COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Greenhouse Gas Emissions and Air Quality in New York City: Measuring CO_2, CH_4, N_2O coupled with CO, NOx, etc

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Funding Provided By:
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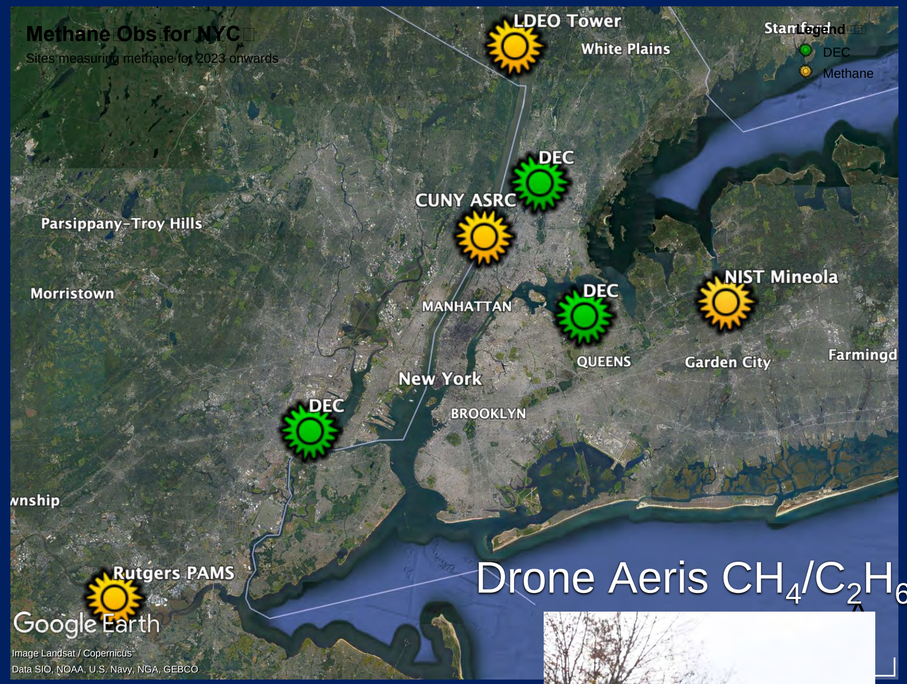
NYC GHG Network: CO_2, methane, N_2O

Long-term Towers



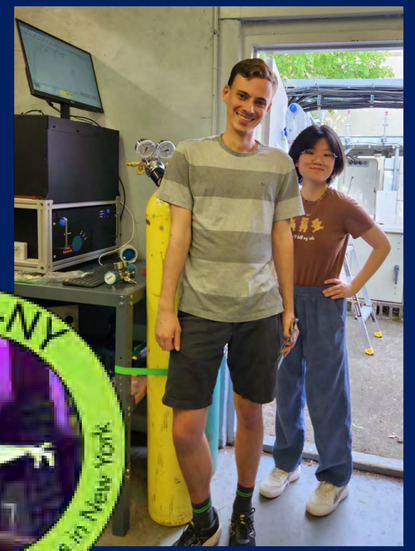
Rutgers, CUNY ASRC,
LDEO (Murray),
Mineola (NIST)
Picarro 2401 or 2301:
CO_2/CO/CH_4

