



Surface Data Analyses for Houston during DISCOVER-AQ 2013

TCEQ AQRP
Austin, TX
June 18, 2015

Robert J. Griffin
Rice University

Barry L. Lefer
University of Houston



Acknowledgements



Our groups (past & present)

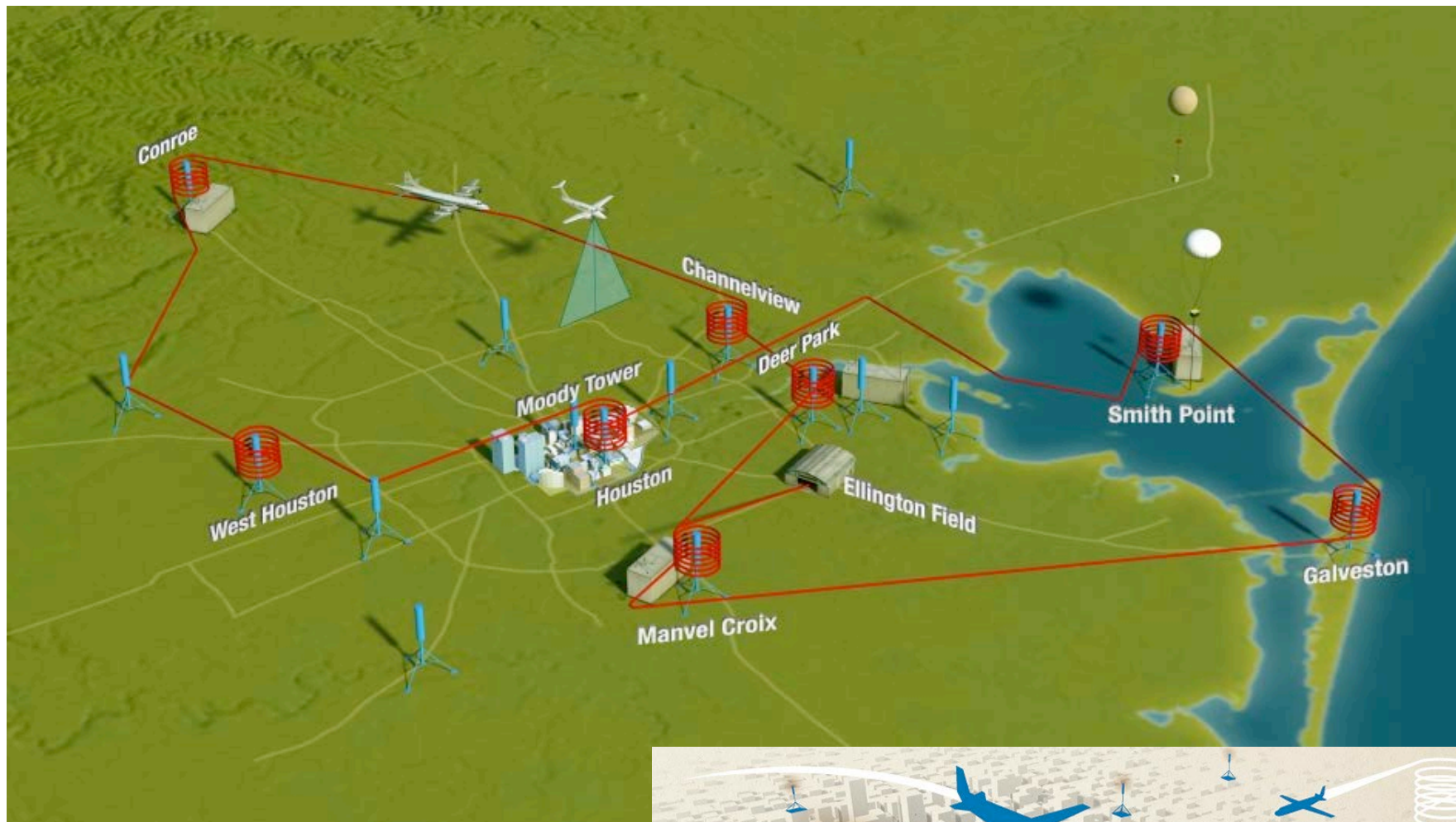
Friends and collaborators too numerous to mention by name

\$\$\$:





DISCOVER-AQ Overview





UH/Rice Mobile Laboratory



RICE®

Mobile laboratory allows sampling while driving and stationary monitoring





MAQL Instrumentation



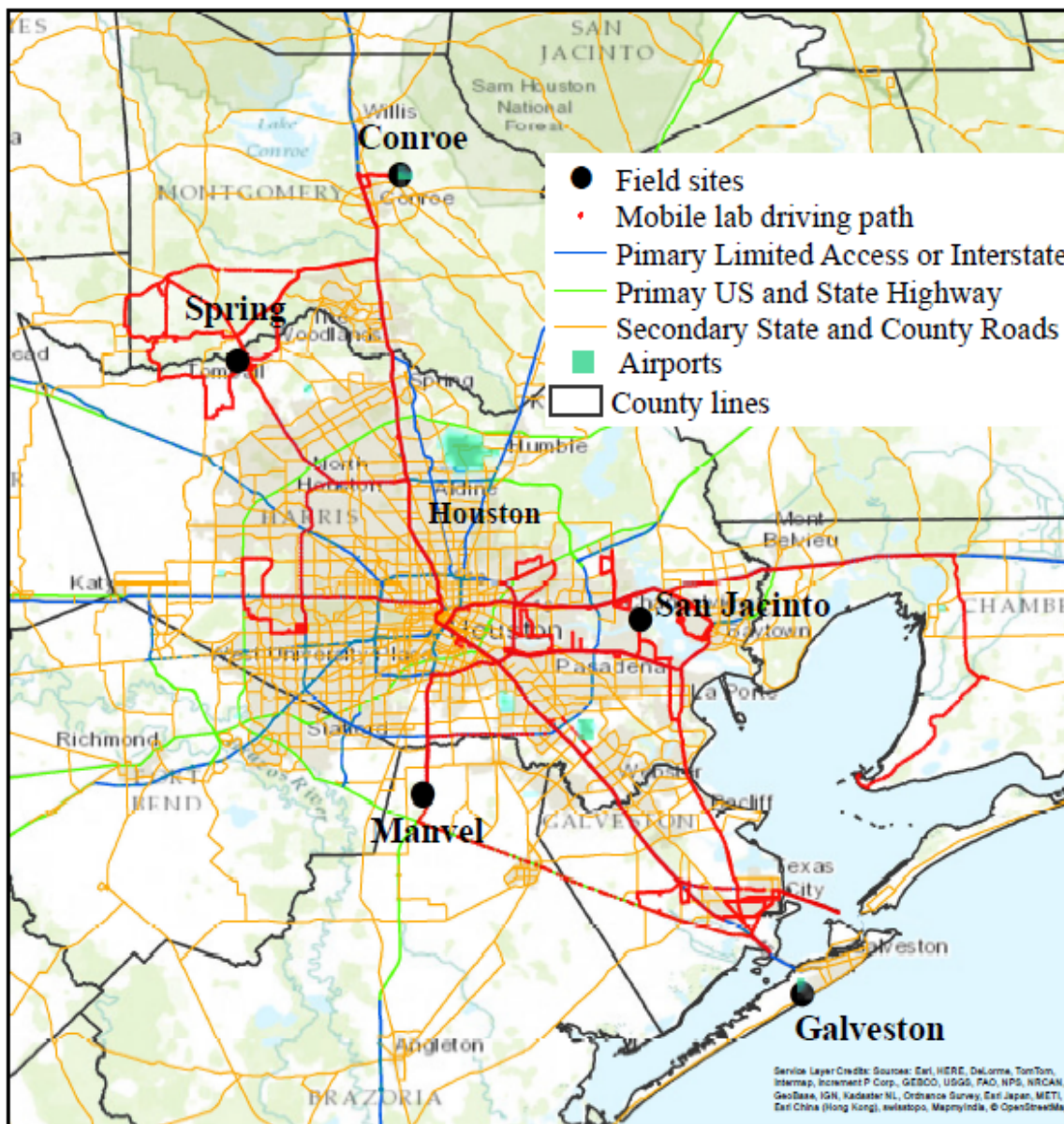
- **Basic instrumentation:**

- High-resolution marine GPS
- RM Young meteorological station (T, P, RH, WS/WD)
- RM Young translator (calculates true winds from vehicle motion and measured winds)
- NO₂ photolysis rate
- Common PC-based data acquisition
- Fore, aft, port, starboard, and sky cameras

- **Chemical instrumentation:**

- UH: O₃, CO, CO₂, SO₂, NO, NO₂, NO_y, particle size distribution, PAH on soot
- Rice: Aerosol composition (Aerodyne HR-ToF-AMS, Magee Scientific Mini Aethalometer)

Sampling Locations





Overview of Project



Project 9

Particulate Matter

- Emissions
 - Events
- Oxidation State
 - Spatial
 - Diurnal
- Secondary Formation
- Biogenic Precursors

Ozone

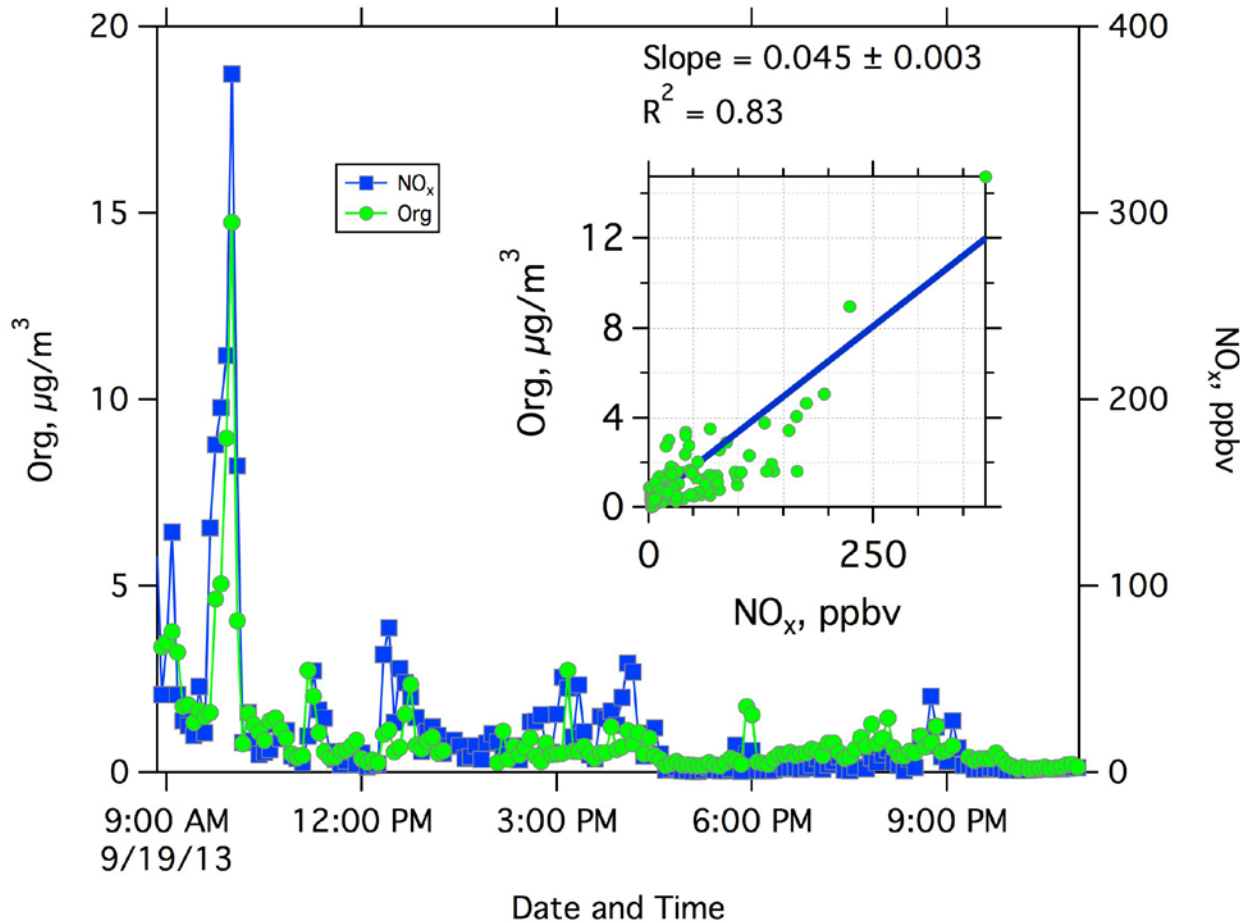
- Biogenic Precursors
- Photochemical Modeling
- Radical Sources

