AERODYNE RESEARCH, Inc.

South Coast AQMD

Using the Aerodyne Mobile Laboratory to characterize industrial emissions in Southern California

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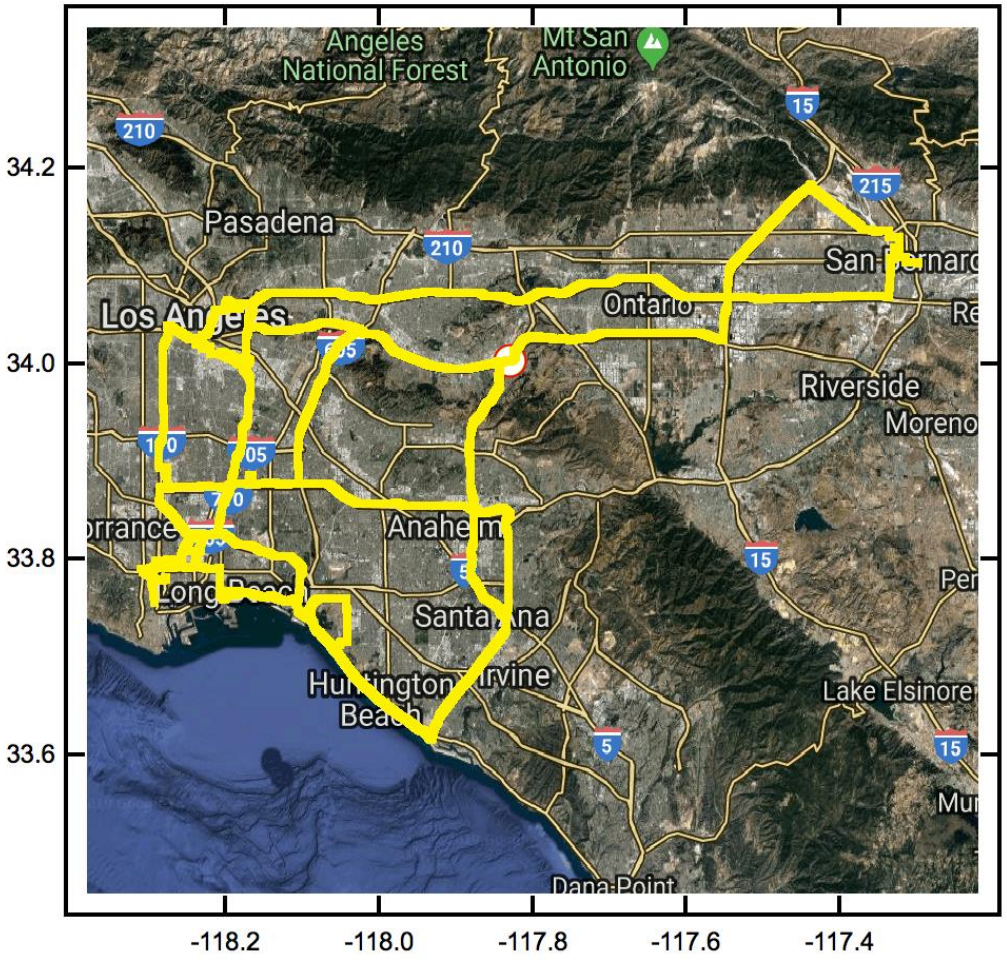
Under direction and sponsorship of **South Coast Air Quality Management District** (Diamond Bar, CA) we sampled a wide variety of industries during November 2019

Los Angeles County
Orange County
San Bernardino County

- Refineries
- Ports
- Metal recycling
- **Agriculture**
- Bus depots
- **Animal rendering**
- **Metal plating**
- Rail yards



Imagery ® 2020 TerraMetrics, Map data ® 2020 Google

Driven coverage by the mobile laboratory (yellow trace)

Selected instrument manifest

Infrared Laser Absorption Spectroscopy (TILDAS)

