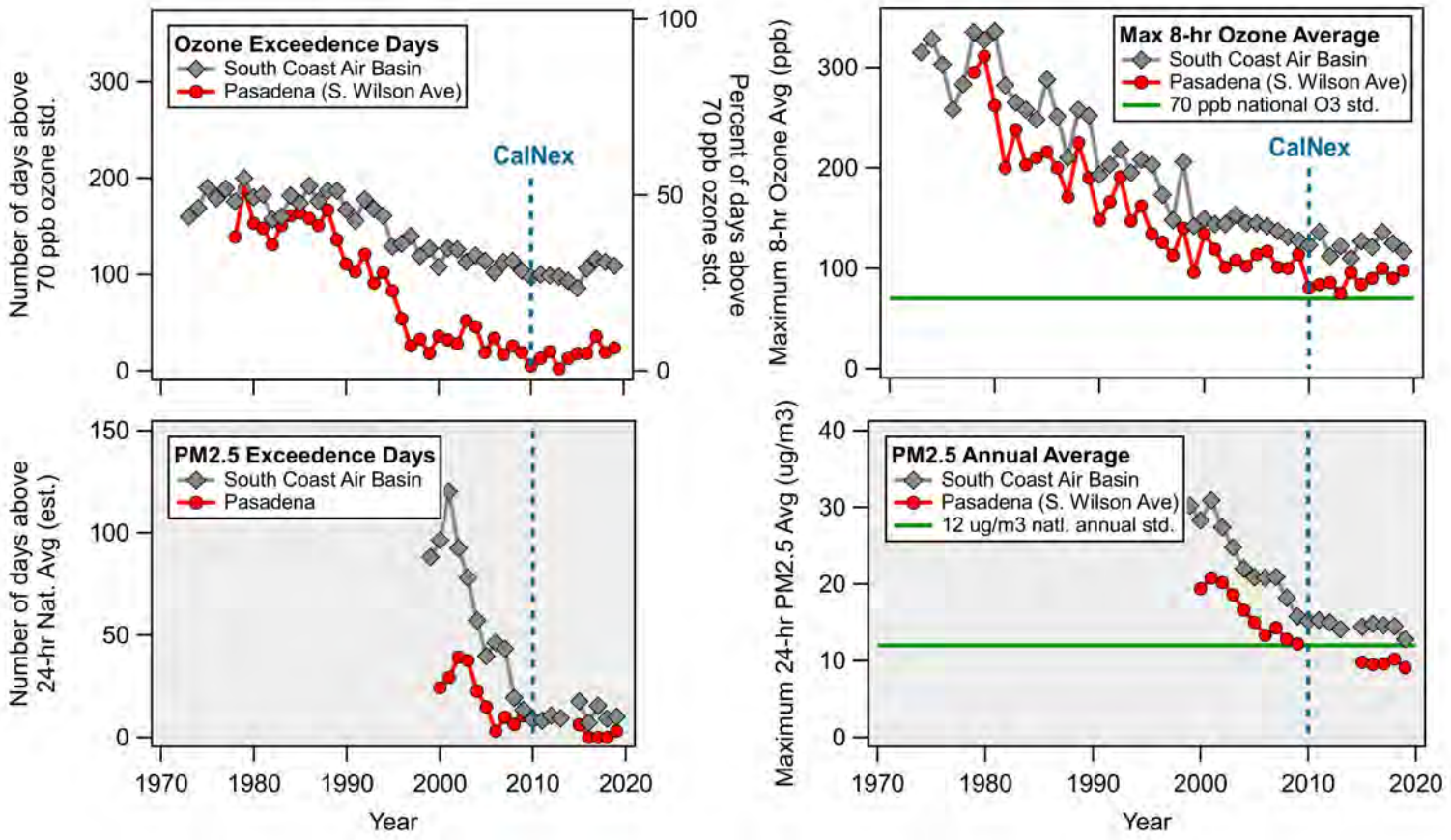
It is important to characterize the changing landscape of VOC and NOx emission sources in order to strengthen efforts to meet air quality standards for O_3 and $PM_{2.5}$ in many major U.S. cities.

Photo of Los Angeles overlooking Griffith Observatory on an exceptionally clear day.

Credit: The internet

Ozone and $PM_{2.5}$ in LA Basin have greatly improved over last several decades, but current trends are now stagnating or even slightly increasing in some areas.



https://www.arb.ca.gov/adam

CalNex 2010:

May 15 - June15
CalTech campus

An unusually clean and relatively cool year with few fires.