Aerodyne QCLS
CO_2/CO/N_2O and
methane/ethane
Usually at ASRC

Drone Aeris CH_4/C_2H_6

Mobile Lab Licor CO_2/CH_4,
Aeris CH_4/C_2H_6, N_2O/CO

Mineola Summer 2023



FROG-NY
Fluxes of Reactive Organic Gases in New York

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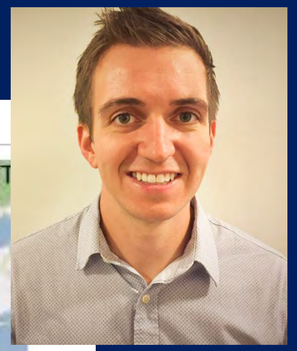
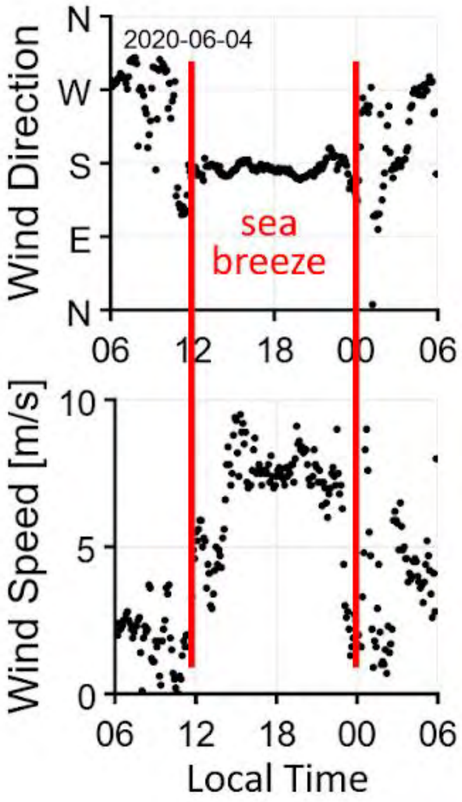
Calculating Surface Influence: Meteorology fields (HRRR) coupled to STILT