Combustion CO_2 CO NO_2 NO SO_2

Stable photo-oxidants O_3 HCHO

Biomass burning HCN

Oil & Gas CH_4 C_2H_6

Biological N_2O

Vocus PTR-TOF 2R

Odors
H_2S CH_3SH

Oxygenates
methanol, acetone

Aromatics
benzene, toluene, xylene

Alkenes
propene, butene, isoprene

Soot Particle – Aerosol Mass Spectrometer (SP-AMS)

Mass

Diameter

Composition

Organics

Sulfates

Nitrates

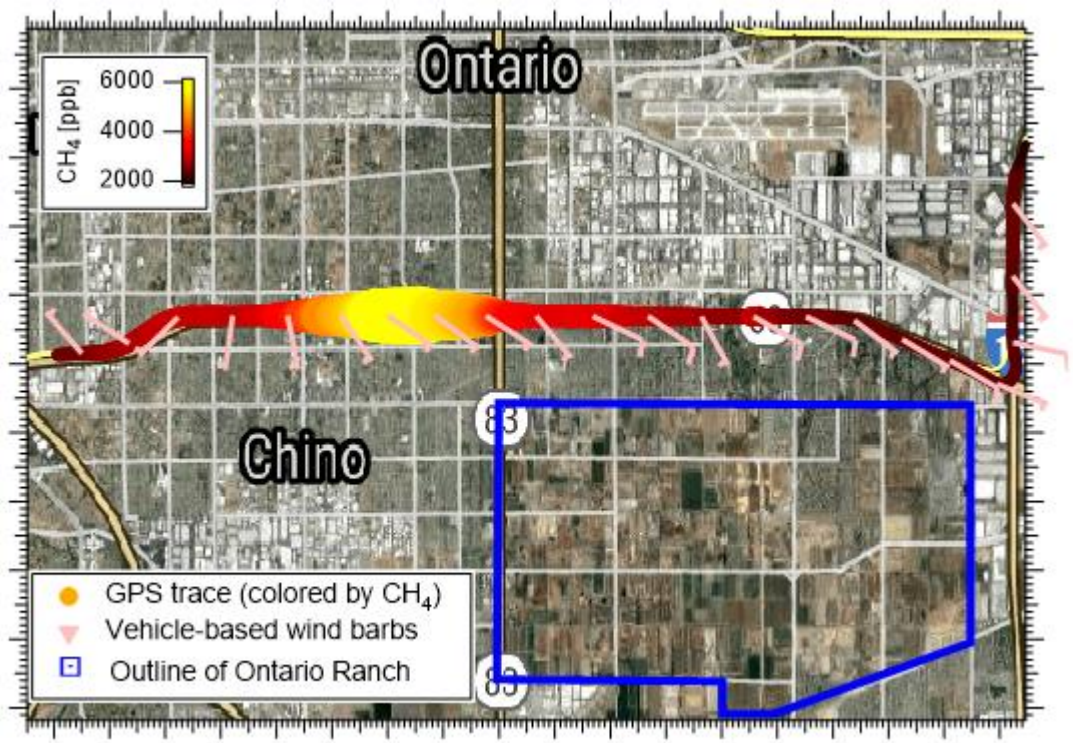
Ammonium

Chloride

Black Carbon

Agriculture

Ontario Ranch (Ontario, CA) is transitioning from **dairy farms** to residential and commercial development [1]



