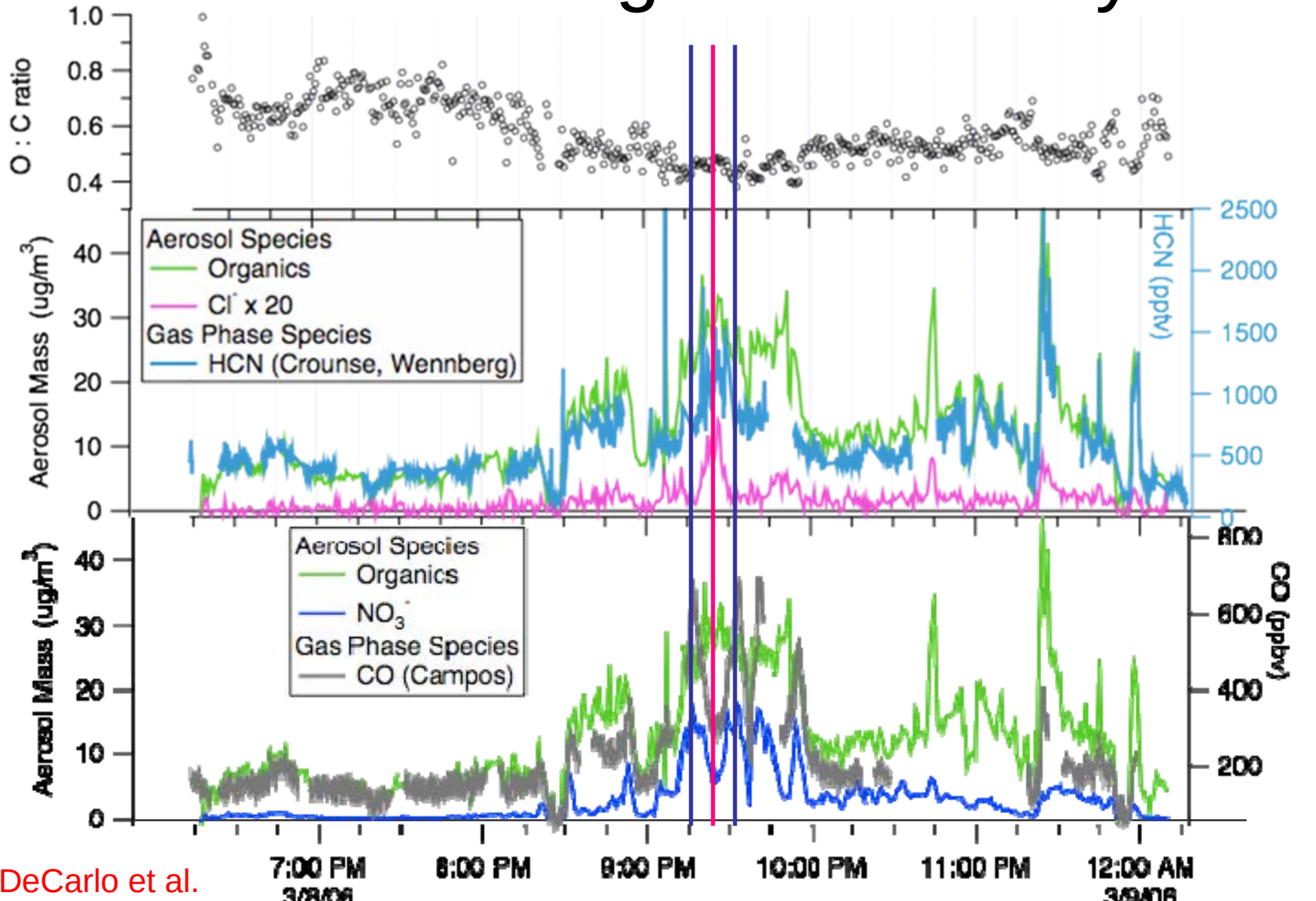
Twin Otter Emission Factors



Yokelson et al.

C-130 3/8 flight case study



DeCarlo et al.