Nitrogen Dioxide

- *In situ*
- Airborne
- Satellite



Vehicle Emissions Factors



Use deltas relative to background

Slope gives relative emissions ratio

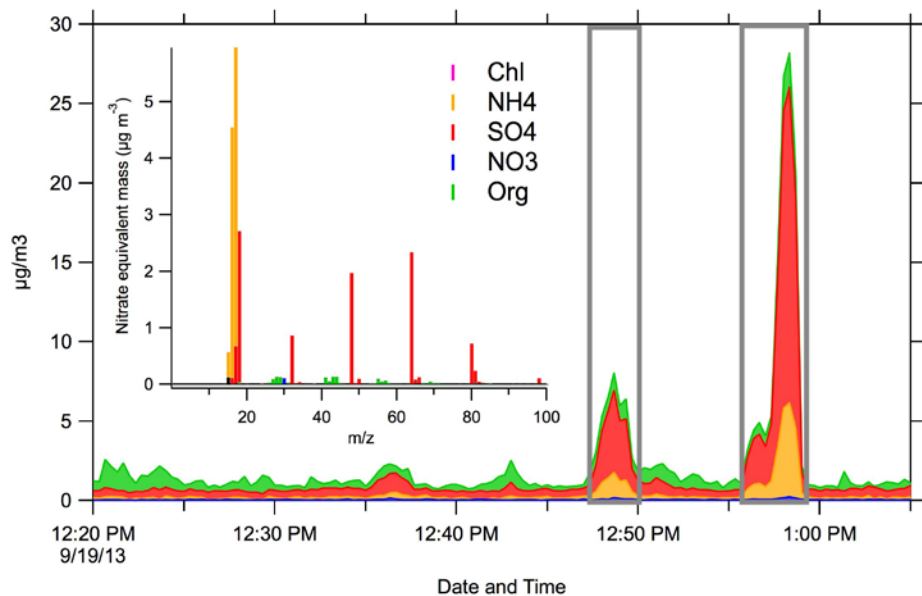
Consider expected NO_x EF from MOVES

Slope and NO_x EF → Org EF

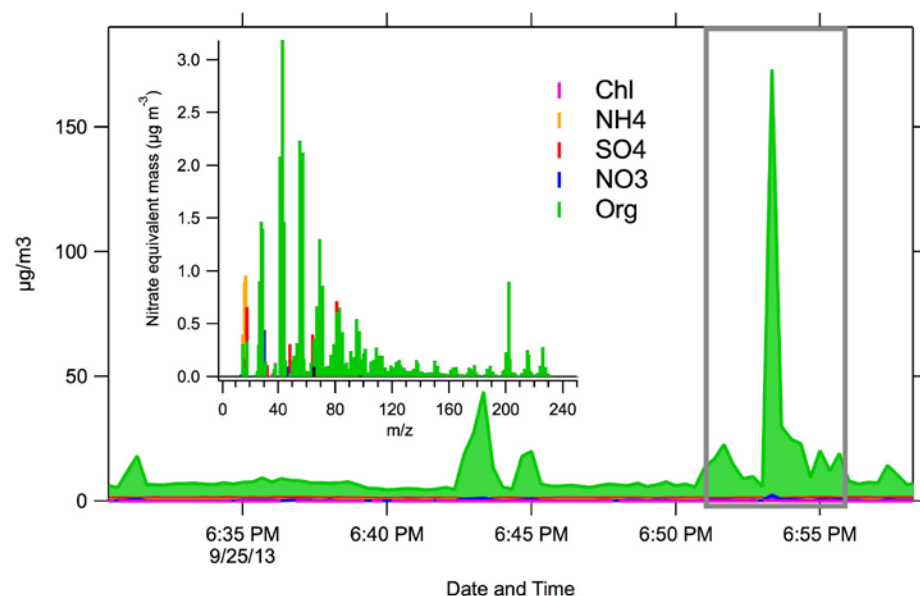
Range of values: 0.14 to 13.74 g OA/mile driven