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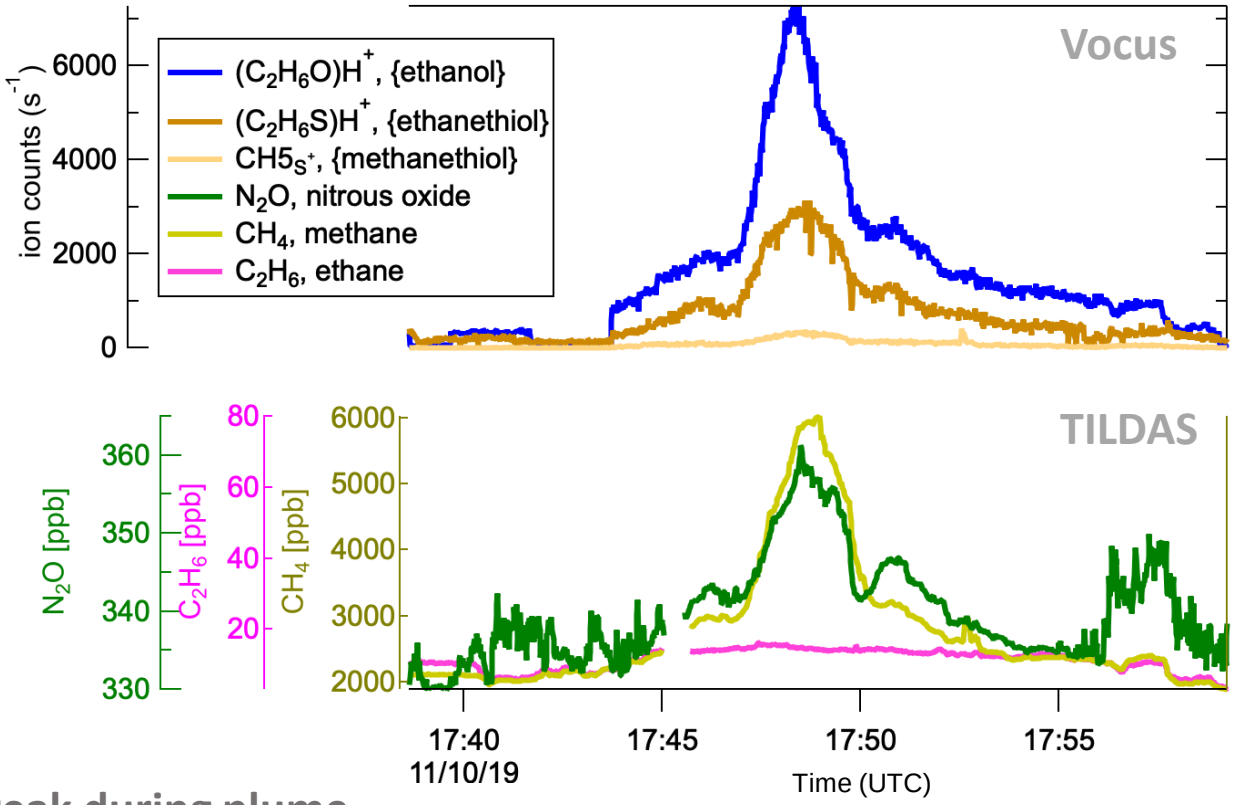
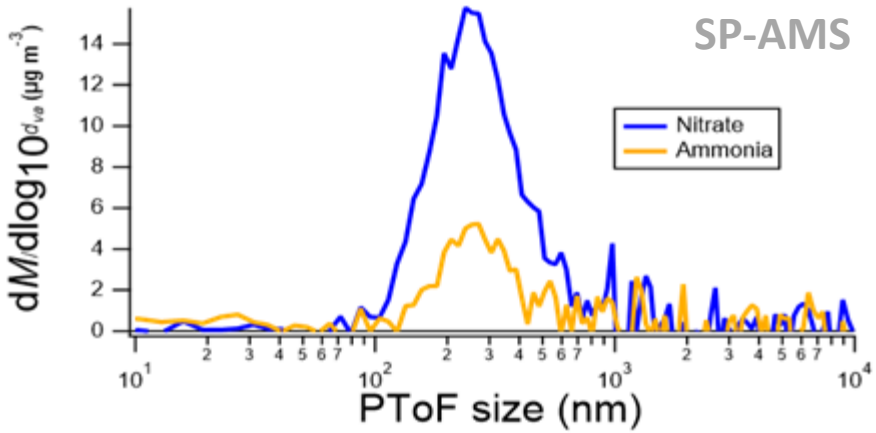


Even at highway speeds, the plume from this large agricultural area is clear, broad, and well-defined by known tracers

Peak during plume

~10 µg m^{-3}
Nitrate

~3 µg m^{-3}
Ammonia



Metal plating

Hard chromium electroplating processes
can generate **hexavalent chromium (CrVI) mists** [2]