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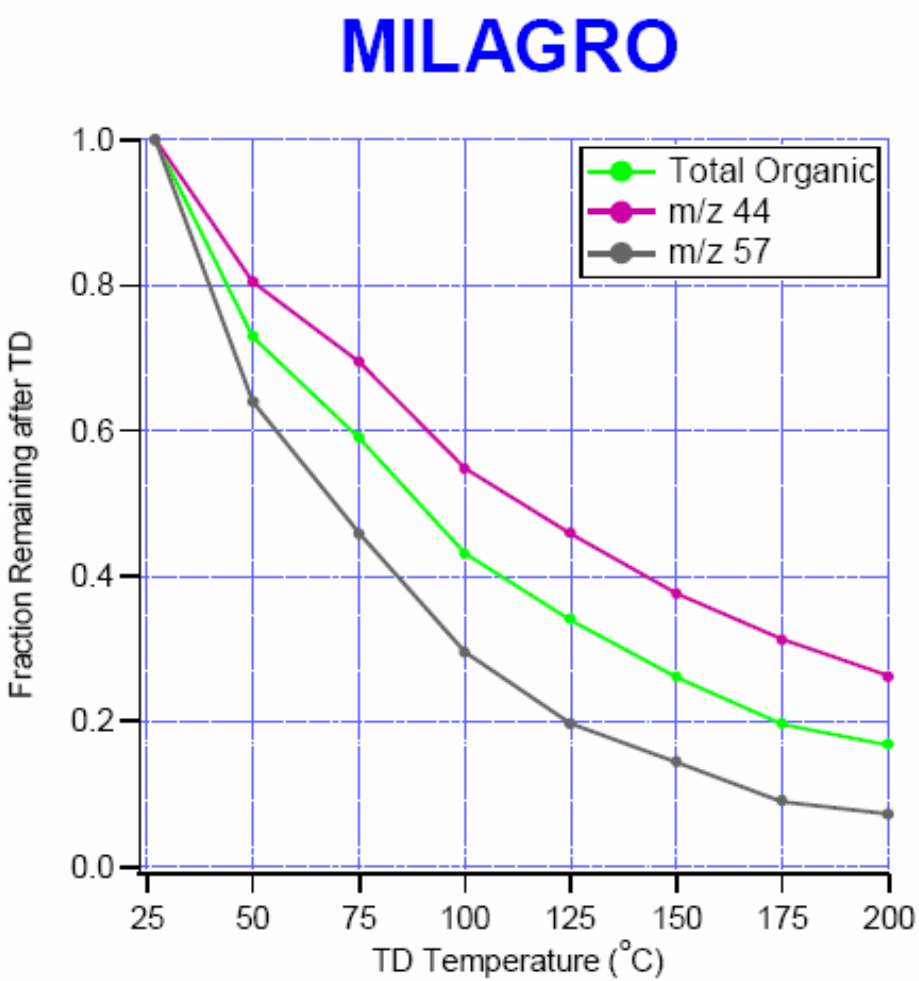
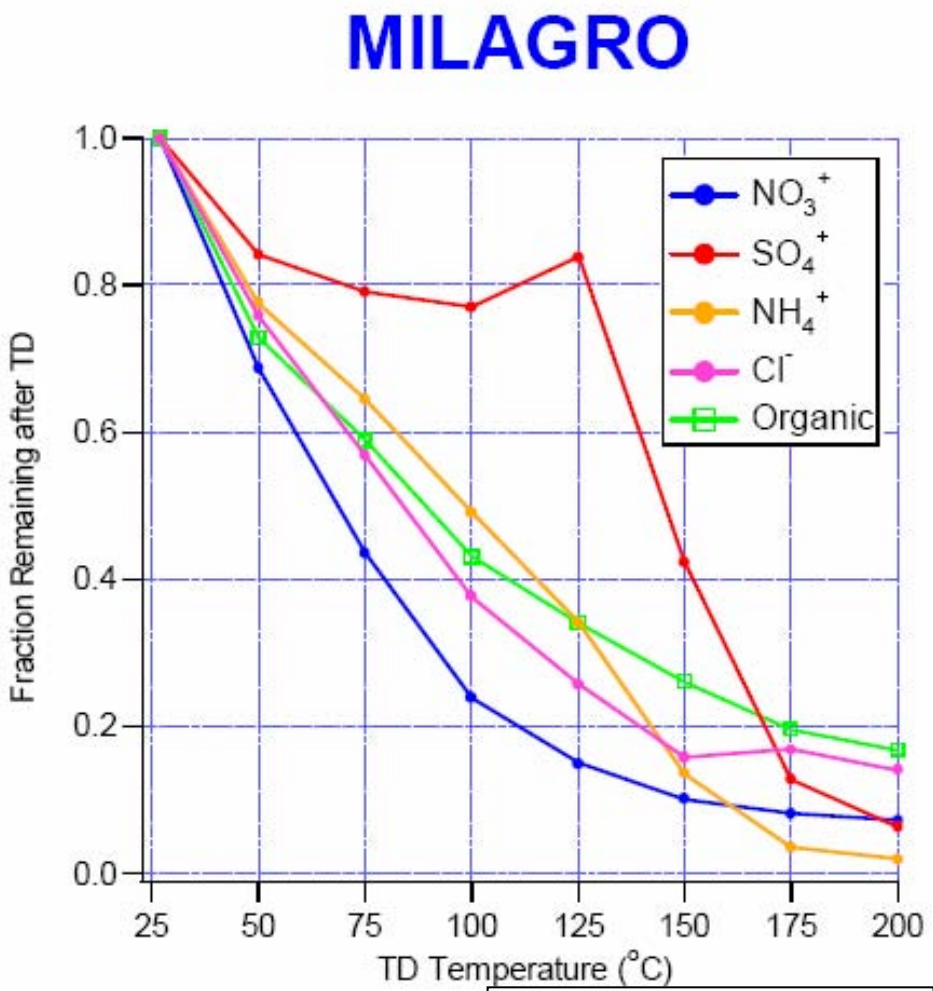
POA Evaporation?

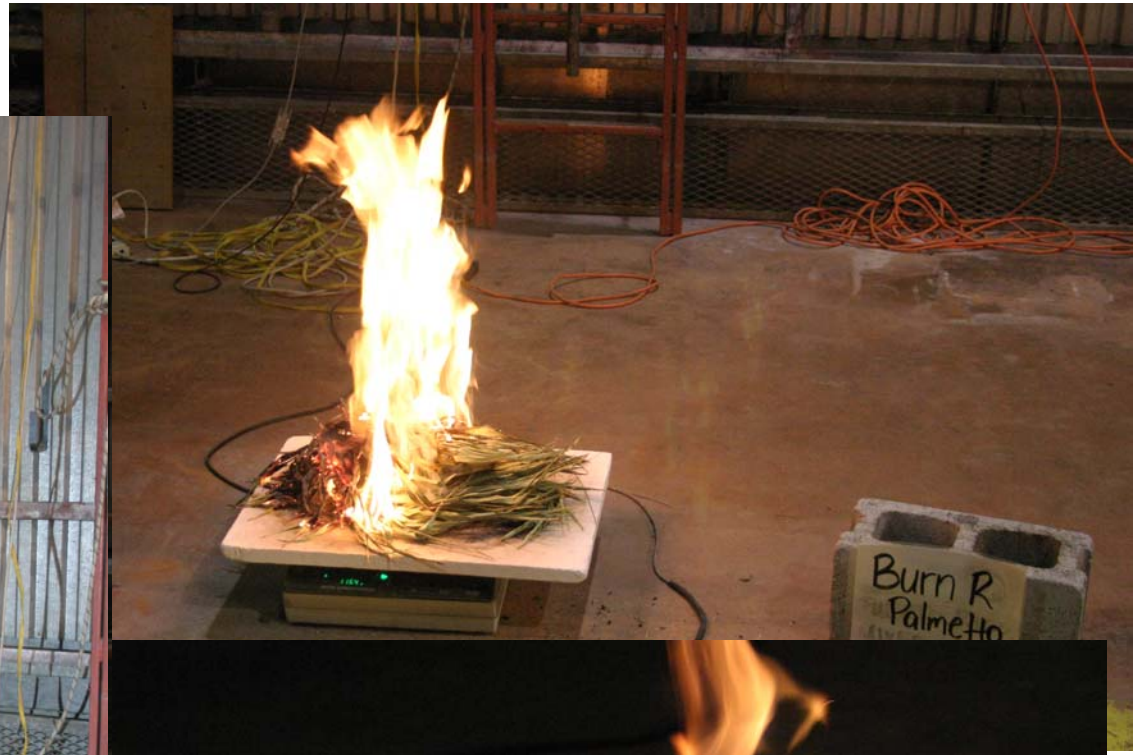
- If nitrate evaporates, does urban and fire POA do the same?