Peak Events



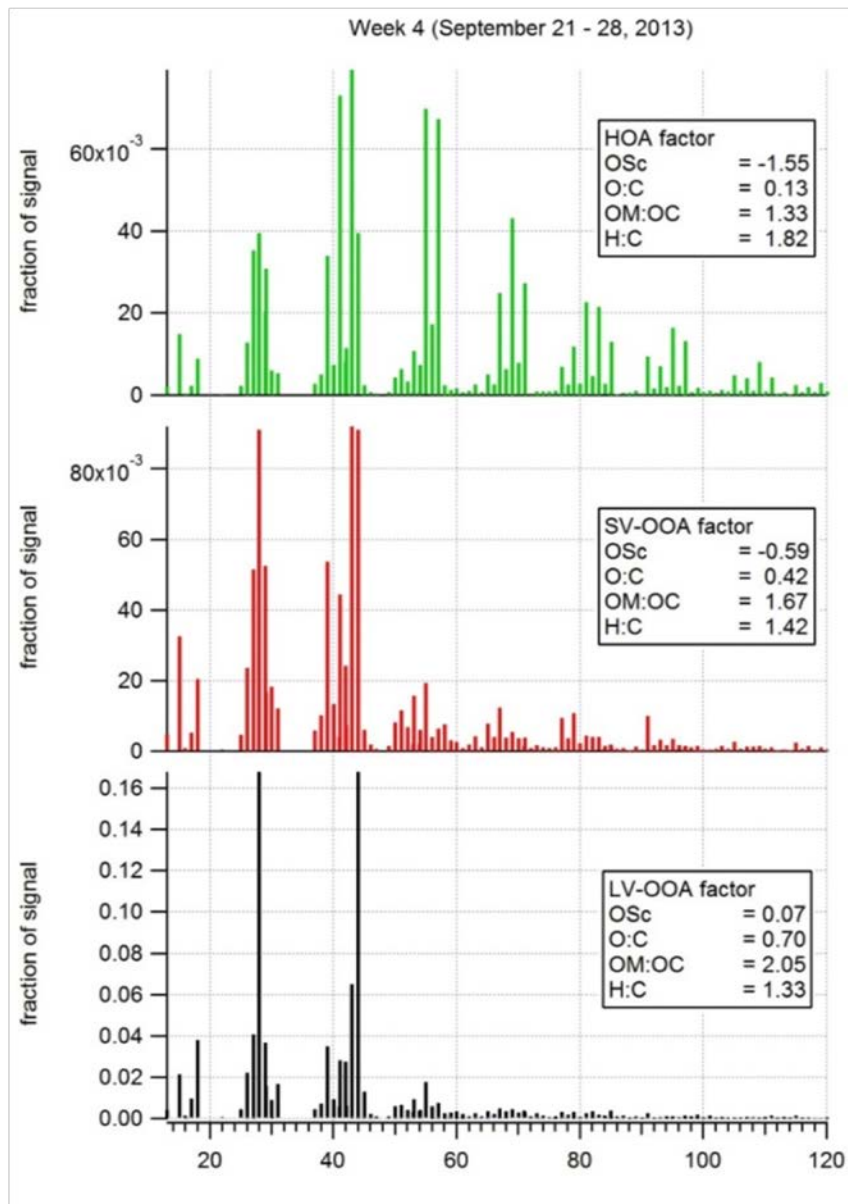
Petrochemical Plant



Modified Diesel

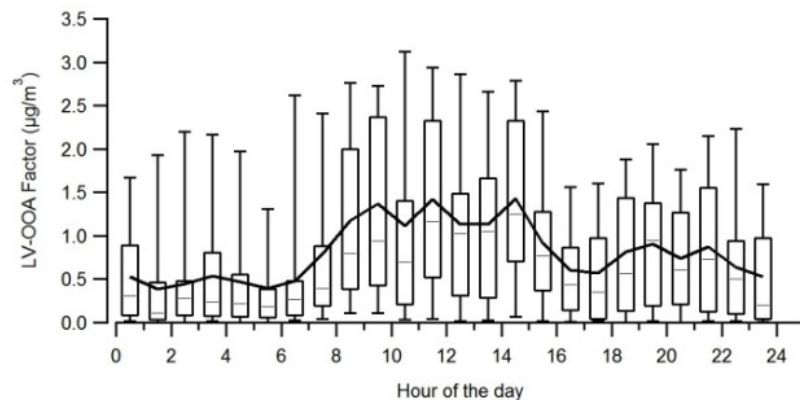
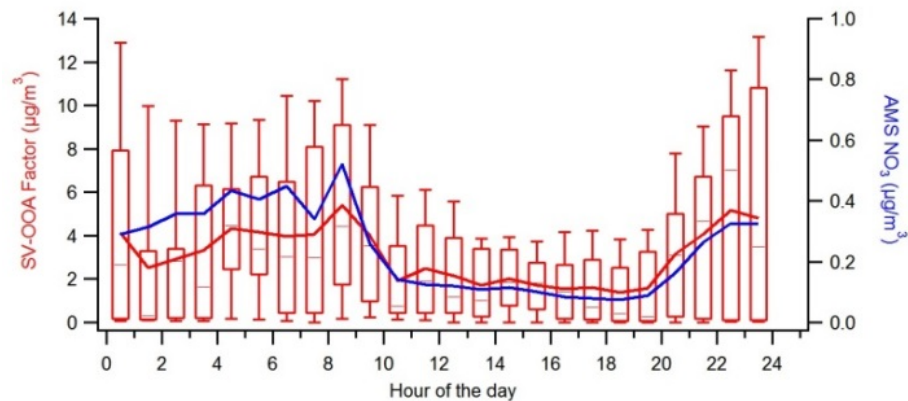
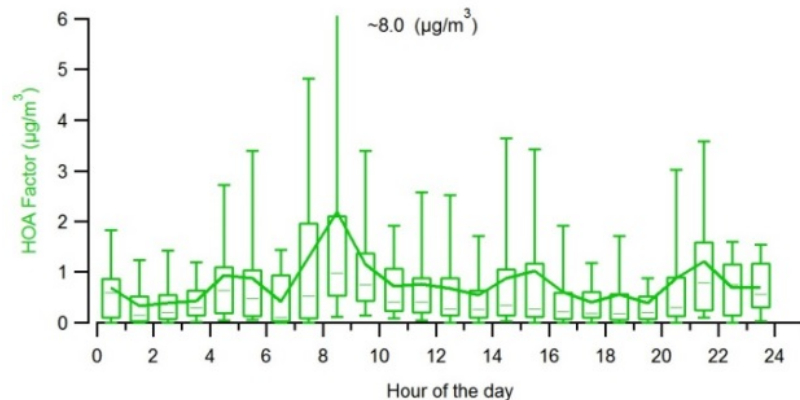


Example Factorization (1)



