LISTOS Measurements at the Yale Coastal Field Station (Guilford, CT) and in New York City

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• Fred Moshery (CCNY)
• NOAA NYC collaborators: Brian McDonald, Carsten Warneke, Matt Coggon, Georgios Gkatzelis
Site Locations

Several typical trajectories of air parcels over ~1 day prior to arrival
Measurements (reference)

**Coastal CT site (year-round)**
- \( \text{O}_3 \)
- \( \text{PM}_{2.5} \)
- Black carbon
- \( \text{NO}_x (\text{NO}/\text{NO}_2) \)
- \( \text{CO} \)
- \( \text{CO}_2 \)
- \( \text{SO}_2 \)

- Offline gas- and aerosol-phase chemical speciation via adsorbent tubes and filters (incl. speciated VOCs and OA)
- Local meteorology
- AERONET (w/ F. Moshery, CCNY)

**Inland CT site (Summer 2018)**
- Boundary layer height via ceilometer
- \( \text{O}_3 \)

**NYC - Manhattan (with NOAA, Summer 2018)**
- Offline gas- and aerosol-phase chemical speciation via adsorbent tubes and filters (incl. speciated VOCs and OA)
High chemical resolution offline measurement capabilities

Example: Gas-phase organics in NYC

Ozone – Coastal CT site

![Graph showing ozone levels over time with a national ambient air quality standard line.](Image)
Ozone – Coastal CT site

115 ppb
(1 hr avg.)

National Ambient Air Quality Standard
Ozone – Coastal CT and inland CT measurements
Boundary layer measurements – Inland site

2018-08-28  Ceilometer

Altitude (km, ASL)

Time of Day (Local)

Log_{10} Backscatter (sr^{-1}km^{-1})

Reported Mixing Layer Height
Increasing influence of non-combustion sources on urban air quality

The fraction of total emissions from known consumer, commercial, and industrial products and materials is increasing

Khare & Gentner, ACP 2018

- Defines a comprehensive emissions framework
- Emissions over lifecycles
- Multiple emission pathways of solvents, solutes, and degradation by-products
- VOCs, IVOCs, and SVOCs
- Most are fossil fuel-derived and the SOA produced is often misattributed

Emissions Data: SoCAB, CARB inventory
Increasing influence of non-combustion sources on urban air quality

The fraction of total emissions from known consumer, commercial, and industrial products and materials is increasing and so are their contributions to SOA and ozone

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Yale-Johns Hopkins SEARCH Center Dense Urban Network in Baltimore

50+ stationary sites, 200+ participants with portable monitors

(A) PM$_{2.5}$ [µg m$^{-3}$]

Zamora et al., ES&T 2019; Xiong et al., in prep
Measurements Summary

Coastal CT site (year-round)
- O₃
- PM₂.₅
- Black carbon
- NOₓ(NO/NO₂)
- CO
- CO₂
- SO₂
- Offline gas- and aerosol-phase chemical speciation via adsorbent tubes and filters (incl. speciated VOCs and OA)
- Local meteorology
- AERONET (w/ F. Moshery, CCNY)

Inland CT site (Summer 2018)
- Boundary layer height via ceilometer
- O₃

NYC - Manhattan (with NOAA, Summer 2018)
- Offline gas- and aerosol-phase chemical speciation via adsorbent tubes and filters (incl. speciated VOCs and OA)