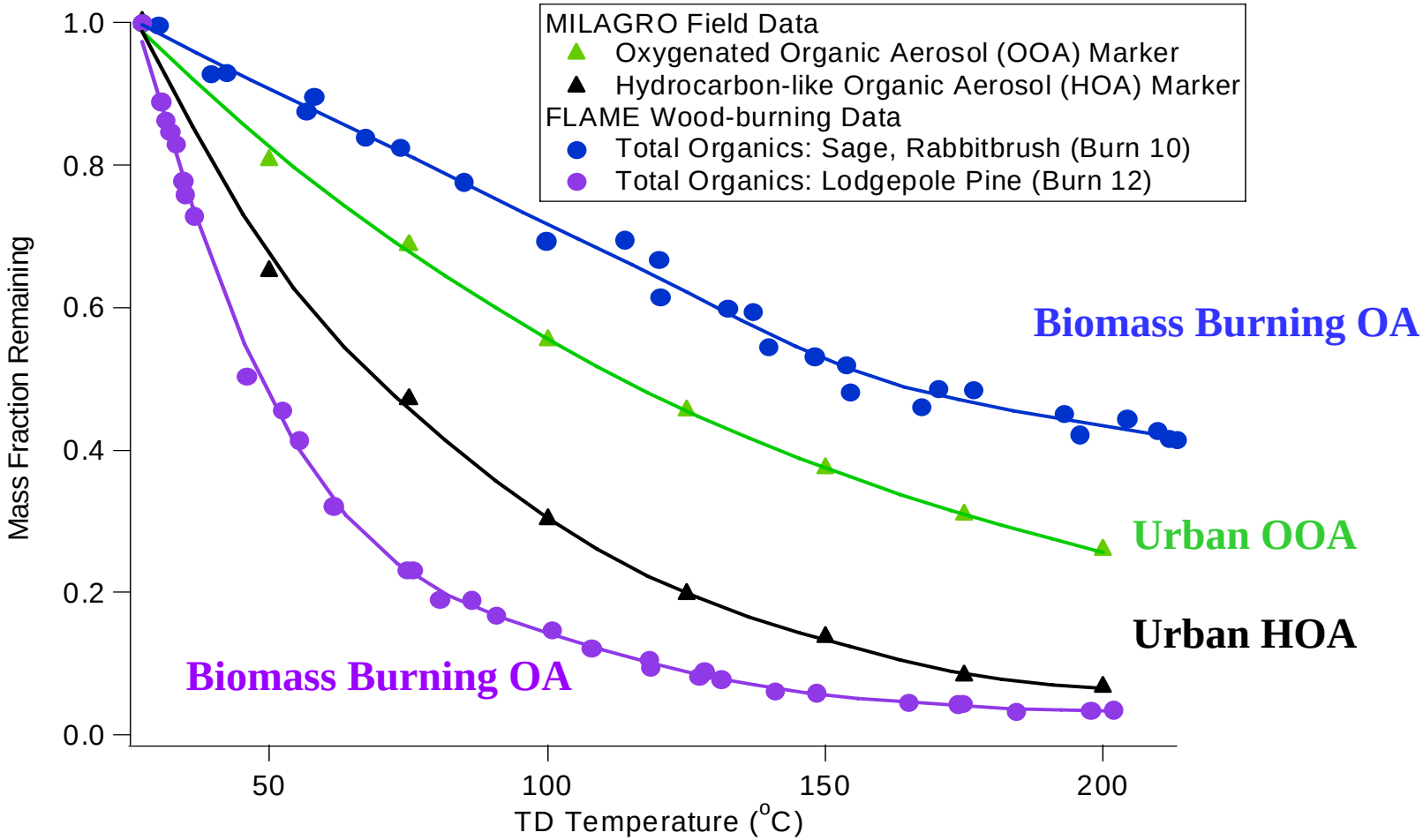


Alex Huffman et al.