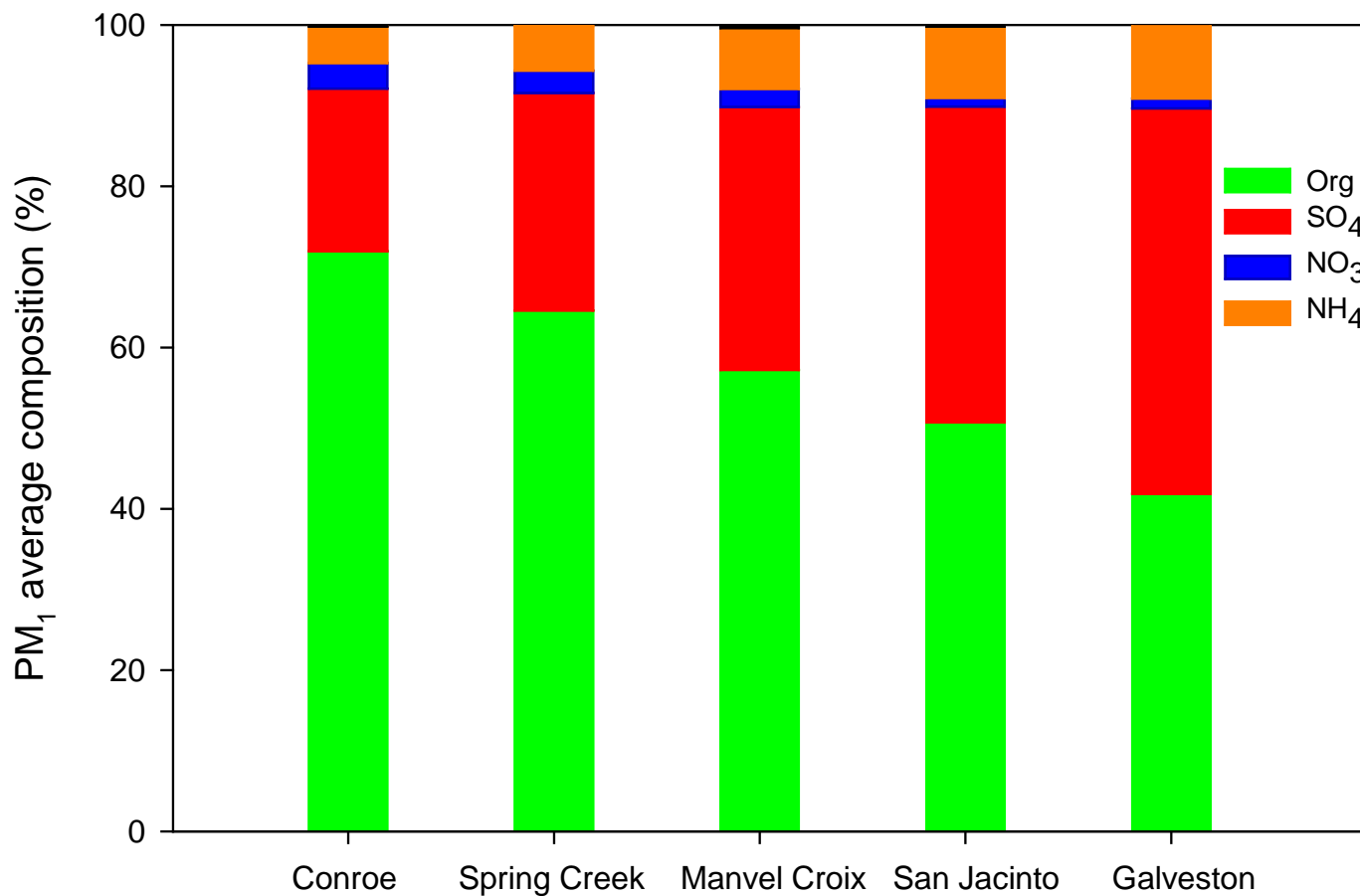


Example Factorization (2)