2020:

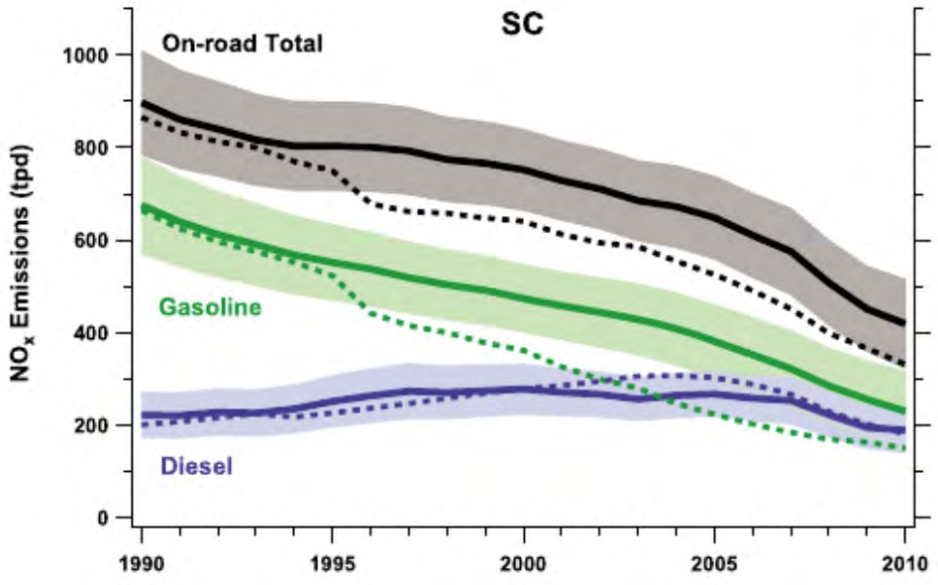
Data not available

Large reductions in mobility due to COVID-19

Incredibly intense fire year with 4+ million acres burned in CA alone!

Nitrogen oxides (NOx = NO + NO_2) and volatile organic compounds (VOCs) are important ozone and PM precursors. Both VOCs and NOx are decreasing in SoCAB, but at different rates.

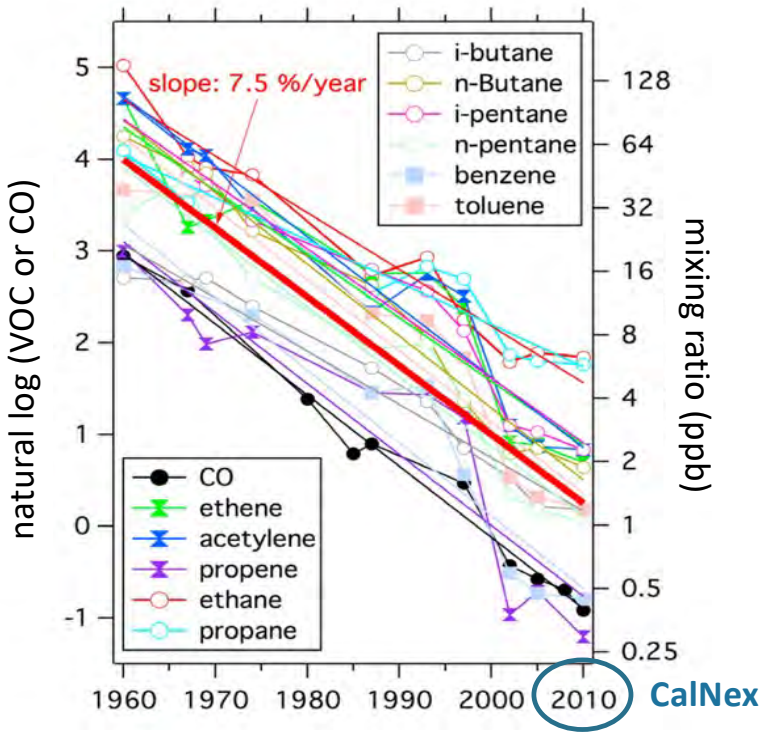
NOx Emission Rates in SoCAB



On-road NOx sources have been declining but are still the dominant source of NOx in SoCAB

McDonald et al. (JGR 2012)

Ambient VOC Mixing Ratios in SoCAB



Warneke et al. (JGR 2012)

Large reductions in VOC emissions from on-road sources now make volatile chemical products (VCPs) the largest fossil-derived VOC source in the SoCAB.

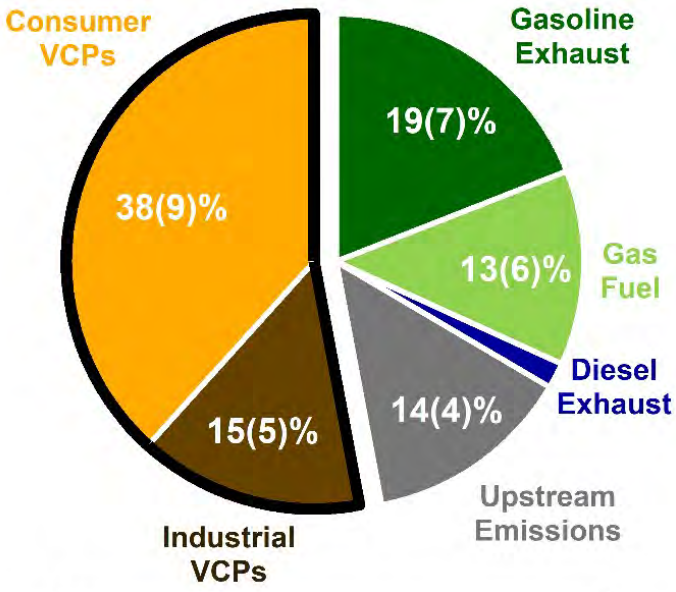
Volatile Chemical Products:

Personal care Cleaning agents

Adhesives Coatings

Insecticides, Inks, and **Fragrances**

Lead author:
Brian McDonald
NOAA CSL



VOC Emissions = 350 ± 50 Gg

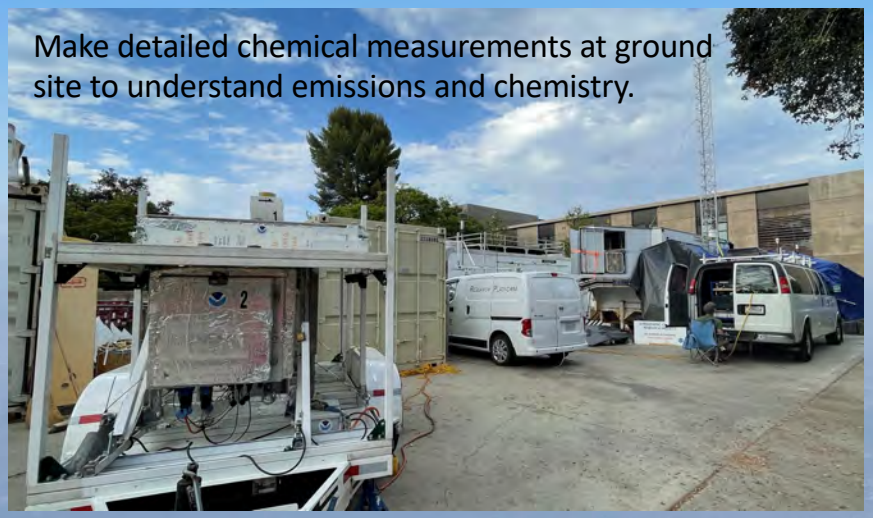
McDonald et al. (*Science* 2018)

Traditional Fossil Sources:

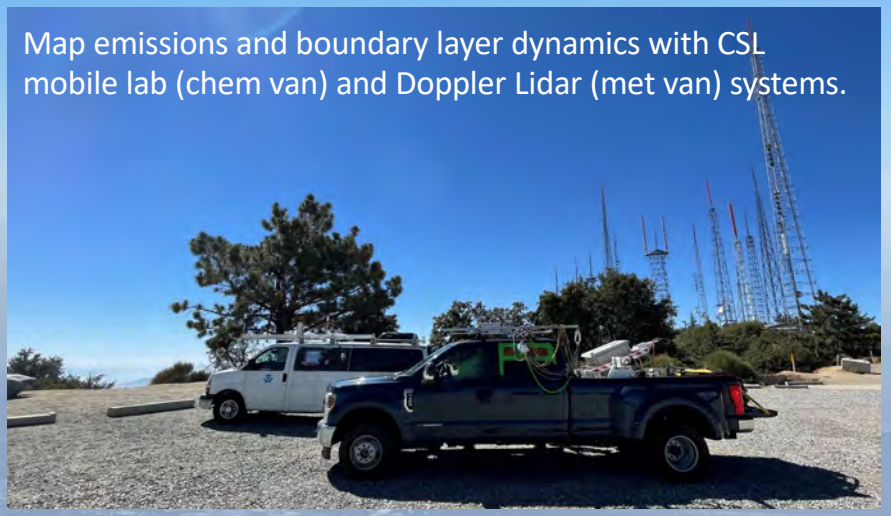
It is important to characterize the changing landscape of VOC and NOx emission sources in order to strengthen efforts to meet air quality standards for O_3 and $PM_{2.5}$ in many major U.S. cities.

It is important to characterize the changing landscape of VOC and NOx emission sources in order to strengthen efforts to meet air quality standards for O_3 and $PM_{2.5}$ in many major U.S. cities.

Make detailed chemical measurements at ground site to understand emissions and chemistry.



Map emissions and boundary layer dynamics with CSL mobile lab (chem van) and Doppler Lidar (met van) systems.