FLAME'06 Study



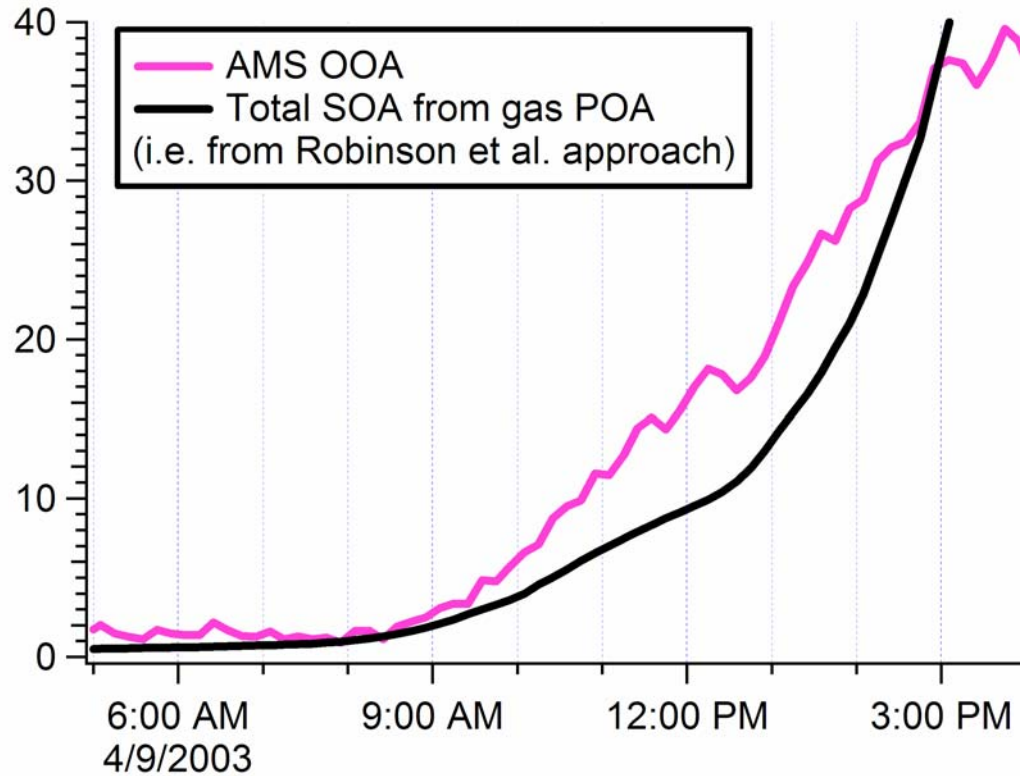
Volatility of Biomass Burning Aerosols



- Urban POA and pine burning is very volatile
  - Evaporation? SVOCs and IVOCs? SOA formation?

Alex Huffman et al.

SOA from evaporated POA



- Robinson et al. (2007) mechanism
  - Can produce enough SOA
    - Injects a very large amount of extra organic mass w/ high yield
  - Predicted composition is not what's observed
  - Timing is delayed

Katja Dzepina et al.