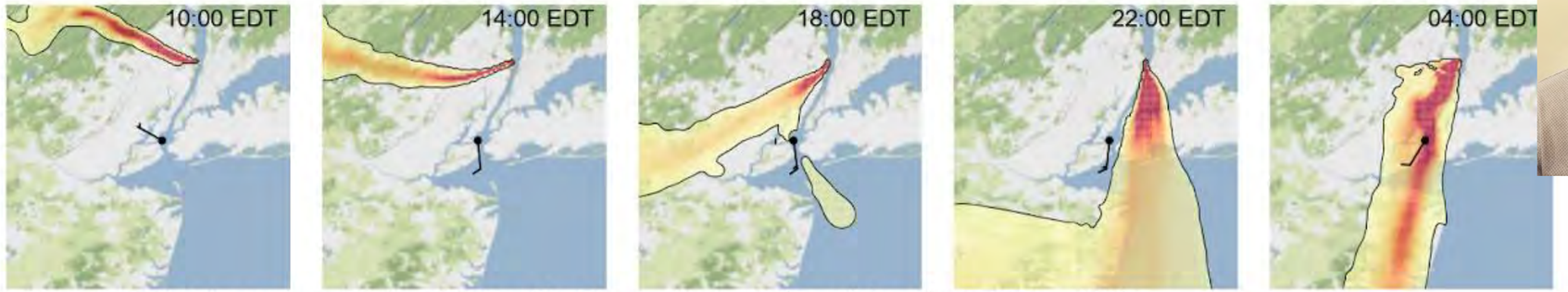
Luke Schiferl



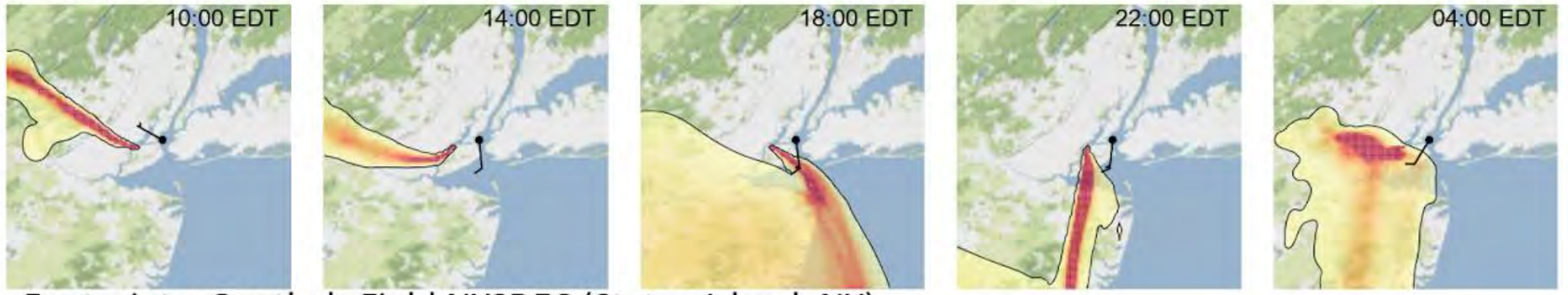
HRRR footprint + buoy diurnal snapshots

Robbins Reef (ROBN4) buoy

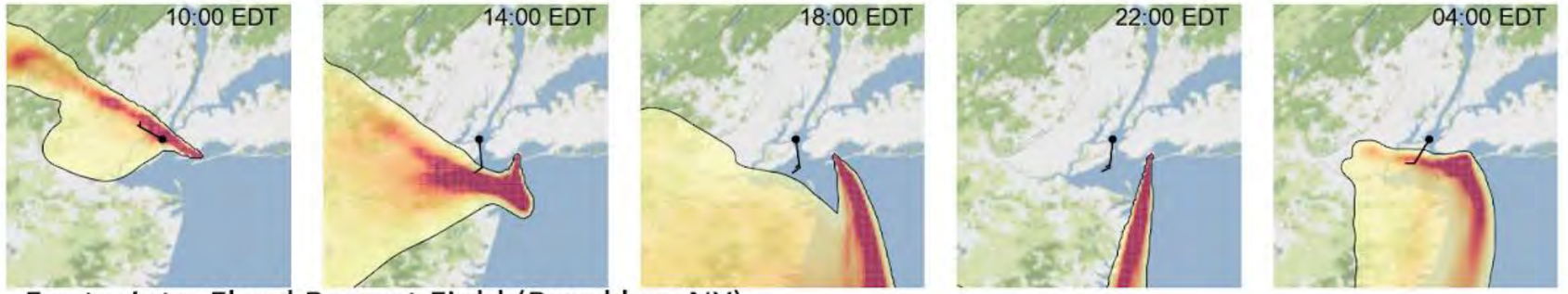




Footprints: Lamont-Doherty Earth Observatory (Rockland County, NY)

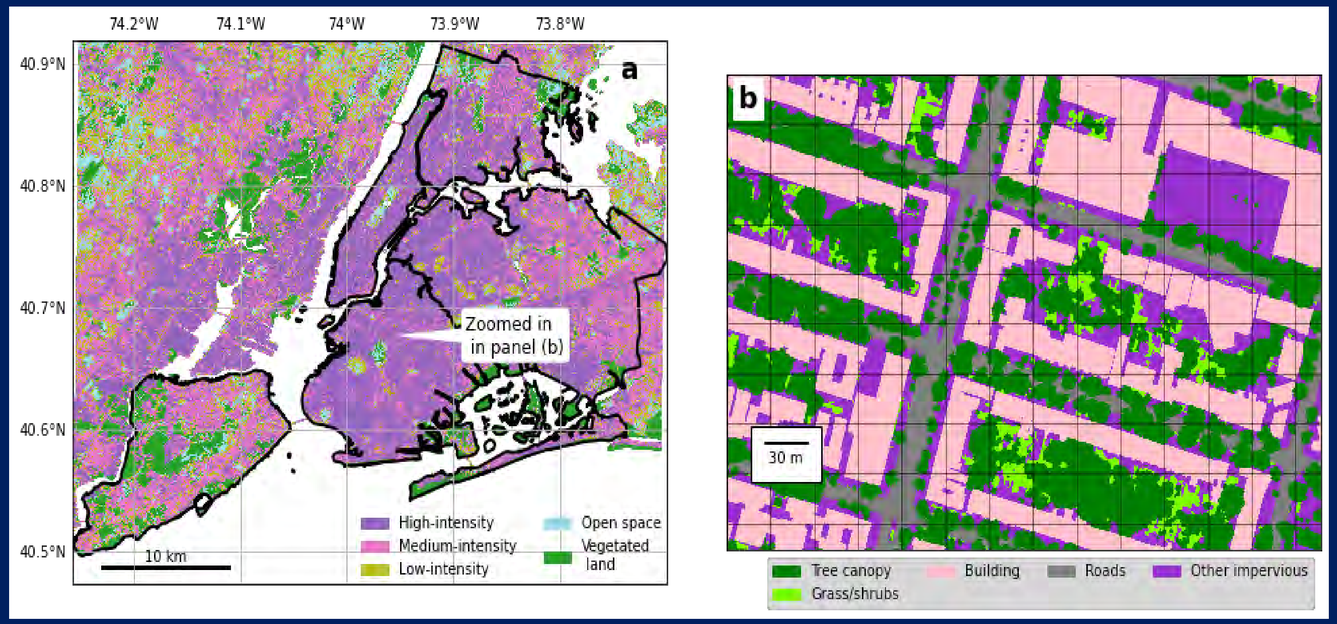


Footprints: Goethals Field NYSDEC (Staten Island, NY)