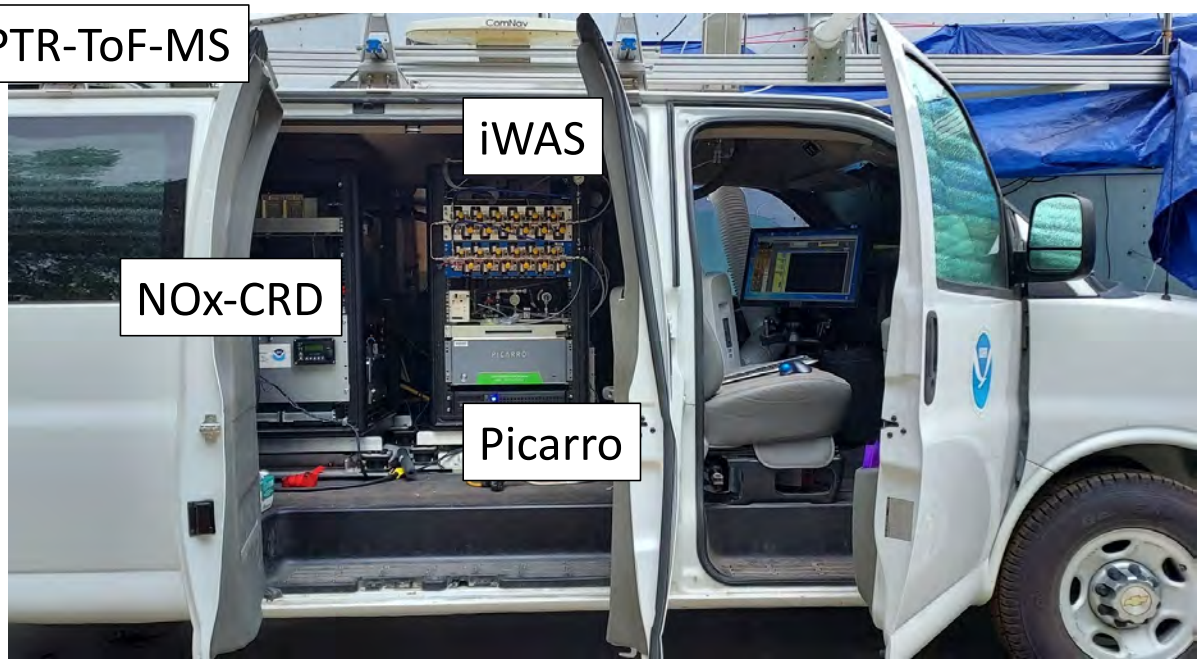
Pasadena Ground Site

Photo from Mt Wilson Observatory looking west over the LA Basin 2021-08-06

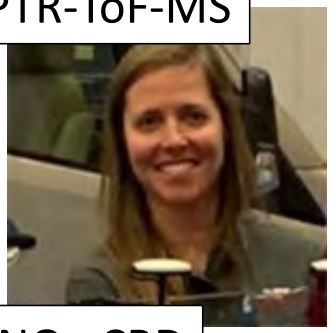
Credit: J. Gilman

We use mobile labs to map emissions, chemistry, and dynamics across the LA Basin

Mobile Lab!