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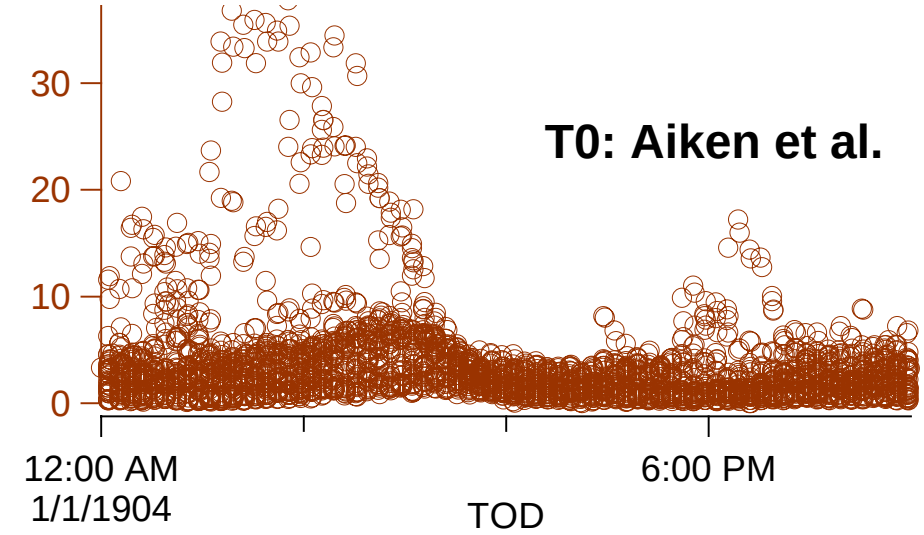
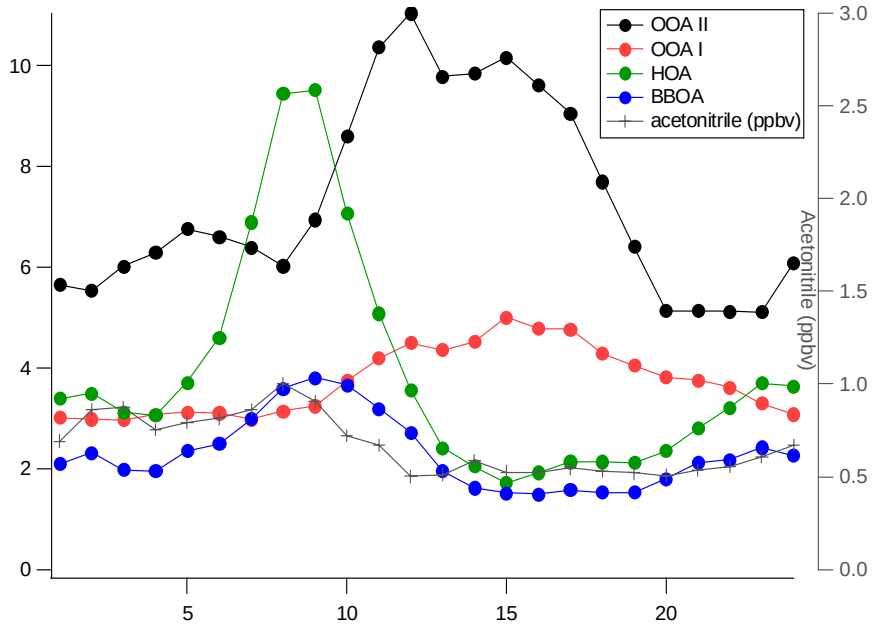
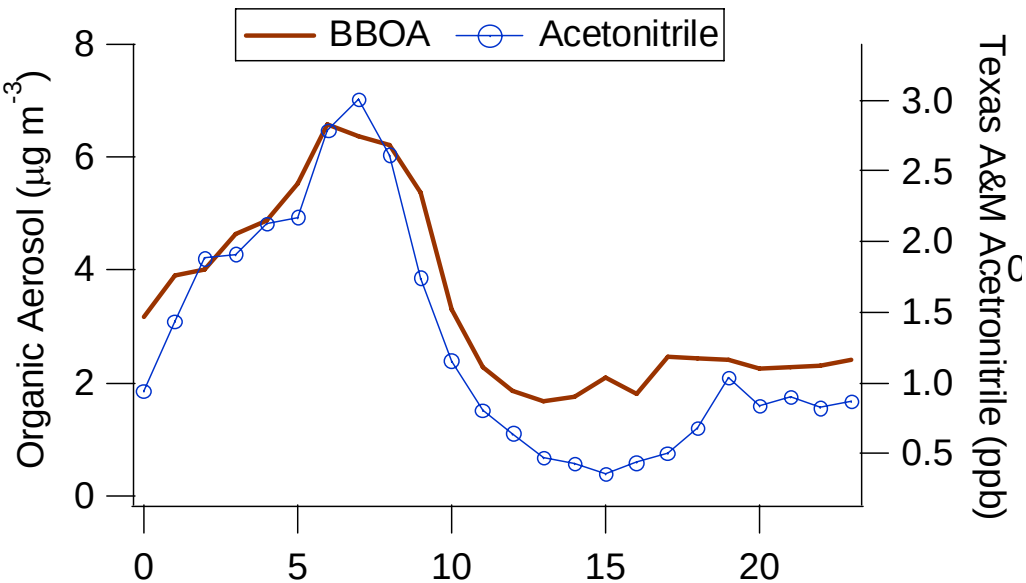
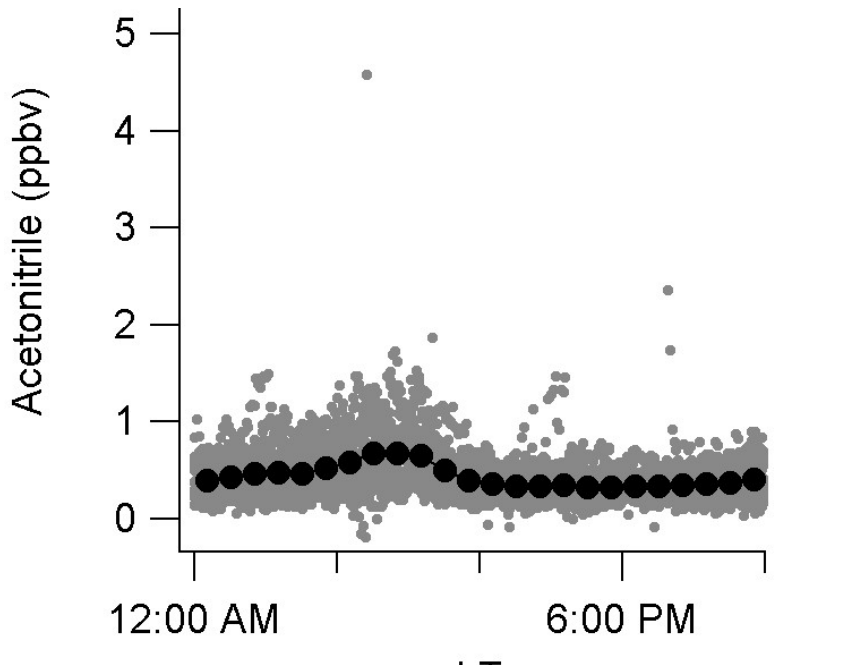
Diurnal cycles of Acetonitrile and BBOA





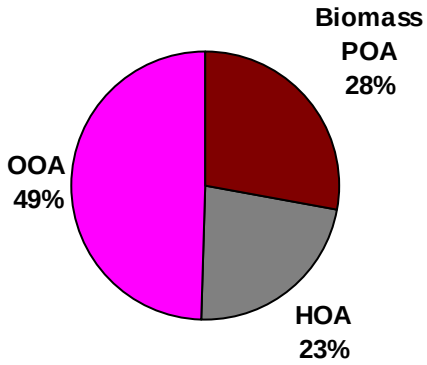




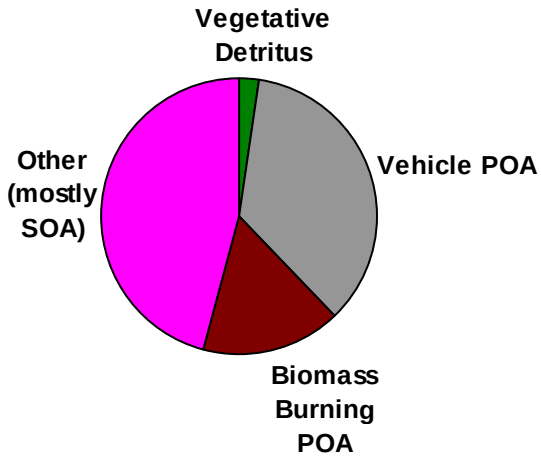
Organic Aerosol Source Apportionment

In Mexico City T0 (IMP)

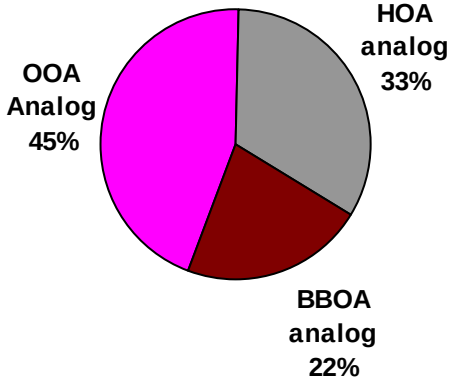
AMS: Aiken et al.