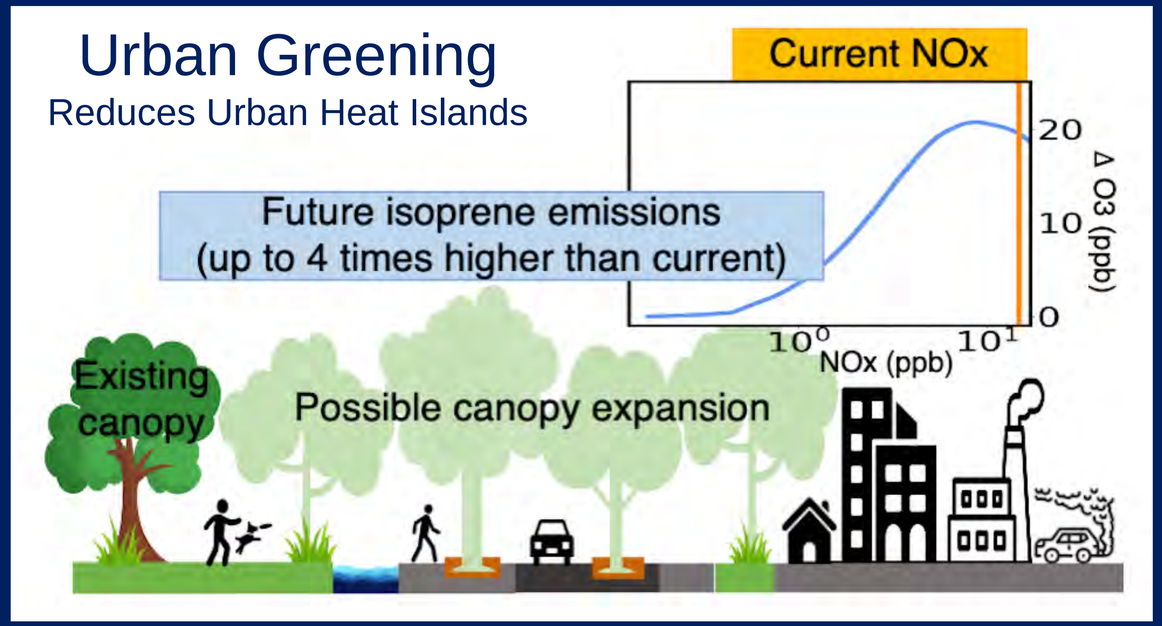
Footprints: Floyd Bennet Field (Brooklyn, NY)

Trees take up lots of CO_2 but some cause pollution



Wei et al., ERL, 2022

Afternoon CO_2 uptake by vegetation
~ Traffic emissions on July afternoon!



Wei et al., ES&T, 2024

Planting oak would increase Ozone

Would need to reduce NOx by more than covid lock-down to not make more ozone

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Drop in CO and NO_2 emissions during COVID

Atmos. Chem. Phys., 22, 2399–2417, 2022
https://doi.org/10.5194/acp-22-2399-2022
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Atmospheric Chemistry and Physics
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Research artic

Declines and peaks in NO_2 pollution during the multiple waves of the COVID-19 pandemic in the New York metropolitan area

Maria Tzortziou[1,2], Charlotte F. Kwong[1], Daniel Goldberg[3], Luke Schiferl[4], Róisín Commane[4,5], Nader Abuhassan[2,6], James J. Szykman[7,8], and Lukas C. Valin[8]

~36% drop in NO_2 in Manhattan in Spring 2020

https://doi.org/10.5194/egusphere-2024-83
Preprint. Discussion started: 25 January 2024
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EGUsphere
Preprint repository

Multi-year observations of variable incomplete combustion in the New York megacity