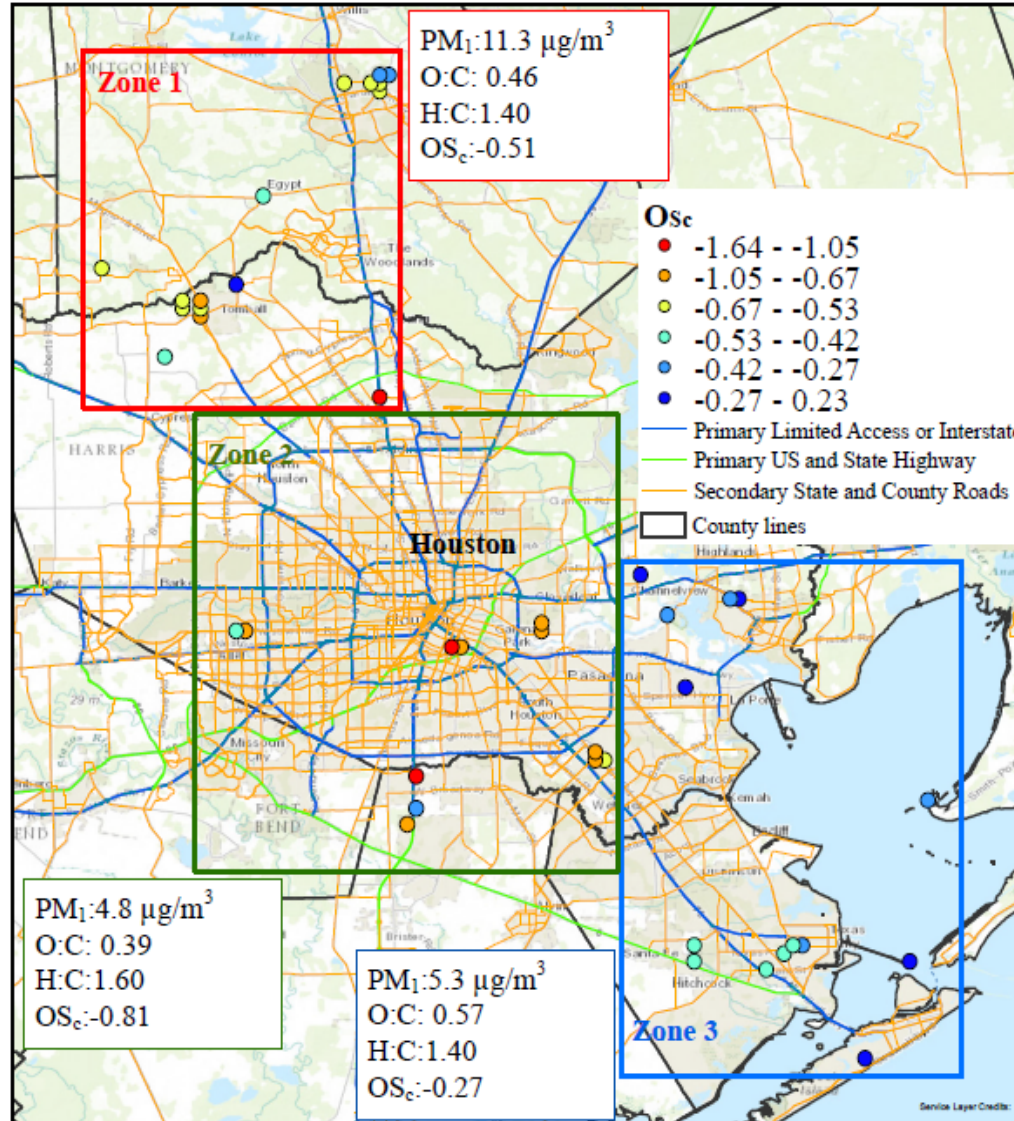




Analysis By Site



Analysis By Zones

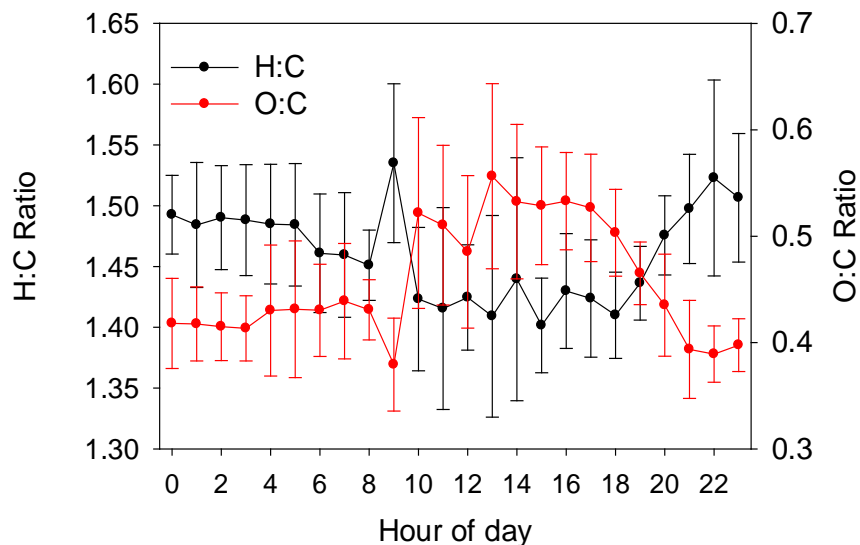




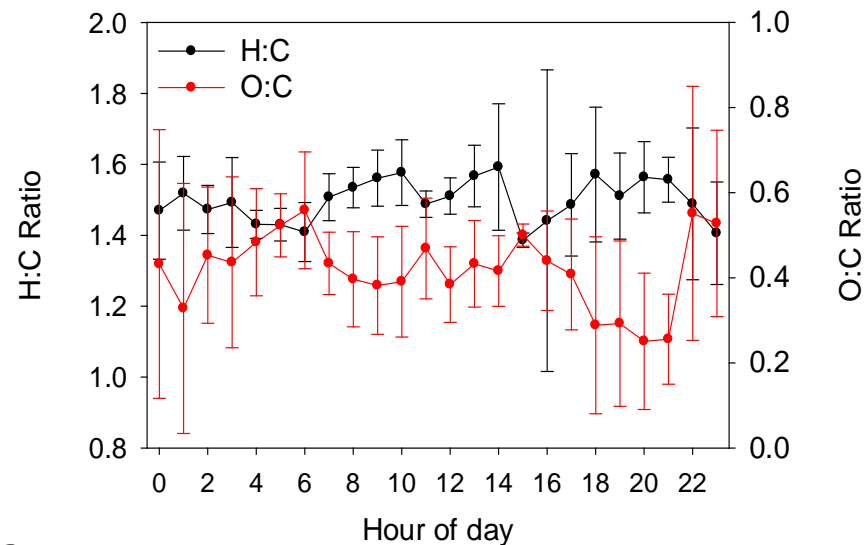
Diurnal By Zone



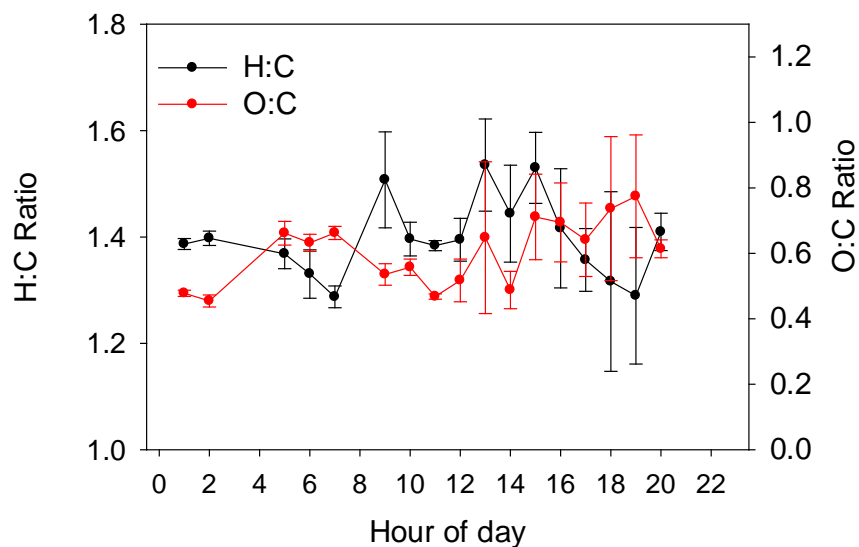
1



2

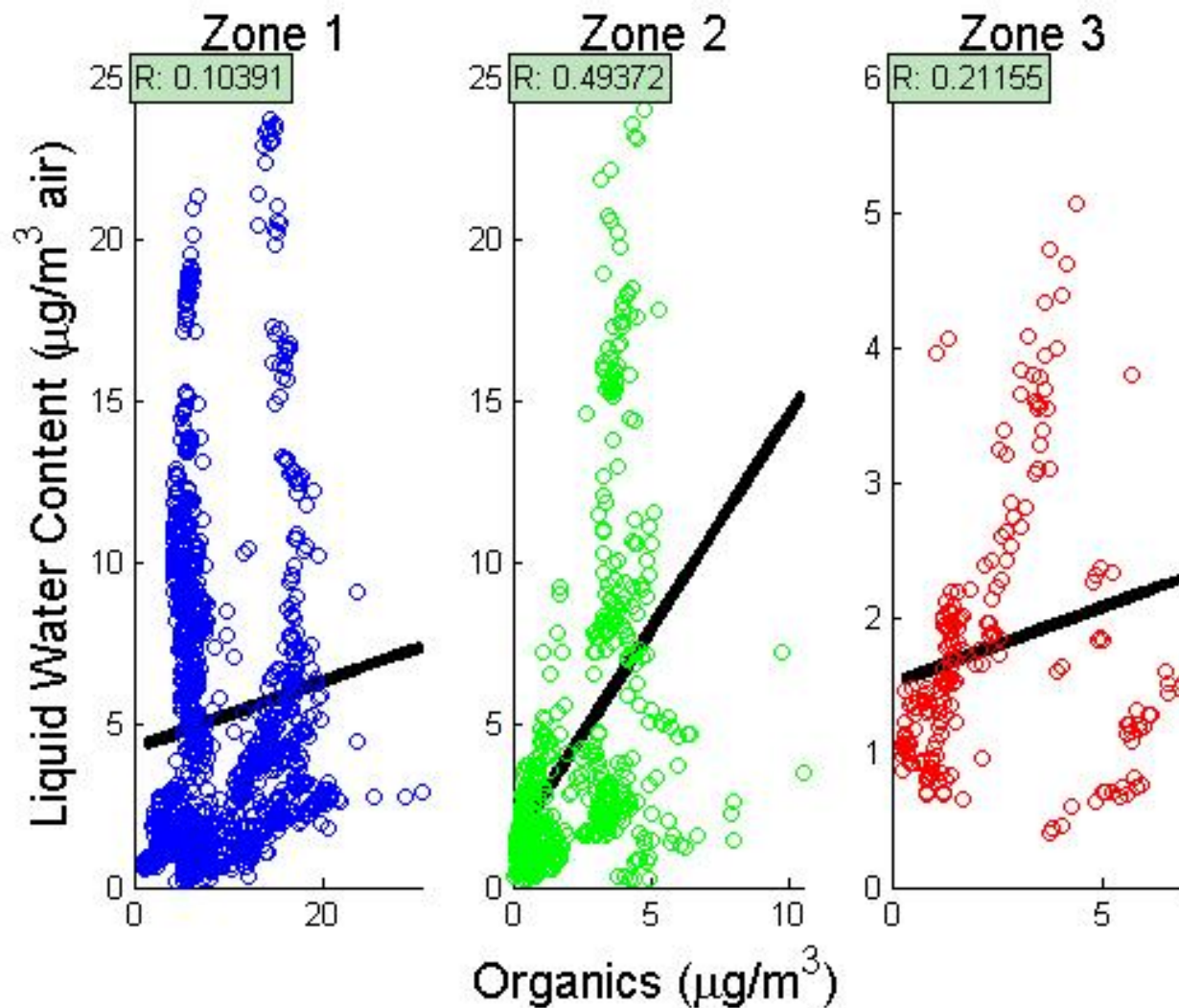


3



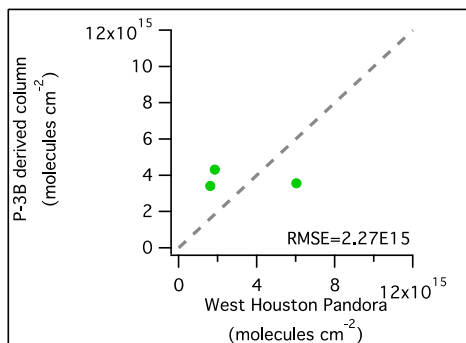