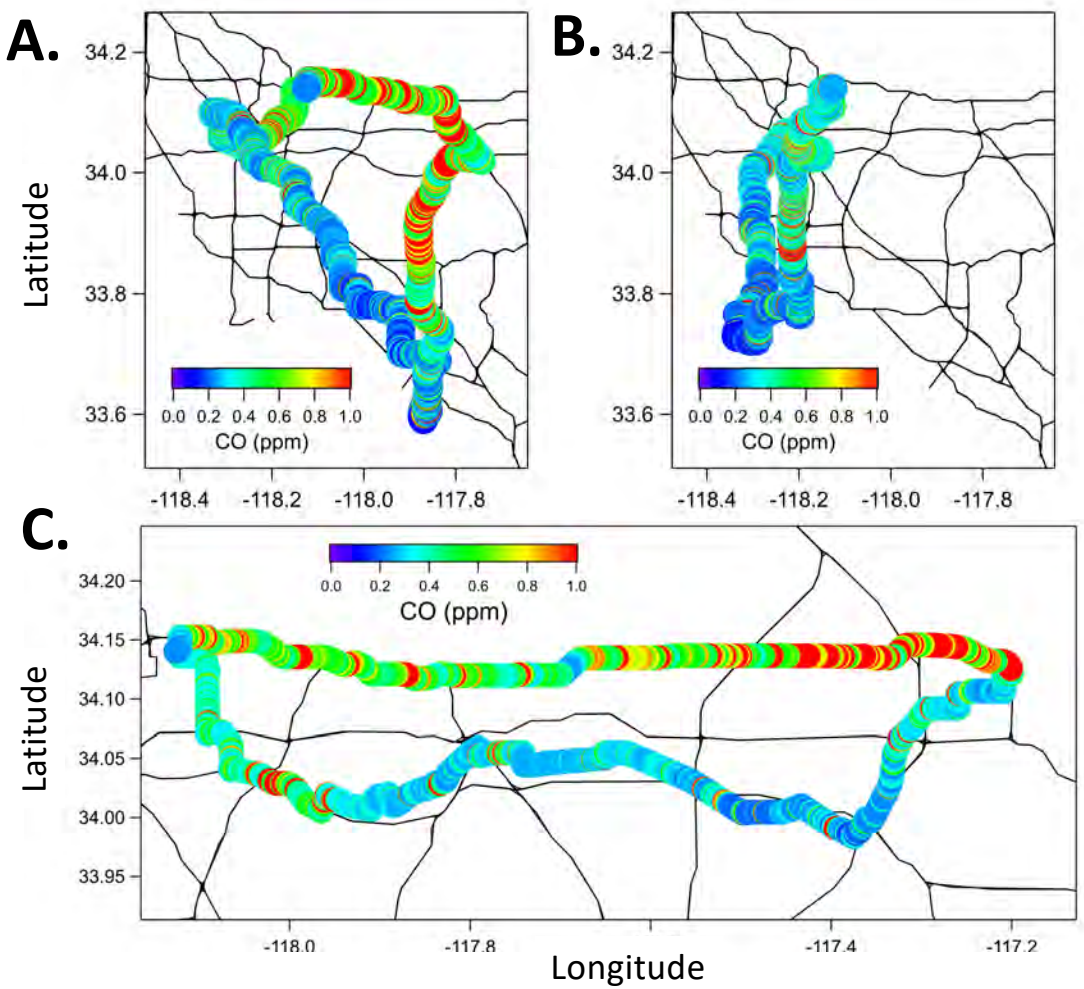
PTR-ToF-MS



NOx-CRD

Picarro

We use mobile labs to map emissions, chemistry, and dynamics across the LA Basin



Drives conducted in LA include:

(A) Population density focused drive to look for non-mobile source emissions (VCPs and cooking).

(B) Socioeconomic drives sampling regions of different income disparity.

(C) Chemistry drive to map photochemical smog evolution

We use mobile labs to map emissions, chemistry, and dynamics across the LA Basin

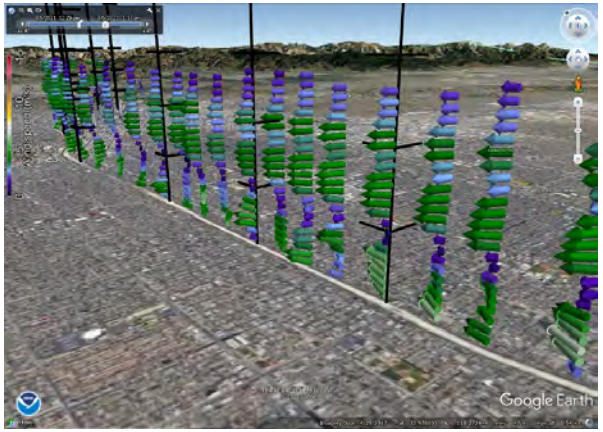
Mobile Doppler lidar (PUMAS)

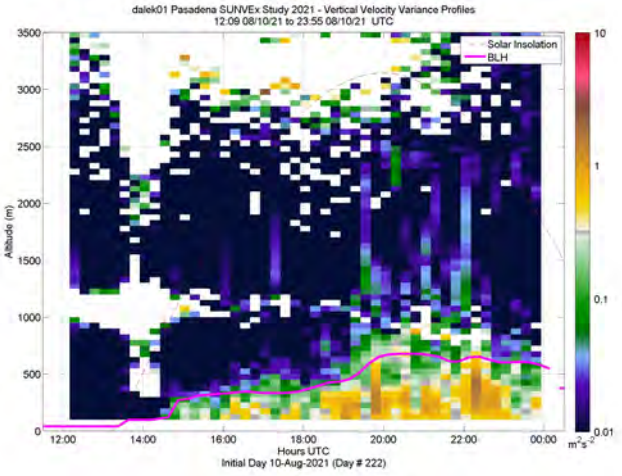
- Spatial wind field and boundary layer height
- Periodic drives directed by forecasts and coordination with Mobile Lab
- PBL evolution, sea breeze propagation, urban canopy effect, upslope flow dynamics

Stationary Doppler lidar

- Boundary layer height
- Wind field dynamics
- Continuous operation

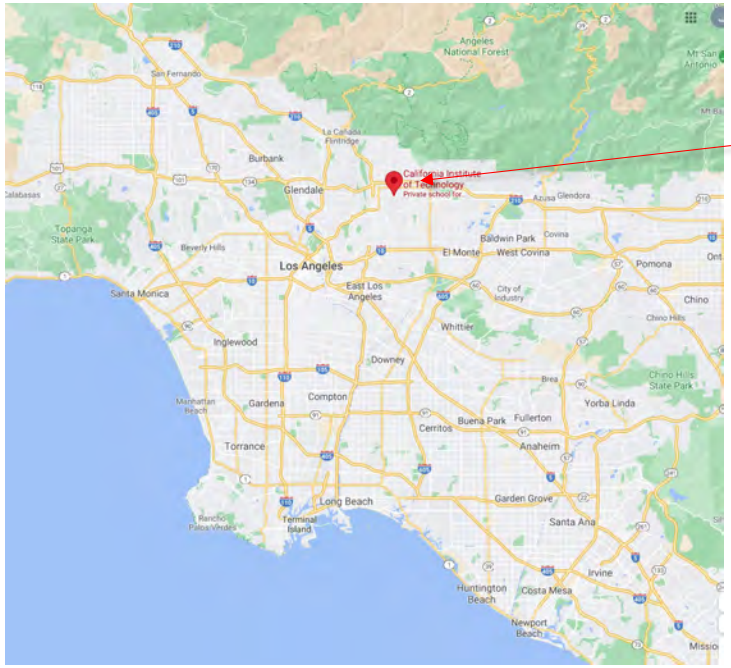
+ Sunil!





