CALIFORNIA
AIR RESOURCES BOARD

Automated License Plate Readers (ALPR) Study in the Portside Environmental Justice Community

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Outline

I. Background: vehicle emissions and EMFAC model
II. How can automated license plate reader (ALPR) data improve fleet characteristics assumptions?
III. Application of ALPR in the Portside Environmental Justice Neighborhoods

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Vehicle Emissions

Exhaust Emissions from On-Road Vehicles

Emissions while vehicles are running

Emissions while vehicles are idling

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Estimating Vehicle Emissions

Estimating emissions from on-road vehicles requires us to know:

1. What is the fleet make-up (e.g., light-duty, heavy-duty)? What fraction are diesel trucks? How old are these vehicles? *We can use county level data, but are they representative?* → ***Fleet Characteristics***
2. How much they operate within our community? How many miles they drive and how many hours they idle? *We can use data from Metropolitan Planning Organizations (MPO) and other data sources such Telematics Service Providers*
3. How many grams of pollutants they emit per unit activity? *We get these estimates through extensive laboratory emissions testing*

Improving Fleet Characteristics Assumptions

- **How can we improve our assumptions?**
  Use vehicle specific data collected within communities to refine:
    - The fraction of light- vs heavy-duty vehicles
    - Model year distribution and therefore age
- **What is the benefit of this data collection?**
  We can validate and/or refine our on-road vehicle emission estimates (in EMFAC model) using this data

What is EMFAC?

- EMFAC is an emissions model*
- Developed and used by CARB to assess emissions from on-road vehicles
- EMFAC supports CARB's regulatory and air quality planning efforts

EMFAC2021 Fleet Characteristics Based on Registration Data

Current Data Sources	Strengths	Limitations
• **California Department of Motor Vehicles (DMV):** California-registered vehicles • **International Registration Plan (IRP):** Fleet-level info for out-of-state vehicles traveling in the state	Comprehensive; includes every currently-registered vehicle	Limited information about where heavy-duty vehicles travel

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*On-Road (EMFAC)
https://ww2.arb.ca.gov/our-work/programs/msei/on-road-emfac

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Background on Automated License Plate Reader (ALPR) Systems*

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** ALPR Privacy and Usage Policy (2017)*
https://ww2.arb.ca.gov/sites/default/files/2021-07/arb_alpr_privacy_usage_policy_050317.pdf

Vehicle Characteristics Derived from ALPR Data

ALPR Software Outputs:
- ✓ Plate State/Country
- ✓ Plate Number

Registration Databases (e.g., Department of Motor Vehicles)

Vehicle Characteristics:
- ✓ Gross Vehicle Weight Rating
- ✓ Model Year
- ✓ Fuel type

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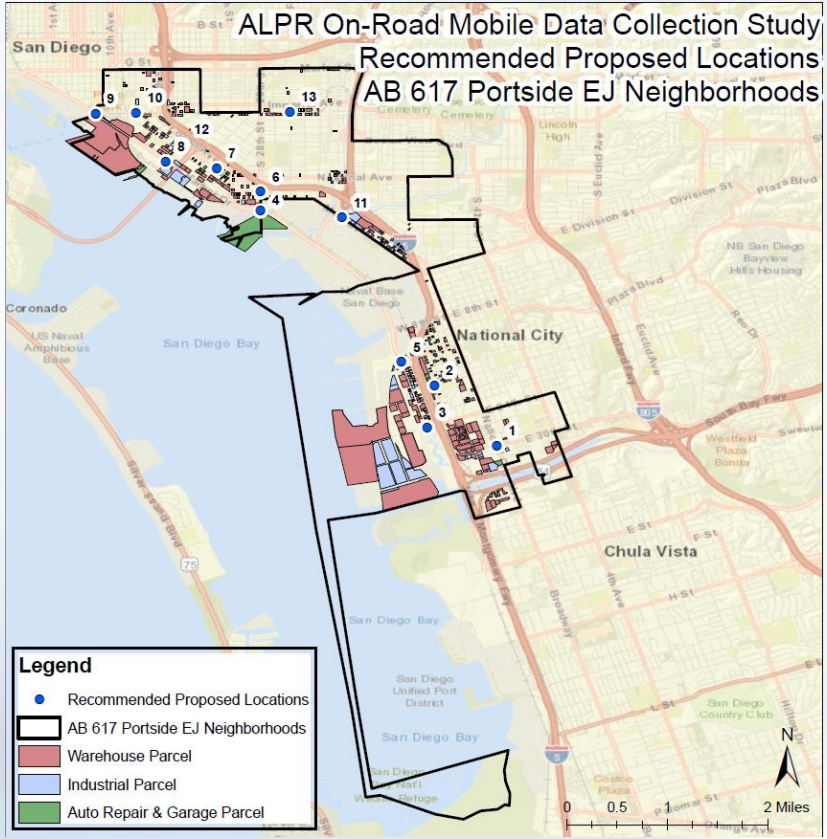
Data Collection Project in the Portside Environmental Justice Neighborhoods