Instrument

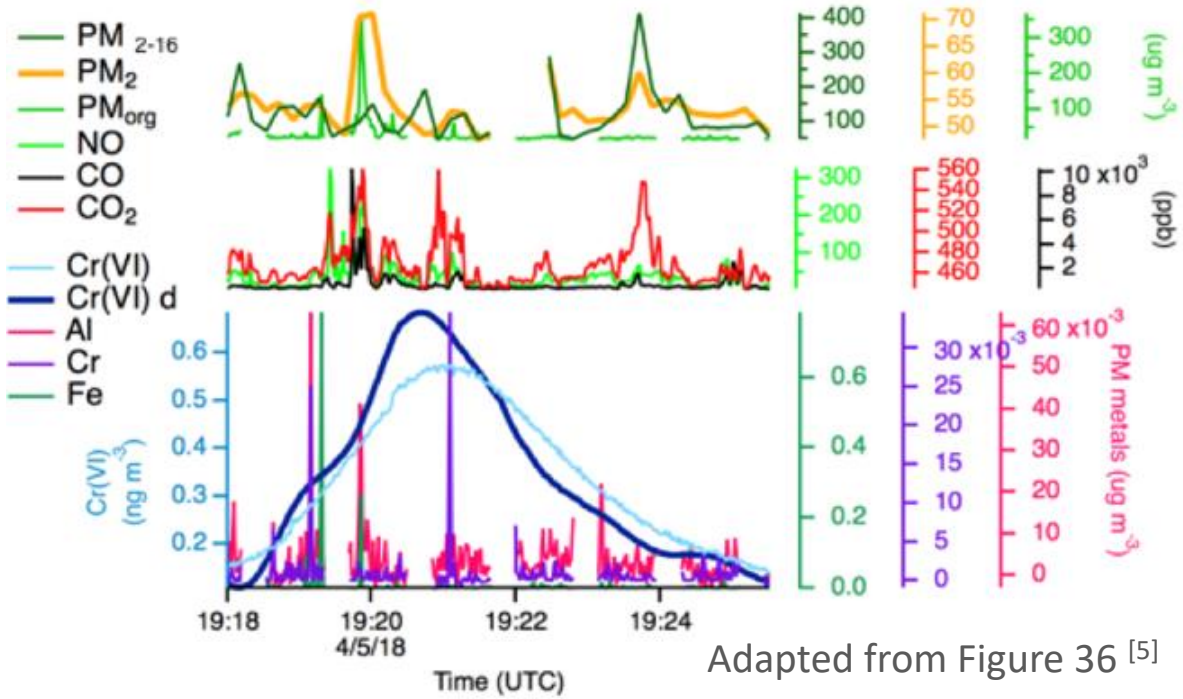
SJAC-LPAS [3]

Desert Research Institute
(Reno, NV, USA)

2018

Major observation:
~1 ng m^{-3} Cr(VI)
~150m away, multiple shops

Cr(VI) specific instrument with longer response time



Adapted from Figure 36 [5]

Instrument

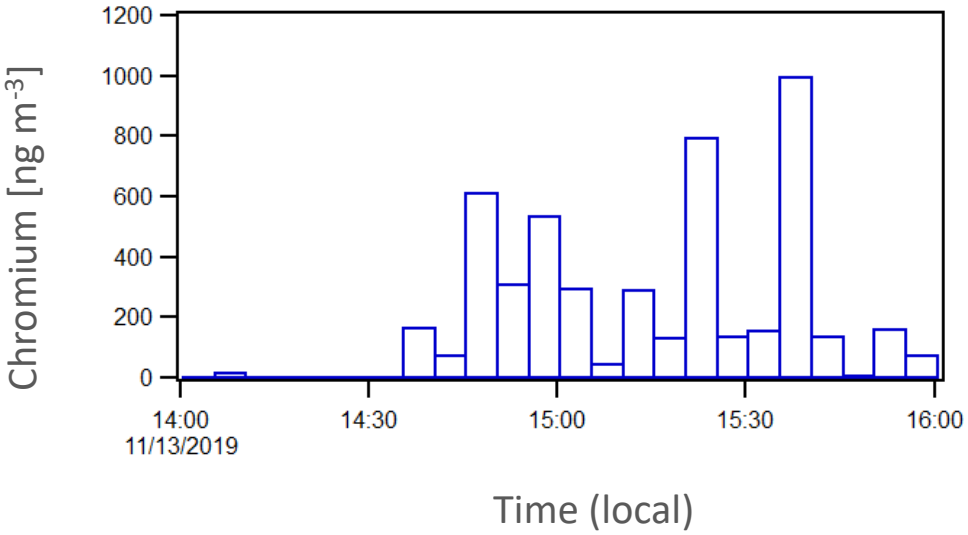
Xact® 625i [4]