Measurement site in Pasadena on CalTech campus

Start measurements by 6 August 2021
Measure through 3 Sept 2021 (~ 4 weeks)

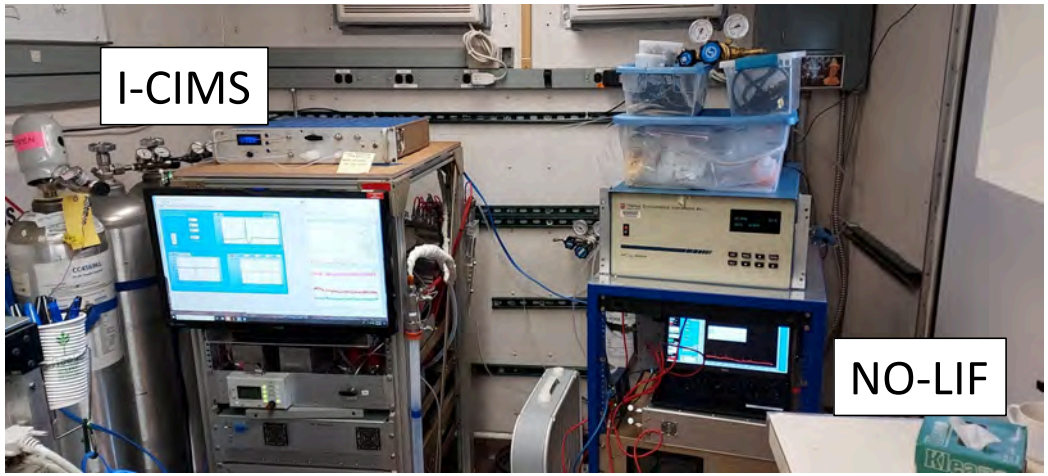


CARB site:
O_3, CO, NO_2, $PM_{2.5}$, Temperature and Wind S/D

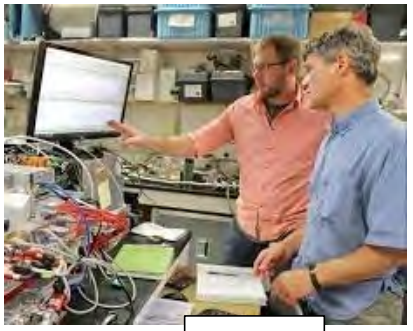
Measurement site in Pasadena on CalTech campus

Ground site:
- 2 trailers
- 2 mobile labs
- Aerodyne HCl instrument
- LIDAR

Revisiting LA pollution with new technology!