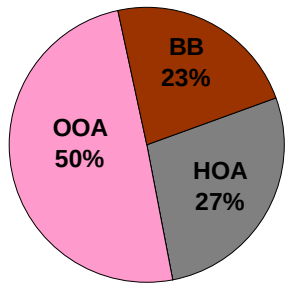
CMB: Stone & Schauer



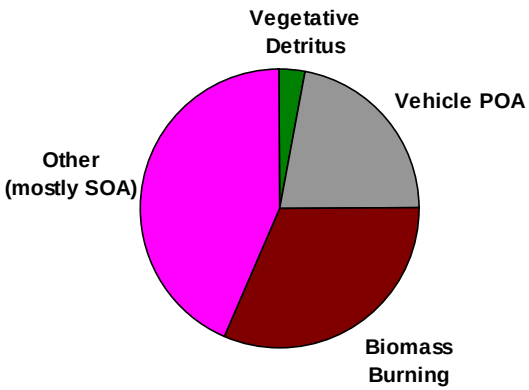
Prevot et al: ^{14}C



AMS for that day

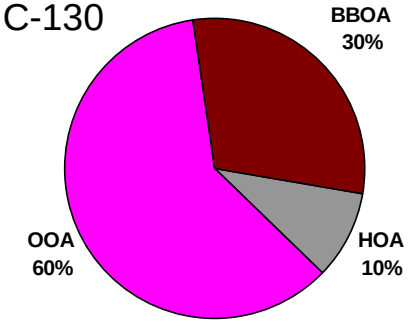


CMB: Schauer et al. T1

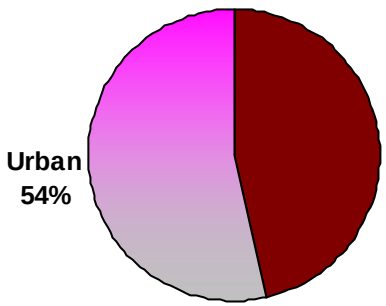


Mexico City Outflow

DeCarlo et al. C-130

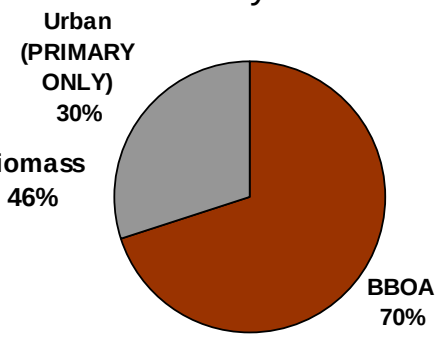


