

FROG-NY

Fluxes of Reactive Organic Gases in New York

Delphine Farmer (Colorado State University)

Dylan Millet & Tim Griffis (University of Minnesota)

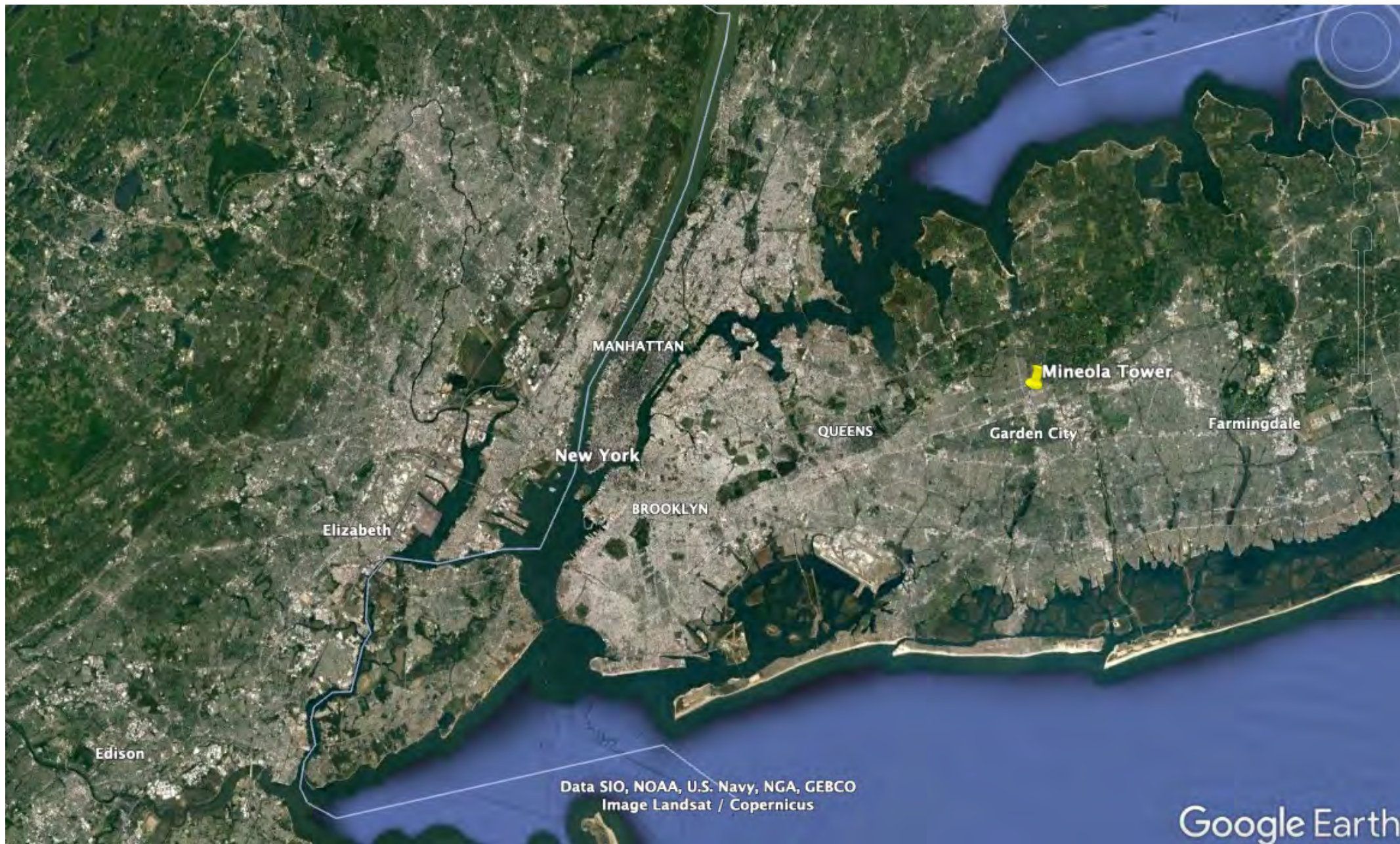


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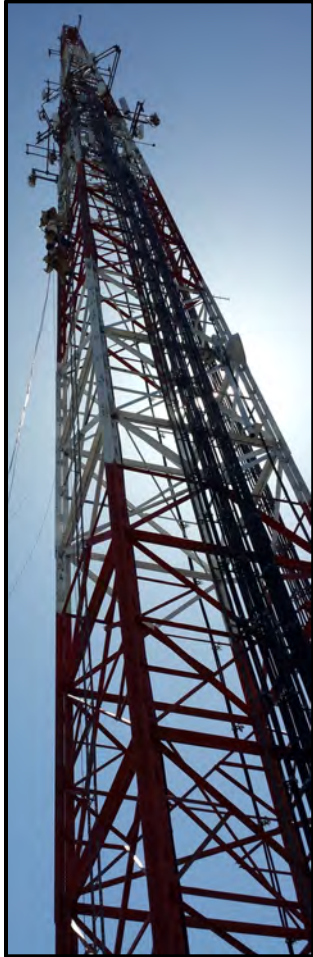
Science Questions

- 1) What are the *bi-directional urban fluxes of reactive organic carbon*?
- 2) How do these fluxes (individual molecules, classes of VOCs, overall ensemble) *vary on hourly, daily, and weekly timescales*?
- 3) What is the *relative importance of VOC emissions from fossil fuels, VCPs, the biosphere, and