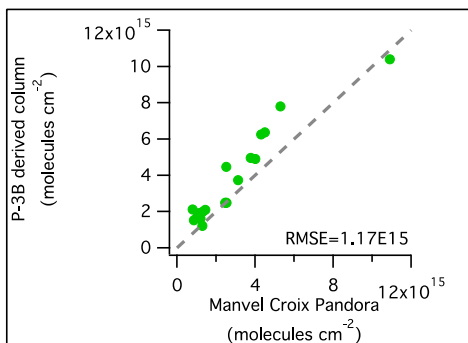
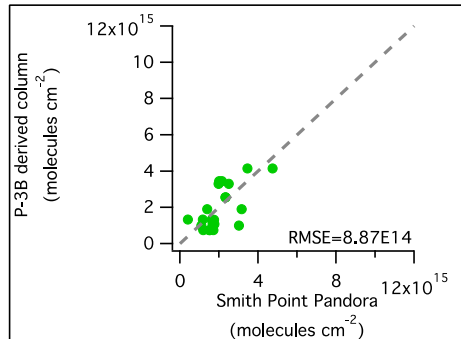
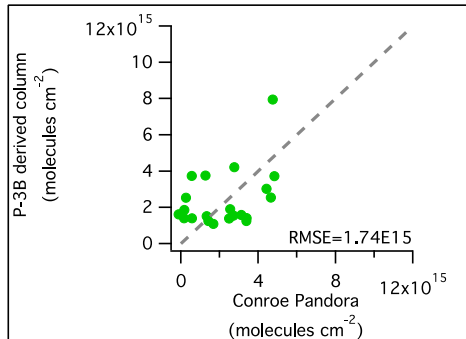
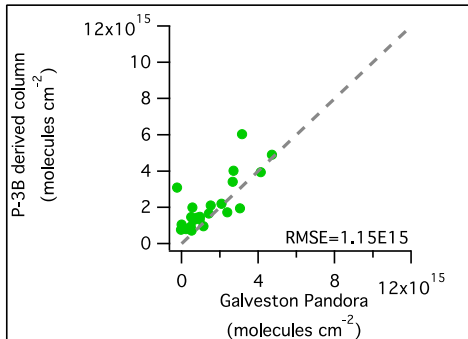
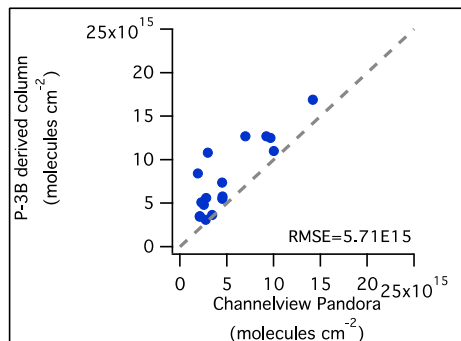
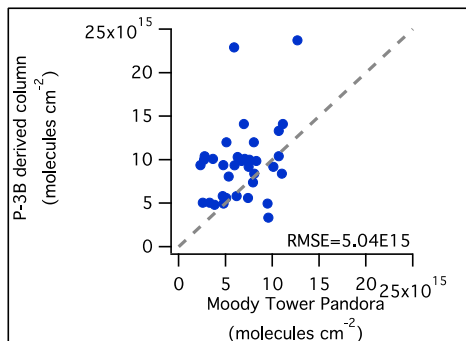
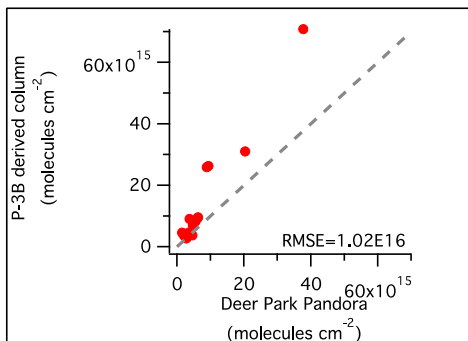