Luke D. Schiferl[1], Cong Cao[2], Bronte Dalton[3,4], Andrew Hallward-Driemeier[1,5], Ricardo Toledo-Crow[6], and Róisín Commane[1,5]

Strong seasonal cycle in CO not captured by inventories
Traffic signal gone from Diurnal CO during COVID

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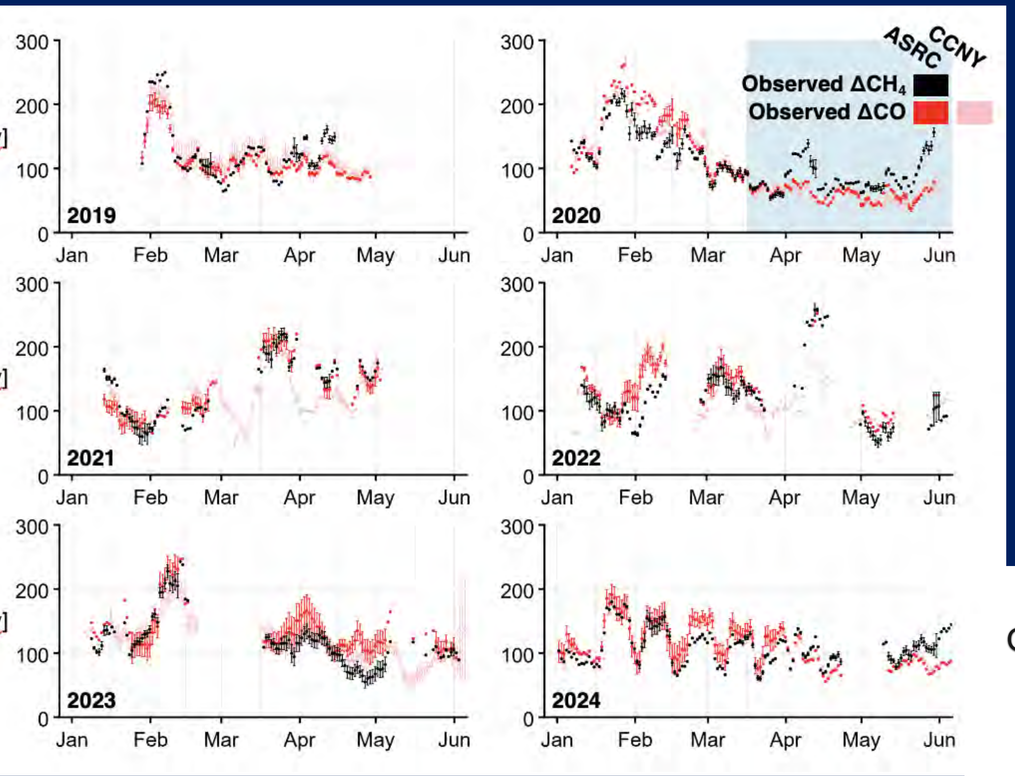
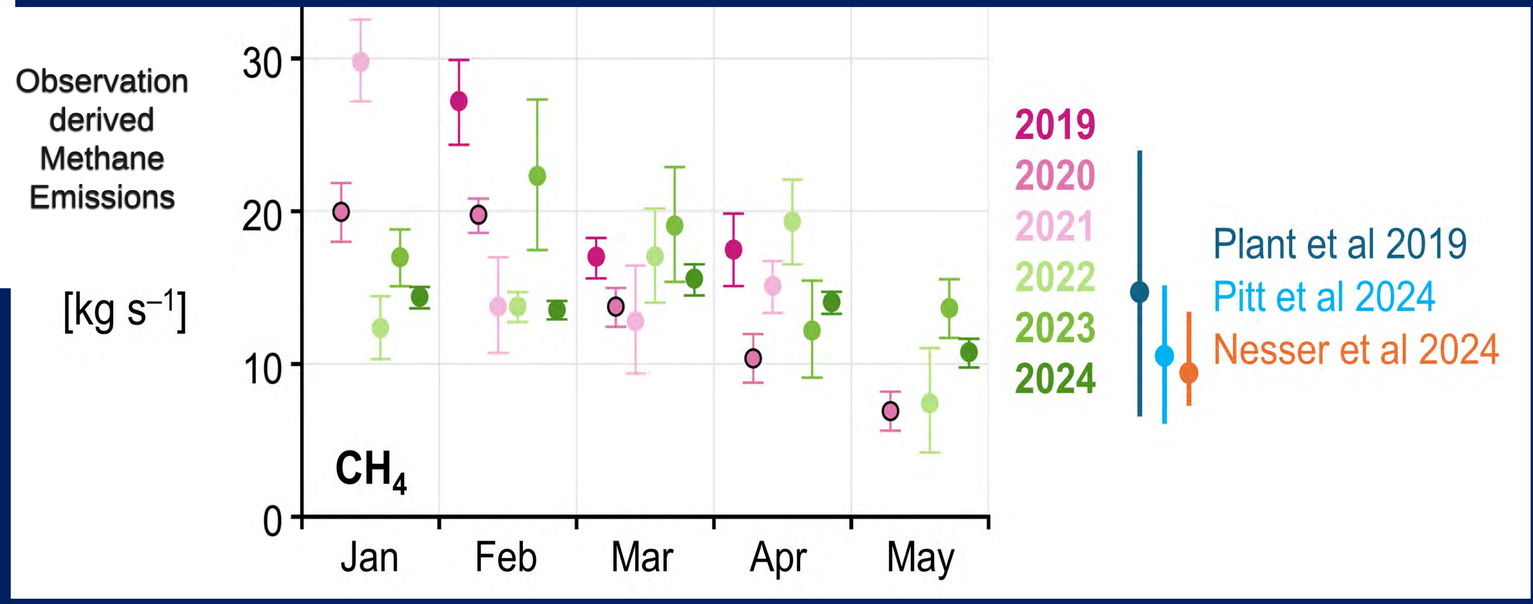
Urban Core Site in Harlem: No annual trend in wintertime City scale CH_4 emissions