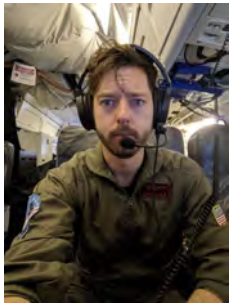
I-CIMS



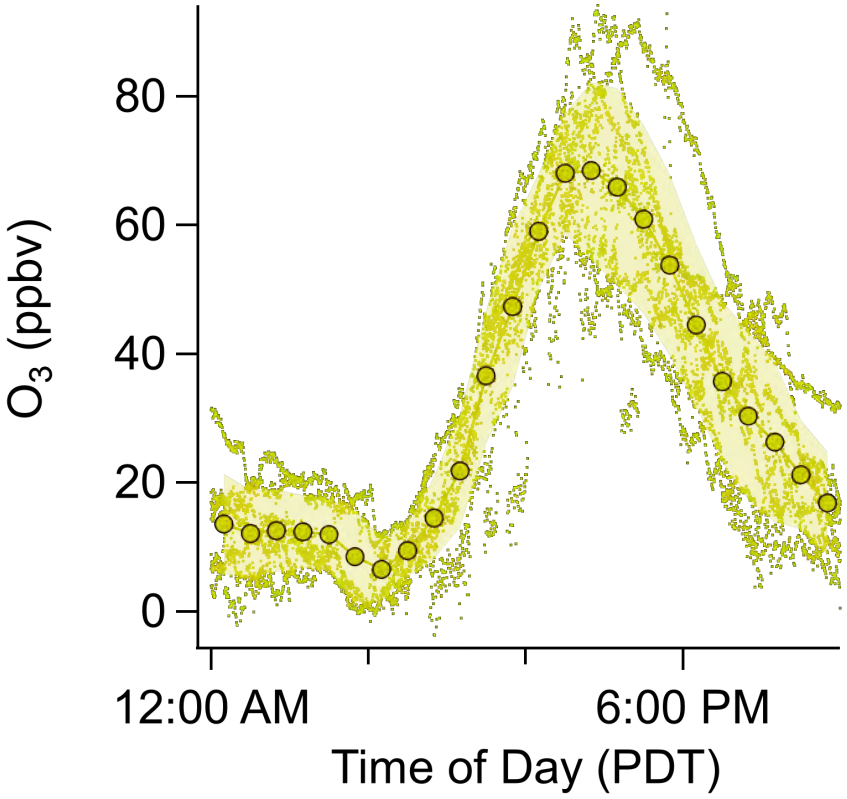
NO-LIF

L-ToF

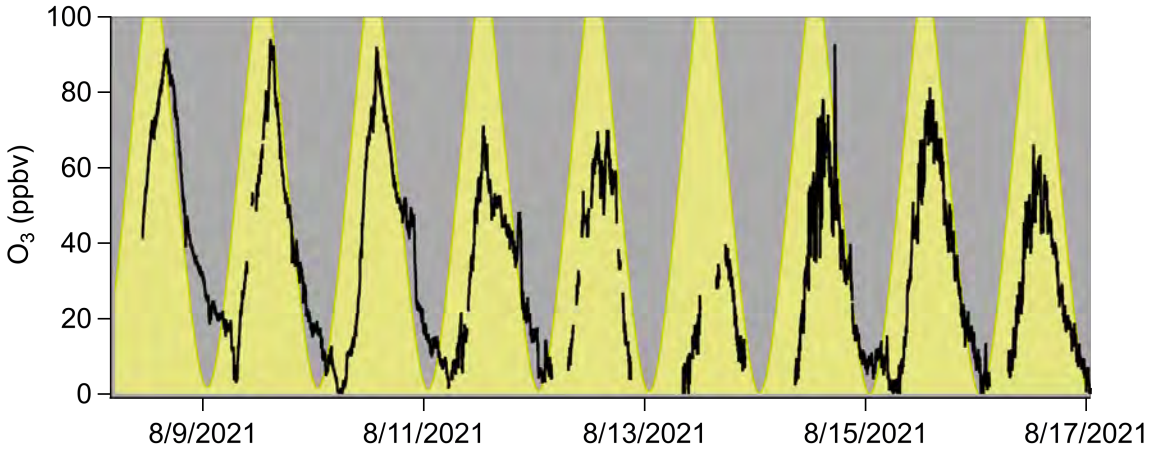
ACCBAR

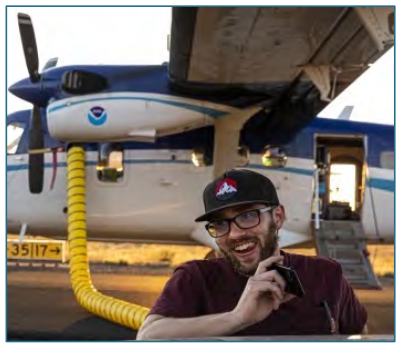


Photochemical ozone production and transport from downtown LA as measured at site.



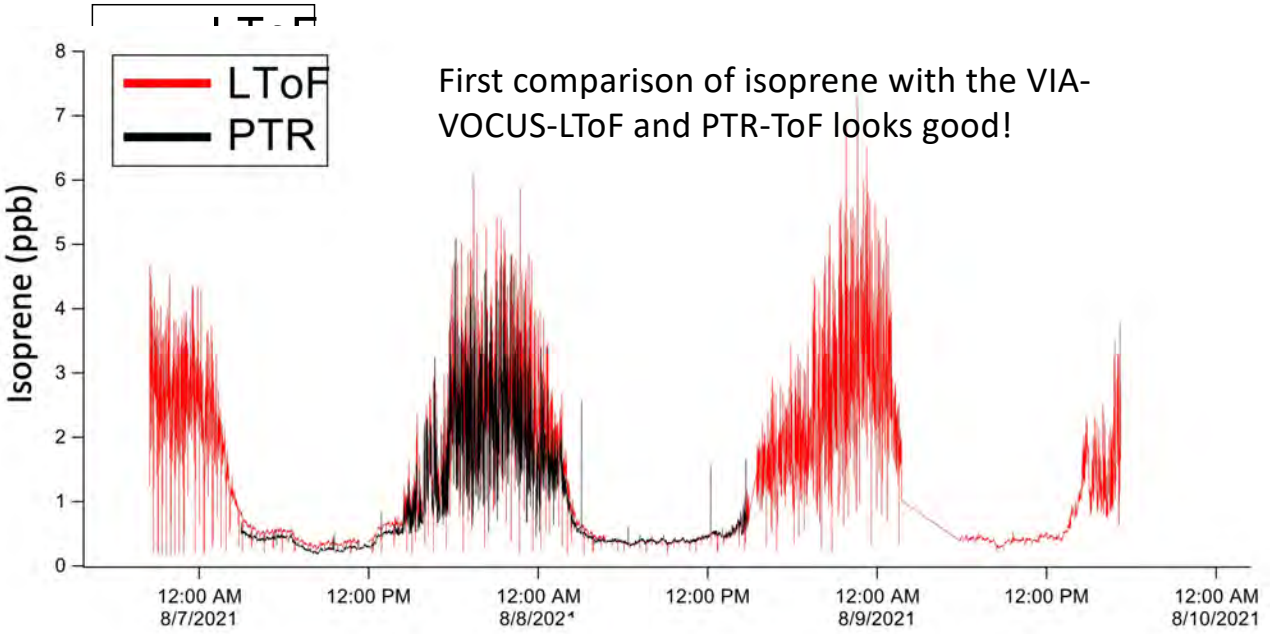
Ozone diurnal profile from Mike Robinson