Cooper Environmental Services
(Beaverton, OR, USA)

2019

Major observation:
~1 µg m^{-3} Cr
~50 m away, single shop

Chromium measured in custom 5 min. sampling mode



SP-AMS measured corresponding Cr^+ spikes at 1 Hz

U.S. OSHA

29 CFR 1910.1026 [6]

"[…] activity involving chromium **cannot release dusts, fumes, or mists of chromium (VI)** in concentrations at or above **0.5 µg/m³** as an 8-hour time-weighted average (TWA) […]"

Animal rendering

Rendering plants **process animal parts** to manufacture fats, bone meal, and other products [7]

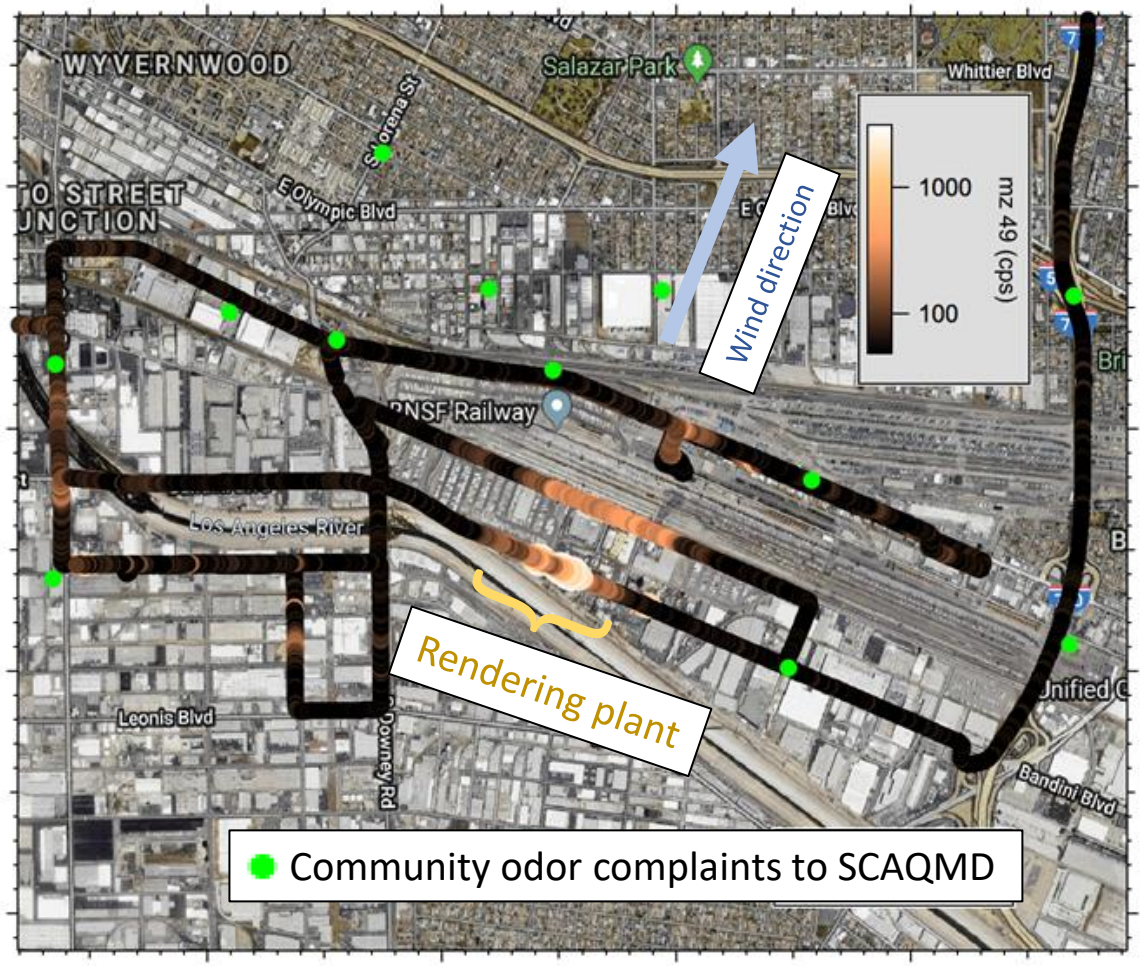
Methanethiol (CH_3SH) is associated with the decomposition of **spoiled meat** has a **pungent odor** [8]

