

New York City metropolitan Measurements of Emissions and TransformationS (NYC-METS)

Emissions and Oxidative Aging of Non-Traditional Gas-Phase Organic Compounds in the Greater New York City Metropolitan Area

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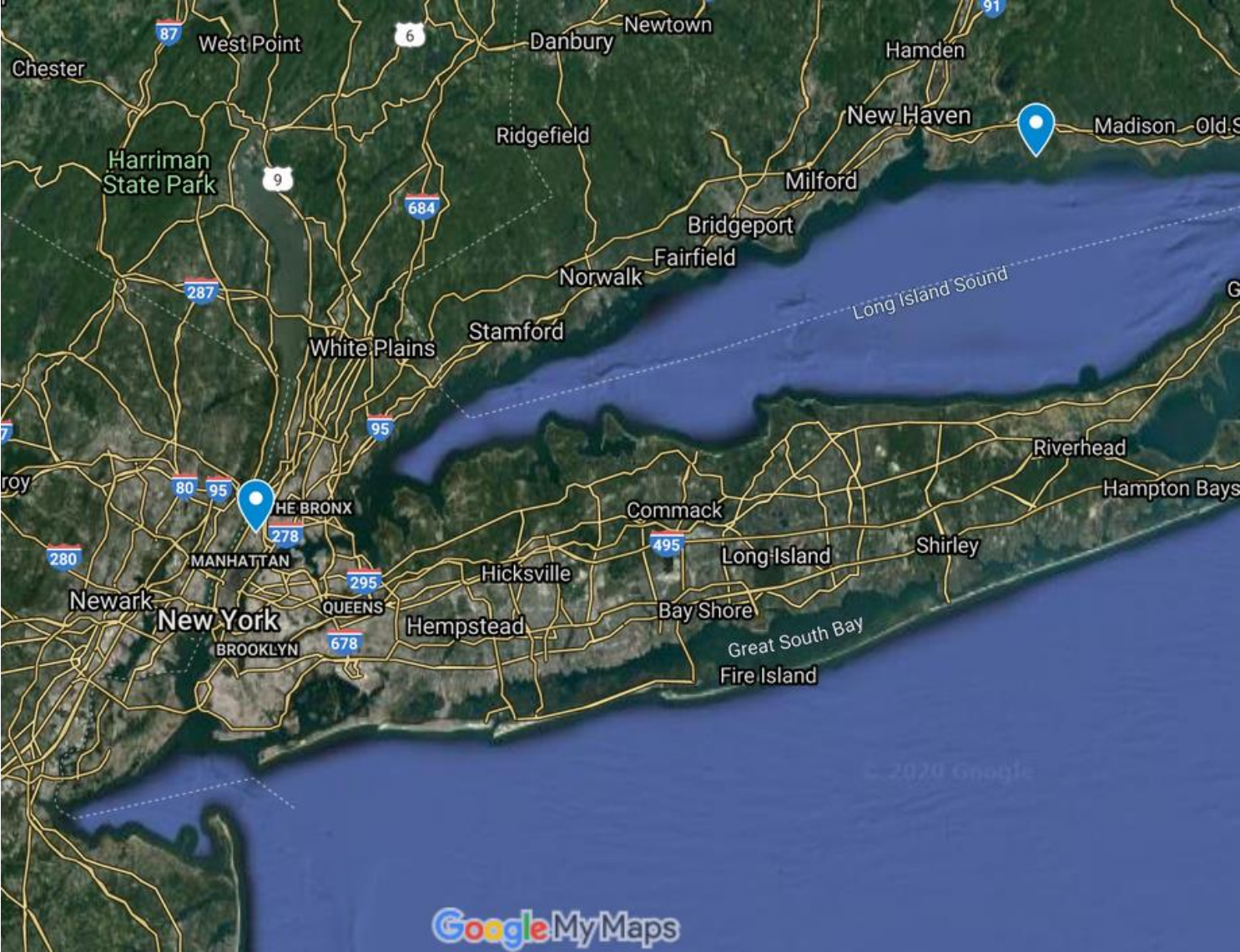
Non-traditional sources of volatile organic compounds (VOCs), intermediate-volatility and semi-volatile organic compounds (I/SVOCs) and oxygenated VOCs (OVOCs), including volatile chemical products, have become the largest anthropogenic emitters of reactive gas-phase organic compounds in urban areas. With ongoing reductions in emissions from combustion-related sources, this mix of under-constrained sources has a larger impact on urban air quality as primary pollutants and as precursors to secondary organic aerosol (SOA) and ozone. Knowledge gaps on sources, emission rates, chemical composition, and oxidative aging of these complex gas-phase mixtures (i.e. I/S/O/VOCs) necessitate top-down emissions studies with flux measurements and detailed chemical characterization. We will investigate the emission rates and oxidative aging of I/S/O/VOCs and greenhouse gases (GHGs) at an elevated site in Upper Manhattan, NY and a downwind site in Guilford, CT that is influenced by atmospheric oxidative aging processes associated with emissions from NYC and elsewhere in the Northeast. Also relevant to AEROMMA, the site is situated on the Long Island Sound waterfront (incl. a small dock) with marine influence. Intensive measurements will be conducted during winter and summer (June/July, coordinated with AEROMMA flights). We will deploy an extensive combination of state-of-the-art spectroscopy-, chromatography-, and mass spectrometry-based techniques that are sensitive to a wide range of gas- and particle-phase compounds, as summarized in the table below. Measurements are tentatively set to take place June 1 to July 15 with a 4 week intensive to be scheduled in coordination with aircraft measurements. Contact drew.gentner@yale.edu; krechmer@aerodyne.com; and lambe@aerodyne.com with collaborative inquiries for either the NYC or CT site.