other sources for the observed organic carbon, OH reactivity, and SOA formation budgets of the New York metropolitan atmosphere*?
- 4) How do carbon dioxide (CO_2) *fluxes co-vary with the VOC ensemble vs chemical tracers? What are the implications for greenhouse gas (GHG) source partitioning*?
- 5) How do the observed VOC emissions contrast with *inventory estimates*?

Flux Tower Site Location: Mineola, NY



Approach: Dual TOF-CIMS for ROC fluxes, gradients and concentrations

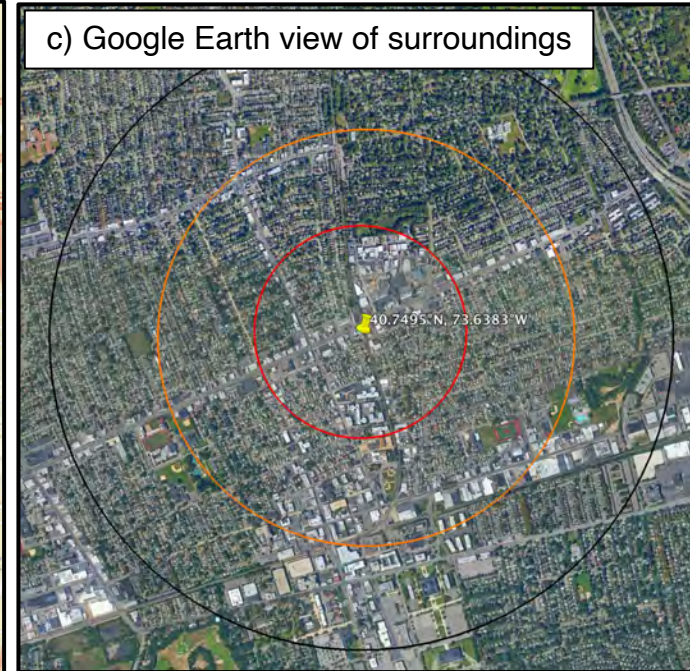
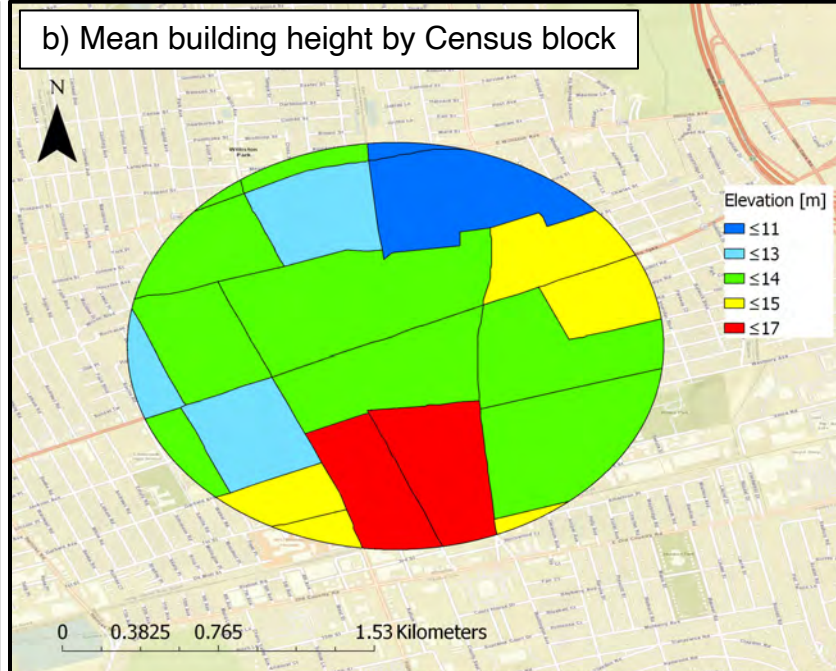
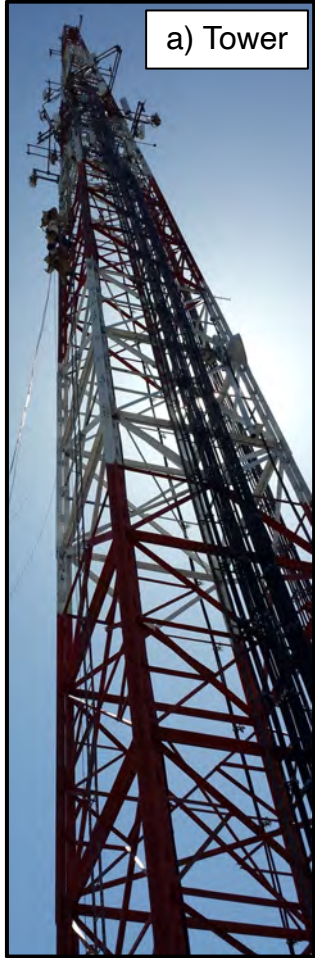