Mike and Kristin thinking hard about NO_x and O_3 chemistry

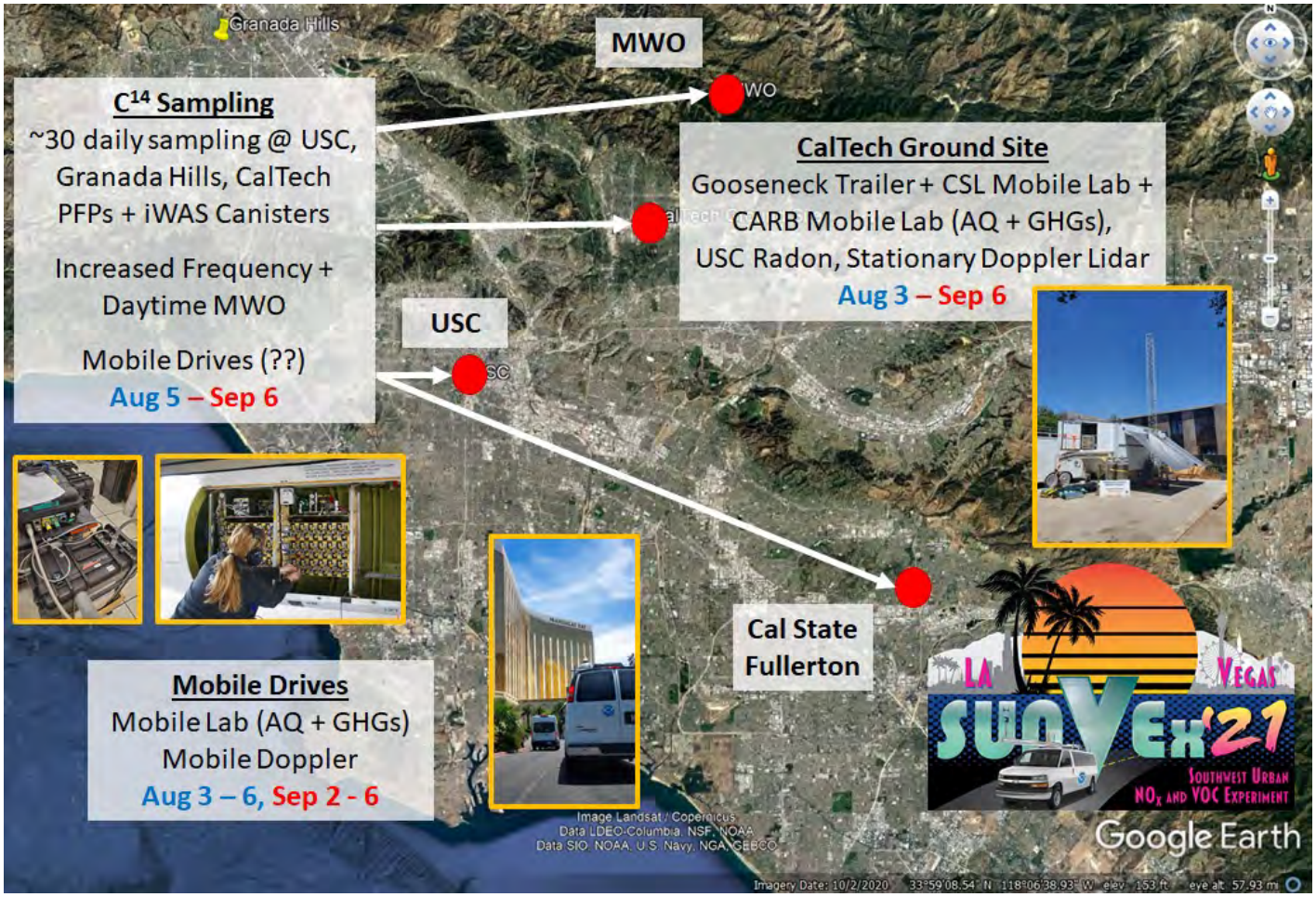
First deployment of the Via-VOCUS-LToF to measure organic gases and particles.



First comparison of isoprene with the VIA-VOCUS-LToF and PTR-ToF looks good!

Lu Xu making the new LToF mass spectrometer work!

NOAA CSL and GML coordinating on daily flask sampling at multiple sites in order to determine the contributions from modern vs. fossil CO_2.



Measurement sites:

- Mt. Wilson Obs. (MWO)
- Univ. of Southern CA (USC)
- Cal State Fullerton
- Caltech ground site in Pasadena