- Collaboration with San Diego Air Pollution Control District
- Collected data with temporary ALPR systems in Summer 2019
- Only processed CA-registered vehicles
- **Goal:** corroborate current emissions inventory assumptions, i.e., fleet mixes and model year distributions from EMFAC San Diego County (registration data)



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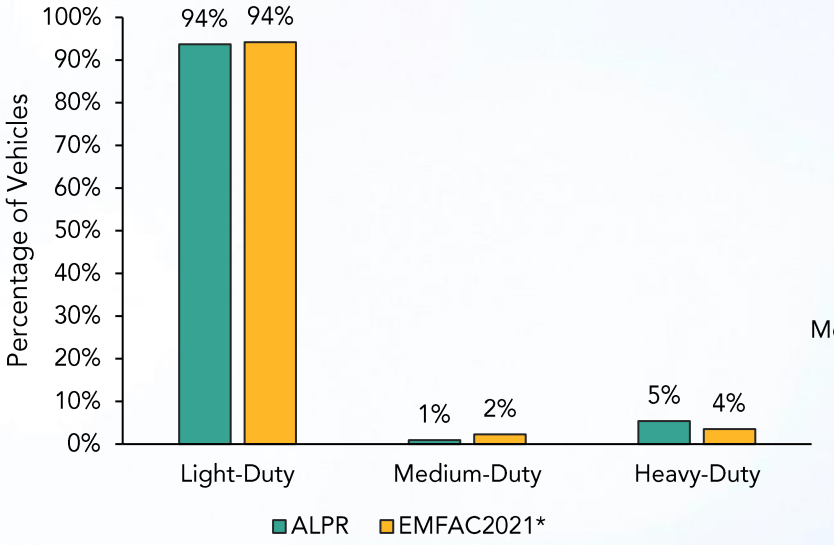
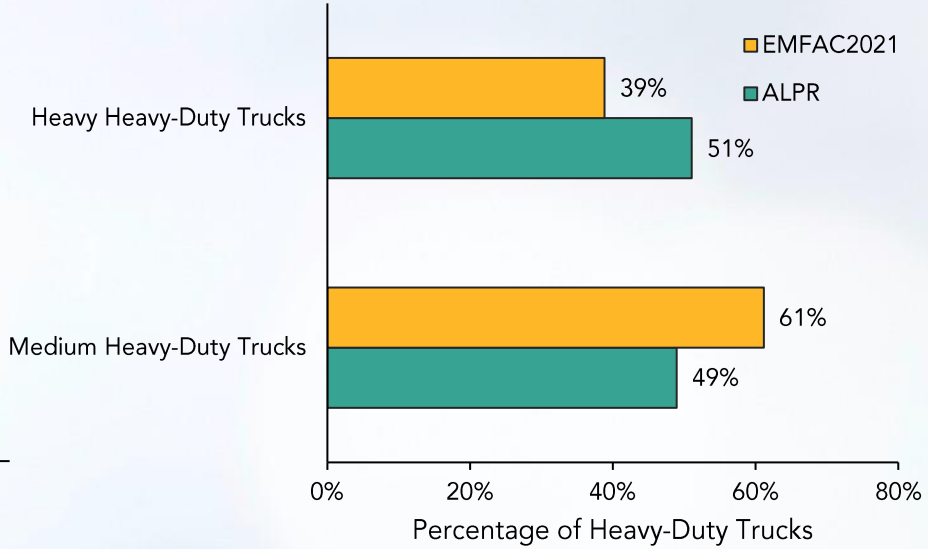
Results (Unique Vehicles): Fleet Mix