- Eddy covariance flux measurements using the UMN-PTR and CSU-CIMS at a tower site in the New York metropolitan area
 - Fluxes, gradients (50 m vs 76 m), concentrations
- Together, H_3O^+ and I^- CIMS reagent ions capture the majority of gas-phase reactive organic carbon to chemically quantify urban-atmosphere VOC exchange



UMN and CSU teams recently worked together to make similar measurements at Manitou Experimental Forest, CO

Our flux tower: Cellular tower in Mineola, NY



- Mainly residential area with on-site meteorological measurements (Weatherbug)
- NIST runs [CO₂] and [CH₄] at 50 and 76m AGL
- We will install sonic anemometers and heated sampling inlets at 50 + 76m
- Instruments will alternate hourly sampling between the two heights to quantify fluxes and vertical gradients.
- Supplement additional measurements to provide context (CO₂ fluxes, aerosol, trace gases)

Measurements: Gas-phase

Fluxes + Gradients/Concentrations

- Volatile Organic Compounds (PTR-TOF; Millet)
- More oxidized organic compounds (I-CIMS; Farmer)
- HCHO / HCOOH (EPA: Whitehill, Valin)
- CO (NOAA: Peischl)
- CO₂, H₂O (Millet)

Gradients / Concentrations

- Ozone (Farmer, 2BTech)
- NO_x (Farmer, chemiluminescence + blue light converter)
- SO₂ (Farmer, Teledyne T100U)

Concentrations (ground level)

- Gas-phase off-line sampling for GC-MS analysis (CSU)
- NH₃ (NOAA – Lichiheb, Saylor)

Measurements: Gas-phase

Fluxes + Gradients/Concentrations



Trey Maddaleno
(UMN, grad student - PTR)



Dr. Michael Vermeuel
(UMN, postdoc)

Gradients / Concentrations



Katelyn Rediger
(CSU, grad student - CIMS)

Measurements: Particle phase (all near-ground)

- Sub-micron non-refractory composition (TOF-ACSM)
- FIGAERO-CIMS
 - Long-integration with infrequent (2x/day?) sampling due to flux sampling
- Size distributions
 - May be sporadic as SMPS will be shared with GOTHAAM AMS calibrations if anyone can loan us an SMPS or equivalent?



Dr. Emily Barnes Franklin
(CSU, NSF Postdoc)



Katelyn Rediger
(CSU, grad student - CIMS)