Image capture: April 2019 ®2020 Google

A rendering plant in Vernon, CA

Image data ®2020 Google

Vocus (m/z 49: $CH_3SH + H_3O^+ \longrightarrow CH_5S^+$)

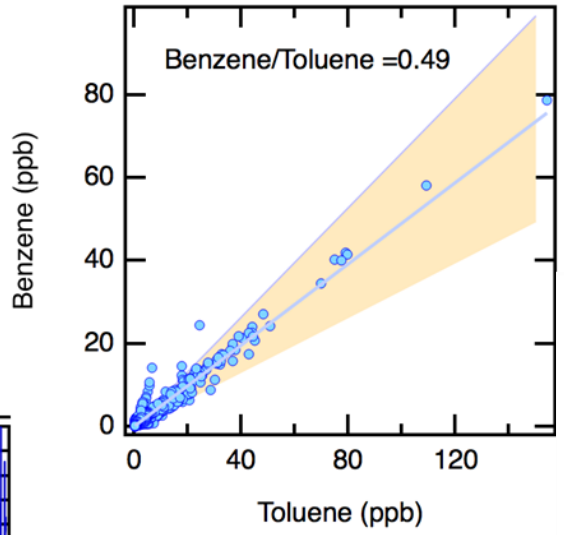


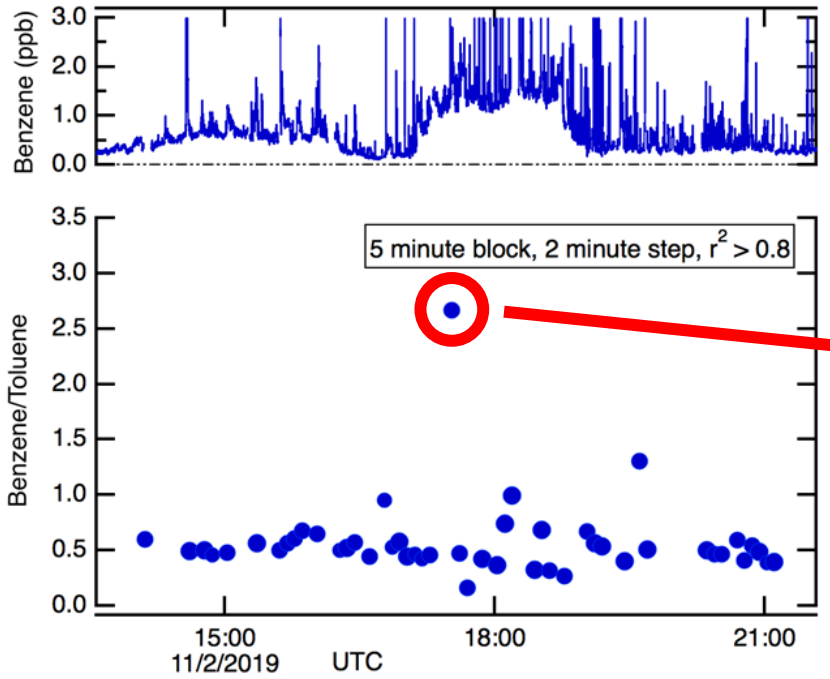
Downwind transects from a rendering plant

Hotspot identification

Time series analysis can be used to **isolate unique enhancements** of compounds from interfering noise