- ALPR-derived light-, medium-, and heavy-duty breakdown compares well to EMFAC2021
- ALPR results suggest a larger contribution of heavy heavy-duty trucks (Class 8 or gross vehicle weight rating > 33,000 lbs) to the overall heavy-duty truck population

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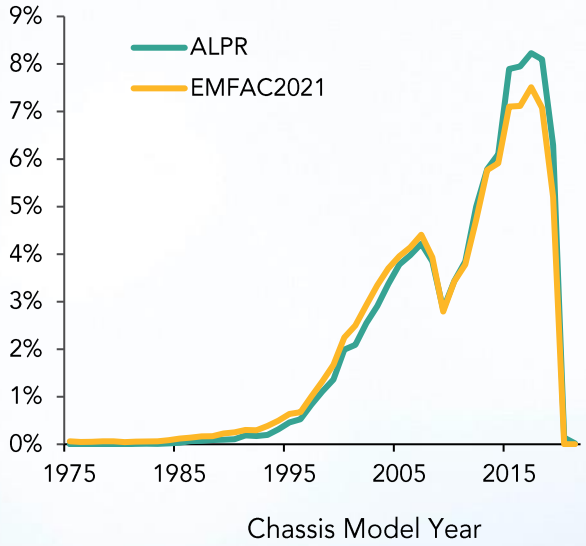
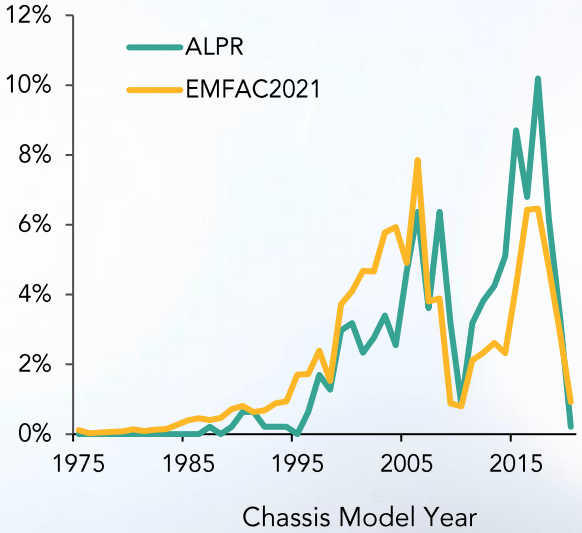
**EMFAC2021 results for San Diego County in CY2019*
EMFAC populations based on California DMV data

