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.
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.

**CalNex 2010:**
May 15 - June 15
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!

https://www.arb.ca.gov/adam
Nitrogen oxides (NOx = NO + NO2) and volatile organic compounds (VOCs) are important ozone and PM precursors. Both VOCs and NOx are decreasing in SoCAB, but at different rates.

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

McDonald et al. (JGR 2012)

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.

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

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

Pasadena Ground Site

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

Credit: J. Gilman
Mobile Lab!

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

We use mobile labs to map emissions, chemistry, and dynamics across the LA Basin + Sunil!
CARB site:
$O_3$, CO, NO$_2$, PM$_{2.5}$, Temperature and Wind S/D

Start measurements by 6 August 2021
Measure through 3 Sept 2021 (~ 4 weeks)
Measurement site in Pasadena on CalTech campus

Ground site:
- 2 trailers
- 2 mobile labs
- Aerodyne HCl instrument
- LIDAR
Revisiting LA pollution with new technology!
Ozone diurnal profile from Mike Robinson

Photochemical ozone production and transport from downtown LA as measured at site.
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 CO₂.

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

**C¹⁴ Sampling**
~30 daily sampling @ USC, Granada Hills, CalTech PFPs + iWAS Canisters
Increased Frequency + Daytime MWO
Mobile Drives (??)
Aug 5 – Sep 6

**CalTech Ground Site**
Gooseneck Trailer + CSL Mobile Lab + CARB Mobile Lab (AQ + GHGs), USC Radon, Stationary Doppler Lidar
Aug 3 – Sep 6

**Mobile Drives**
Mobile Lab (AQ + GHGs)
Mobile Doppler
Aug 3 – 6, Sep 2 – 6