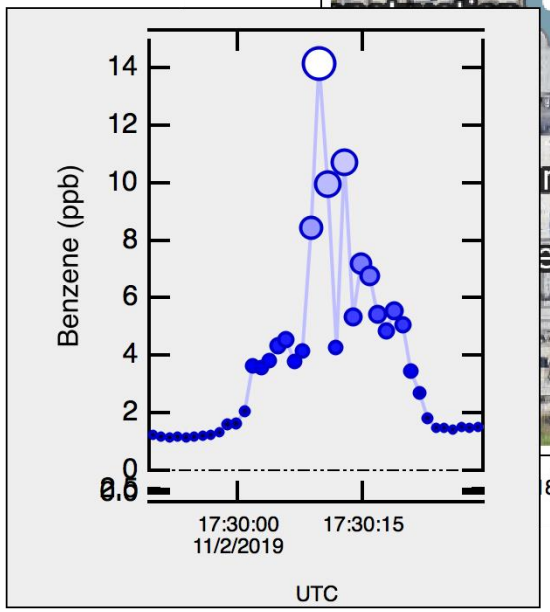
Expected relationship of emissions from **fuel vapors** based on previous data

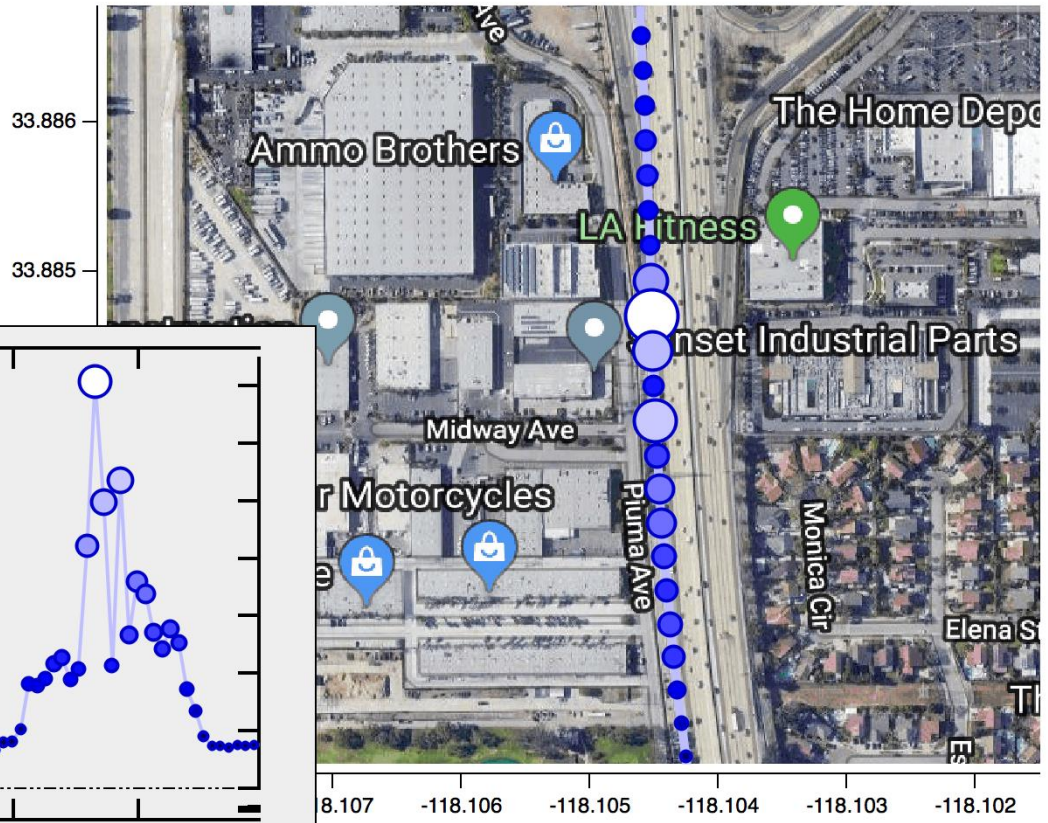




Higher benzene/toluene ratio

Potential industrial source of **benzene** identified amongst highway traffic





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