Results (Unique Vehicles): Model Year Distribution

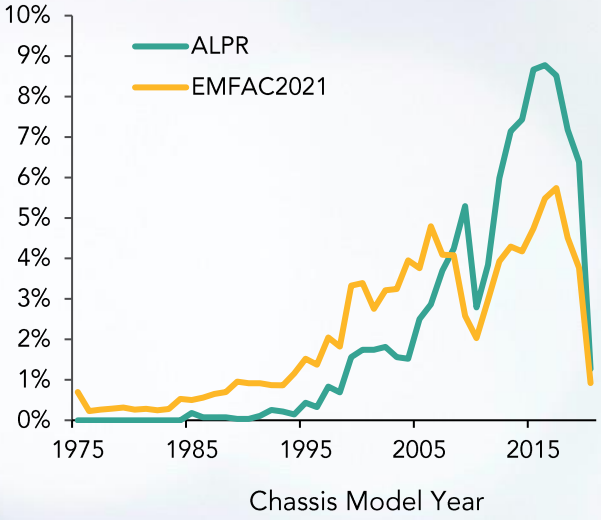
Light-Duty
N = 47,799



Medium-Duty
N = 469



Heavy-Duty
N = 2,752



ALPR-derived medium- and heavy-duty vehicles are newer than predicted by EMFAC2021

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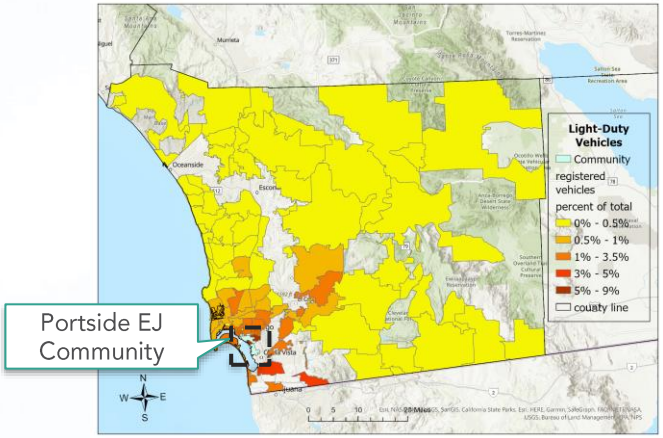
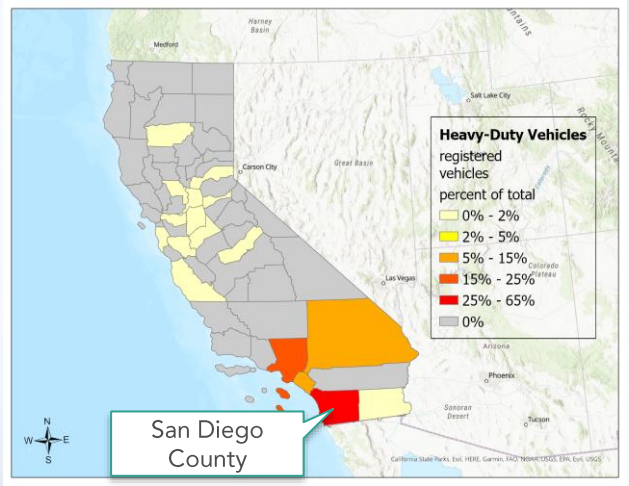
Where Are Vehicles Operating in the Community Registered?

Light-Duty Vehicle Population Fractions by DMV Zip Code



- **30%** of light-duty vehicles are registered within the community
- **83%** are registered within San Diego County
- Significant portion of intra-county travel, especially within a 25 miles of the community

Heavy-Duty Vehicle Population by DMV County



- **22%** of heavy-duty vehicles operating in the community are registered in the community
- **57%** are registered within San Diego County, but a significant portion are registered in other areas, particularly in LA and San Bernardino

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Conclusion and Next Steps for Community ALPR Data Collection

- Overall, community fleet mix and model year distributions are consistent with EMFAC2021 county level data
  - Larger heavy heavy-duty fraction – emissions ↑
  - Newer fleet – emissions ↓
  - **Overall effect:** diesel PM - **lower**, NOx – **neutral**
- Significant fraction of travel from vehicles registered outside of the community.
- Analyze ALPR data from other CARB projects in other AB617 communities.
- Improve future EMFAC versions to better capture local-scale activity and emissions.

Thank you!
Questions and Discussion