CH_4 about to be submitted;
CO described in
Schiferl et al., ACPD, 2024, accepted

City-scale Methane Emissions show strong seasonal trend
More in winter during the heating season. Minimum in May.
Seasonal trend much less in inventories if included at all.



Drop in vehicle emissions of CO during COVID not accompanied by drop in CH_4, otherwise correlated!

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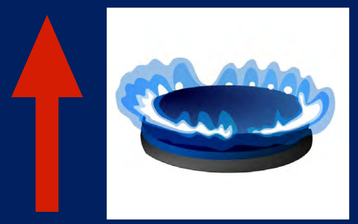
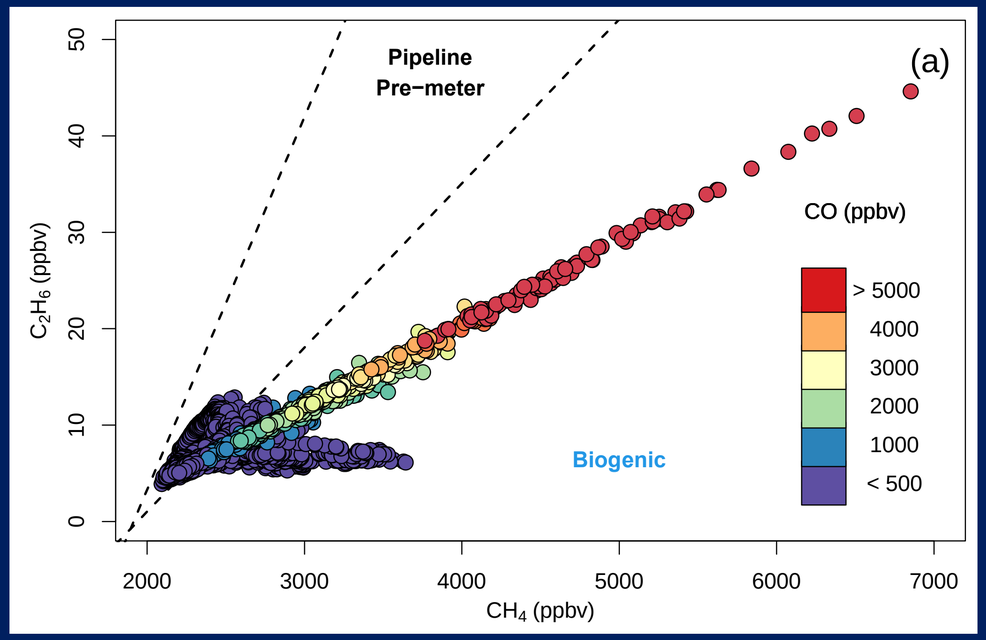
Source Characterization: methane

23 ppm!