Crounse, DeCarlo et al. C-130

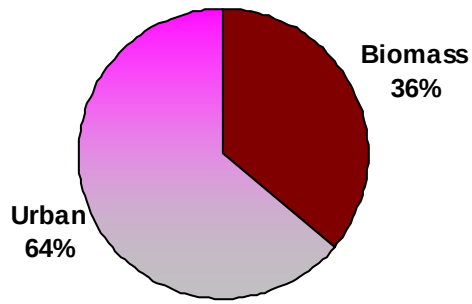


Yokelson et al. – Twin Otter

Primary ONLY



Including SOA



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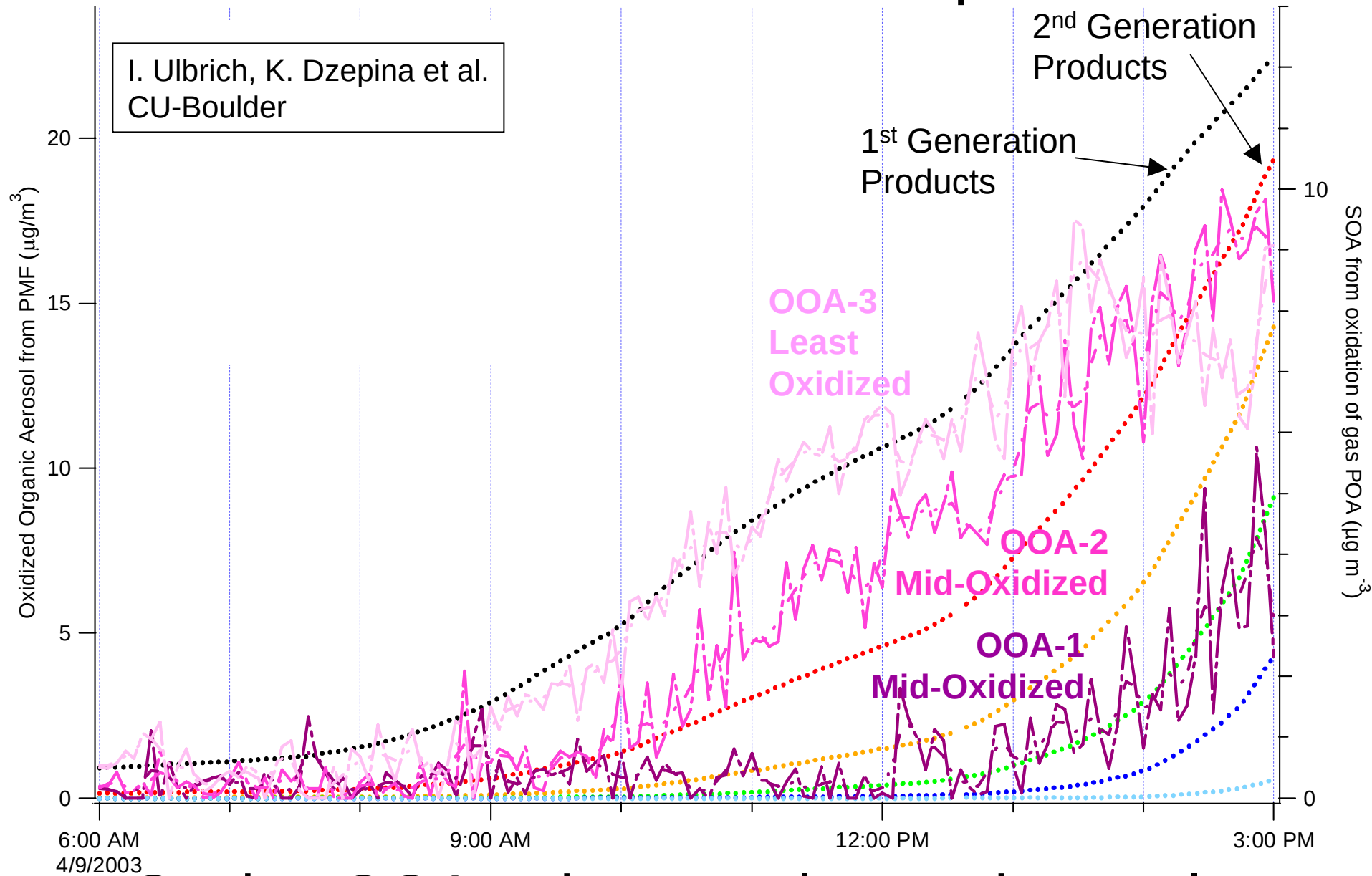
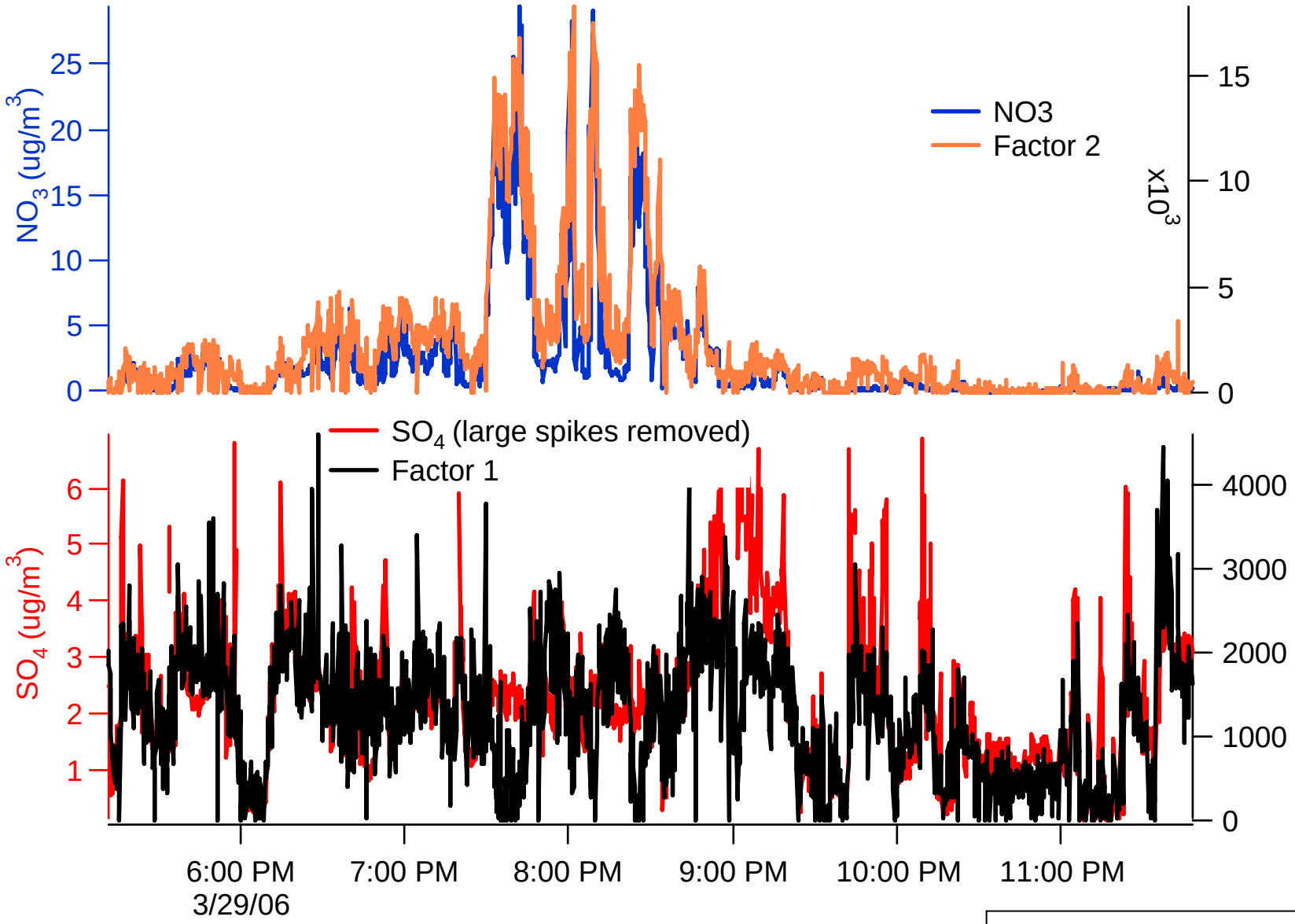
Ground: SOA Evolution on April 9, 2003