Instrument overview for Summer 2021 NYC site

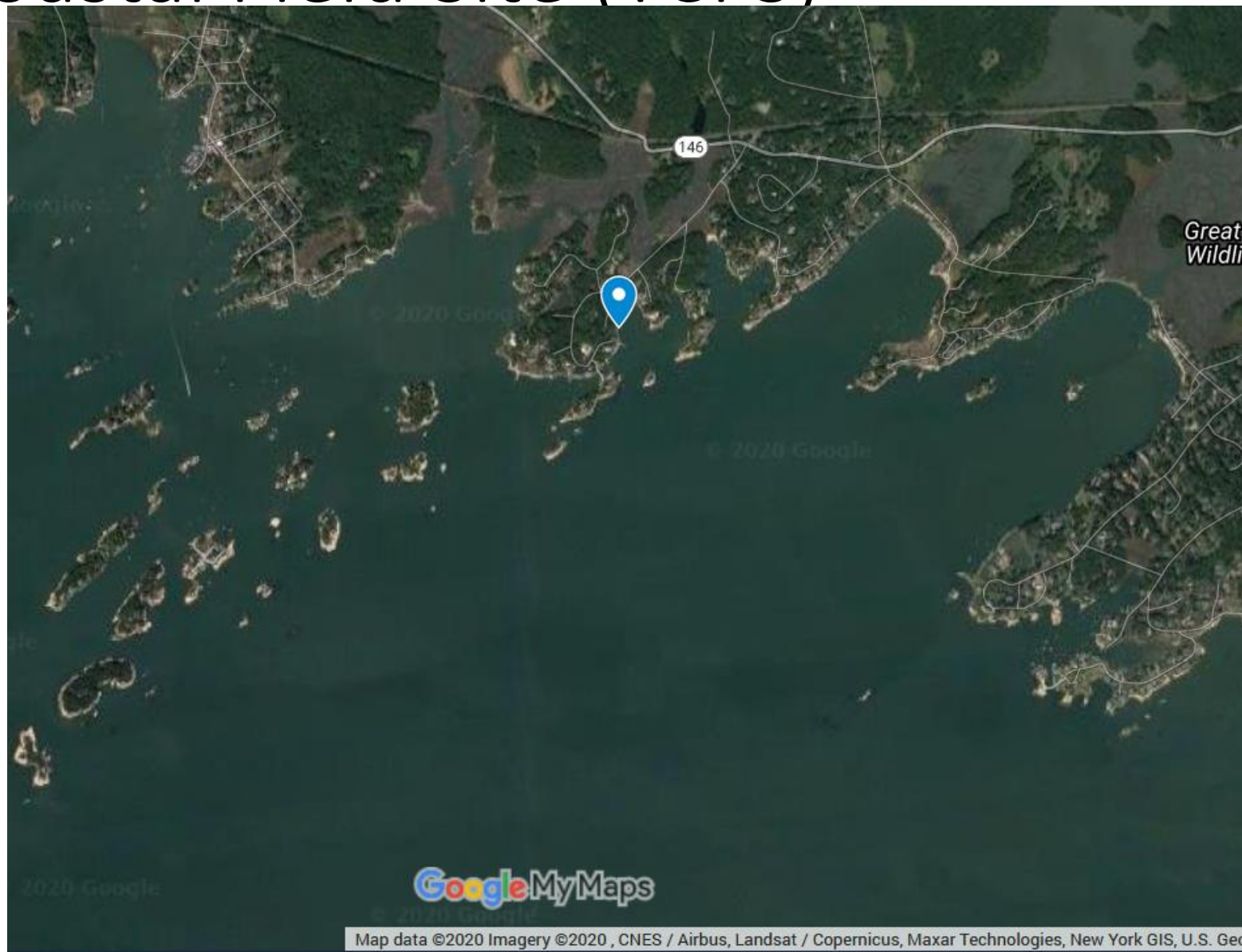
Technique	Example Compounds	Sampling Time Resolution
Tunable Infrared Laser Direct Absorption Spectroscopy	CH ₄ , C ₂ H ₆ , CO, CO ₂	0.1 - 1 s
Vocus Proton-Transfer Reaction Time-of-Flight Mass Spectrometry	C ₆ -C ₁₂ aromatics, (CH ₃) ₂ CO, CH ₄ S, C ₇ H ₄ ClF ₃ , C ₁₀ H ₃₀ O ₅ Si ₅ (i.e. D5-siloxane)	0.1 – 1 s
Iodide Anion Chemical Ionization Mass Spectrometry	HCOOH, CH ₂ (COOH) ₂ , C ₅ H ₉ O ₄ N, N ₂ O ₅ , HNO ₃ , HONO, ClNO ₂ , Cl ₂	1 s
Adsorbent sample tubes for offline GC analysis	VOCs-SVOCs (C ₅ -C ₂₈)	20-120 min
PM filter samples for offline mass spectrometer analysis	IVOCs-ELVOCs	8-12 hr
Aerosol Chemical Speciation Monitor	Particulate organics, NO ₃ ⁻ , SO ₄ ²⁻ , NH ₄ ⁺ , Cl ⁻	1-5 min

Oxidation Flow Reactor	<i>in situ</i> OH/O ₃ /NO ₃ /Cl oxidation products of VOCs, I/SVOCs, OVOCs	N/A
Supporting baseline measurements	PM _{2.5} , O ₃ , BC, CO, NO, NO ₂ , SO ₂ , aerosol optical depth, Meteorology	<1 - 60 min

NYC-METS Measurement Locations



Yale Coastal Field Site (YCFS)



CUNY ASRC Site (NYC)