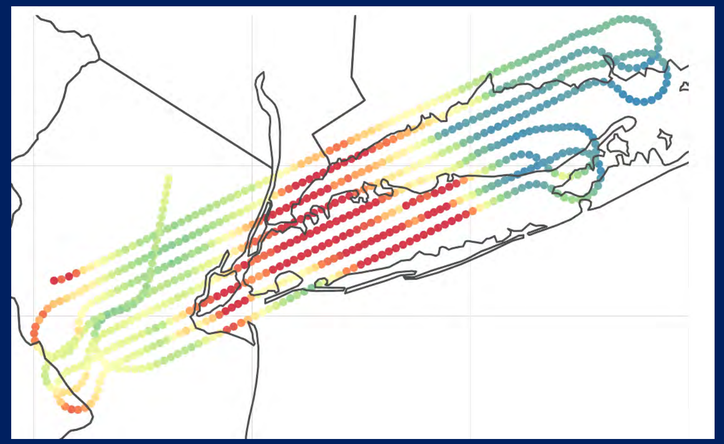
CH_4, Ethane, CO



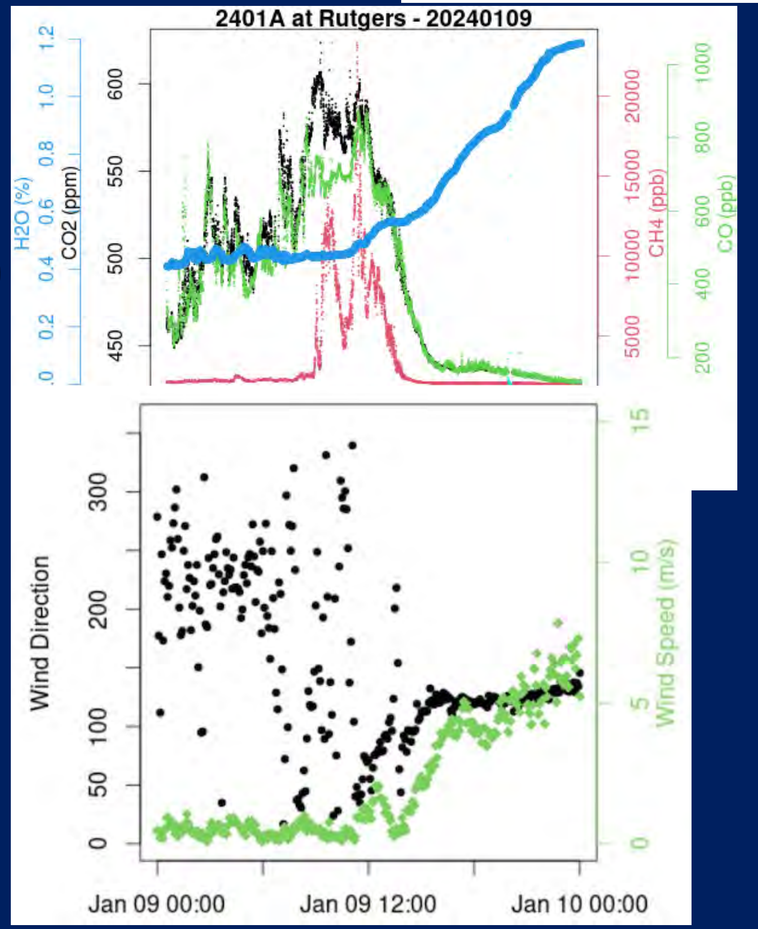


Post Meter Methane: Lots of CO Preferential combustion of ethane

NASA GIII Airborne HALO STAQS Summer 2023



Sean Crowell, Amin Nehrir, Luke Schiferl XCH_4 Anthropogenic – EPA 2016 inventory



Rutgers samples landfill to east. Lots of signal even in winter!