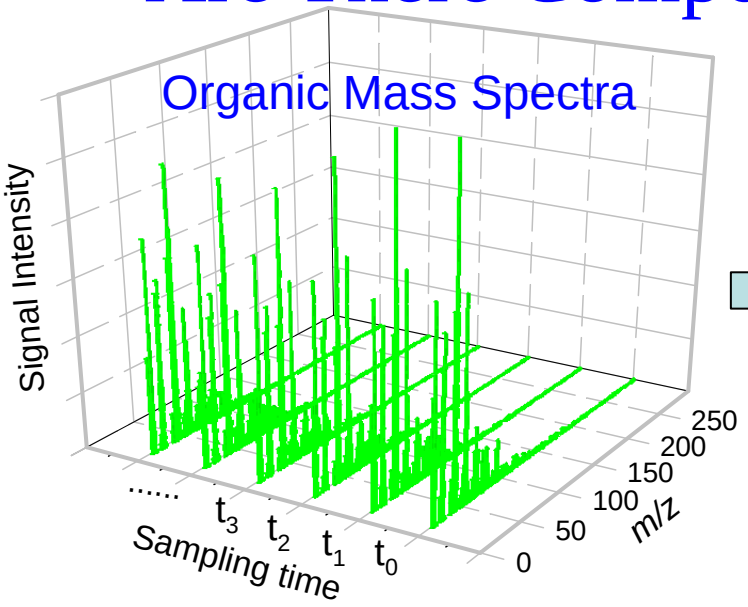
- Seeing OOA aging on relevant timescales

C-130: Factors 1 and 2 with Inorganics



DeCarlo et al. (poster outside)

Are There Components of AMS Organic Spectra?



$$\begin{bmatrix} m_{1,1} & m_{2,1} & \Lambda & m_{300,1} \\ m_{1,2} & m_{2,2} & \Lambda & m_{300,2} \\ \Lambda & \Lambda & \Lambda & \Lambda \\ m_{1,t} & m_{2,t} & \Lambda & m_{300,t} \end{bmatrix}$$

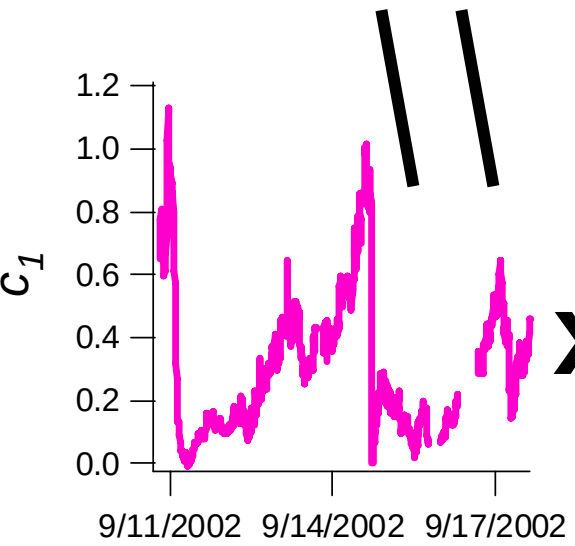
i

t

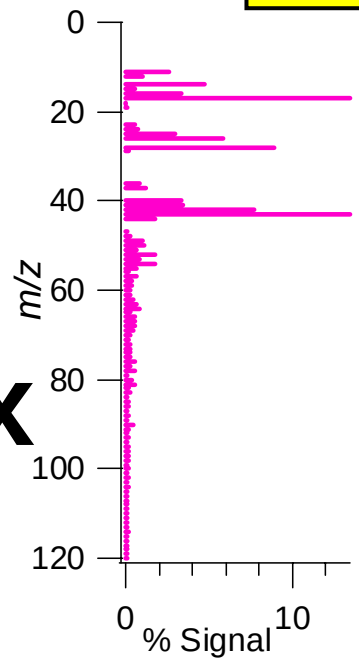
Row: mass spec
Column: t series

Pittsburgh:
$N_t = 3200$
Mexico City
$N_t = 9100$

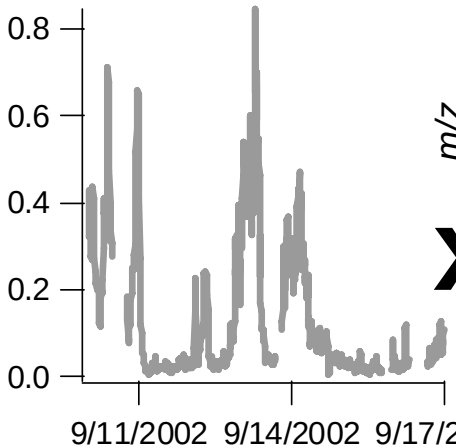
$$\mathbf{ms}_t = c_1 \cdot \mathbf{ms}_1 + c_2 \cdot \mathbf{ms}_2 + \varepsilon_i$$



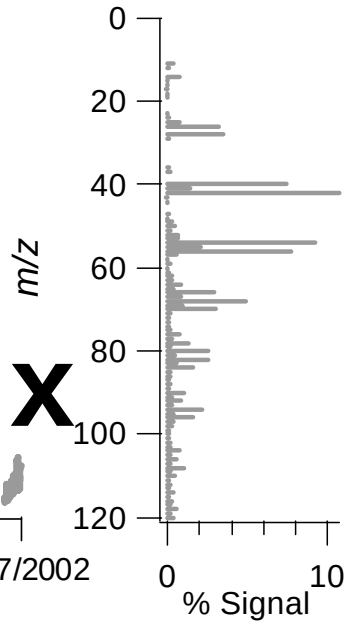
x



+ c2



x



Conceptual Model of OA in Mexico City