Organic-Water Link





Pandora-P3B Comparison

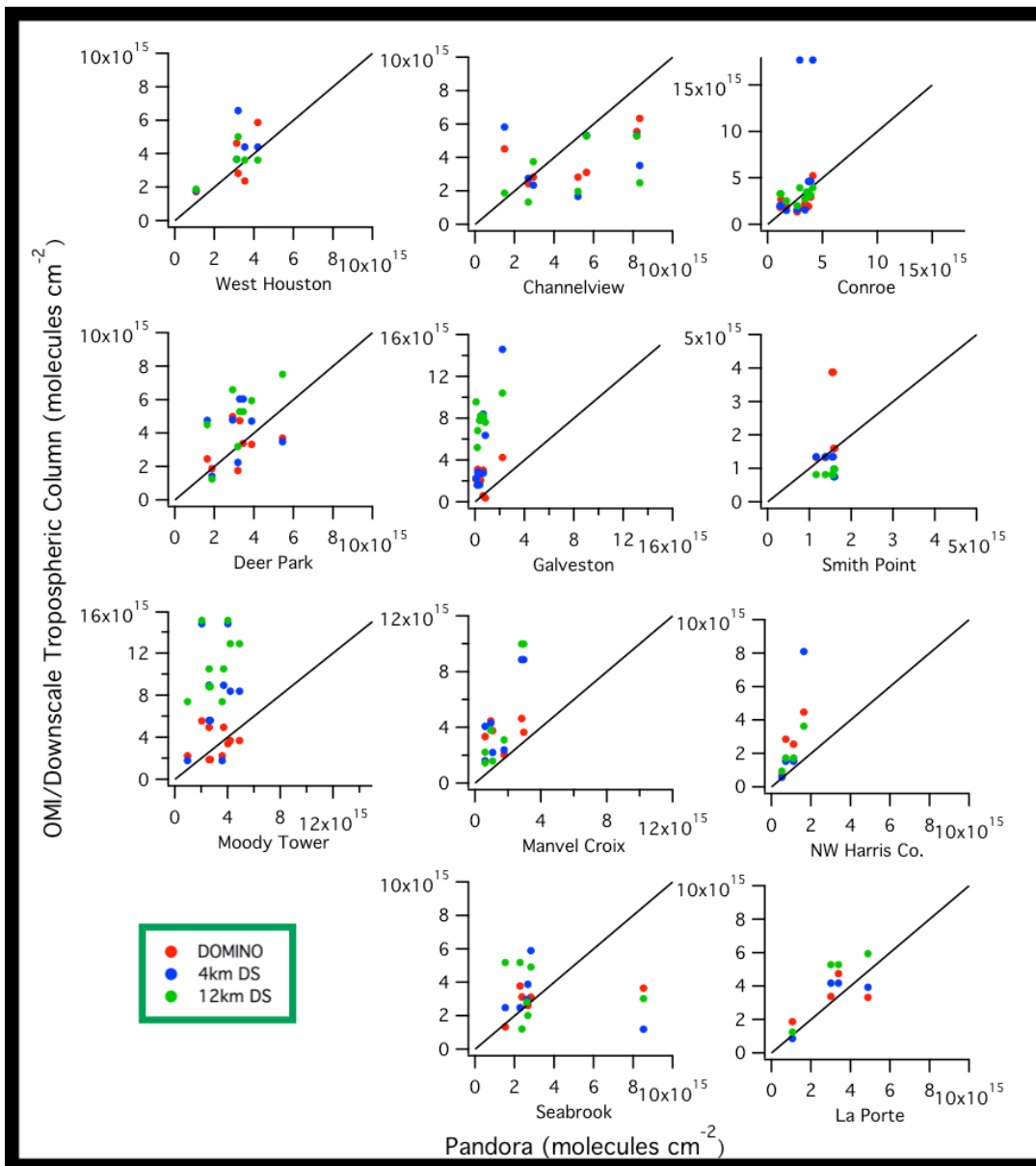


Pollution levels:

Red > Blue > Green

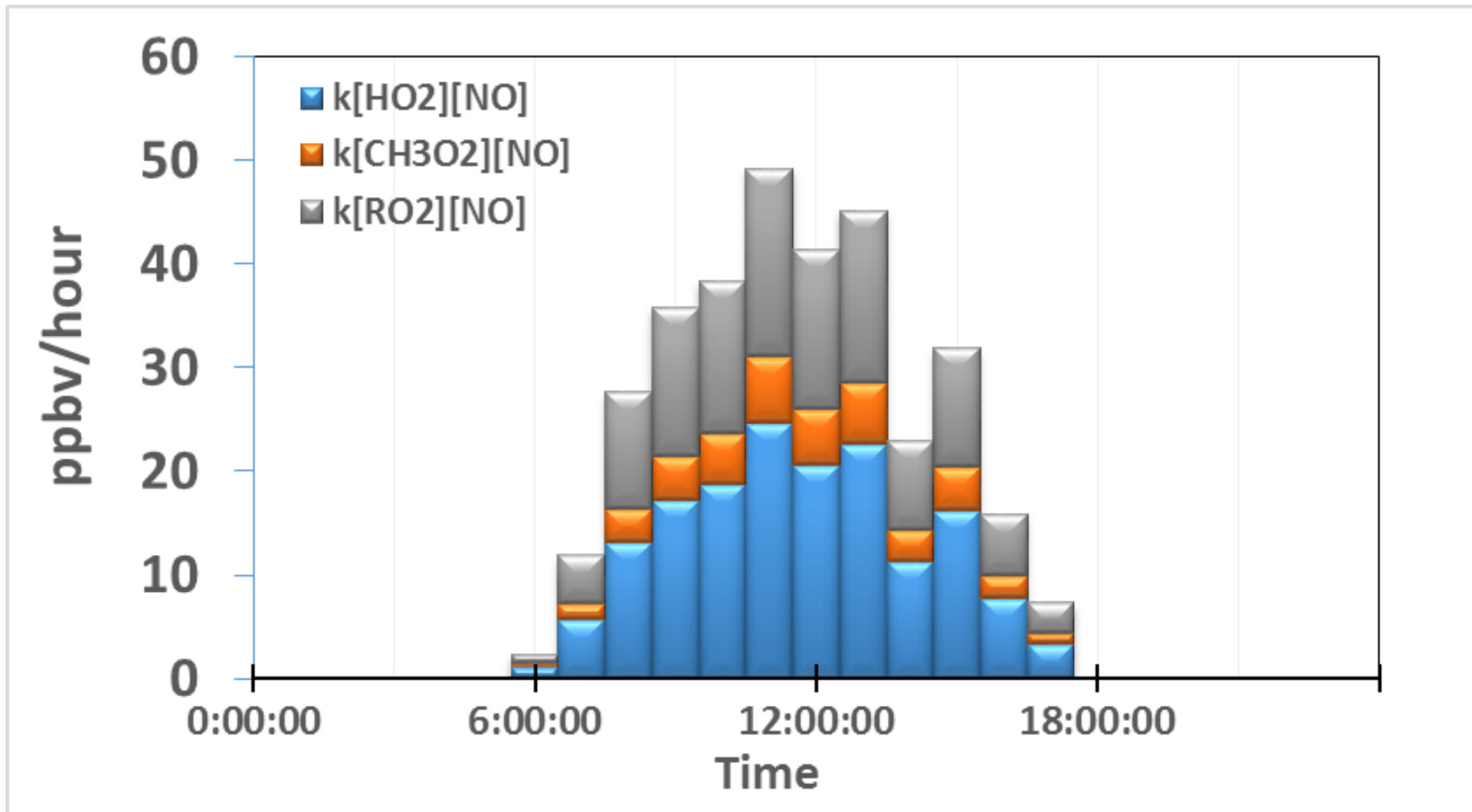


Pandora-OMI-CMAAQ





Ozone Production





Remaining Work



All tasks considered complete except:

- LWC-OOA and temporal regressions
- Radical modeling (scenarios established)

Final report due 30 June 2015

Conversion of findings and report into publishable materials (six potential manuscripts identified)



Conclusions



- Suggestion of continued support of mobile operations to understand the dynamics and controlling processes for PM in Houston
- Continued vehicular and open burn control programs
- Interplay between NO_x and secondary PM critical to understand
- Need to better understand what role RH plays in PM formation, as it is not controllable and likely to change