



# Use of Vehicle Telematics Data to Update Mileage Accrual Rates

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# Acknowledgements



CARB project leads:

- ❖ Sherrie Sala-Moore
- ❖ Sara Forestieri
- ❖ Sam Pournazeri

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Caltrans provided 2018 California Vehicle Inventory and Use Survey (CA-VIUS).



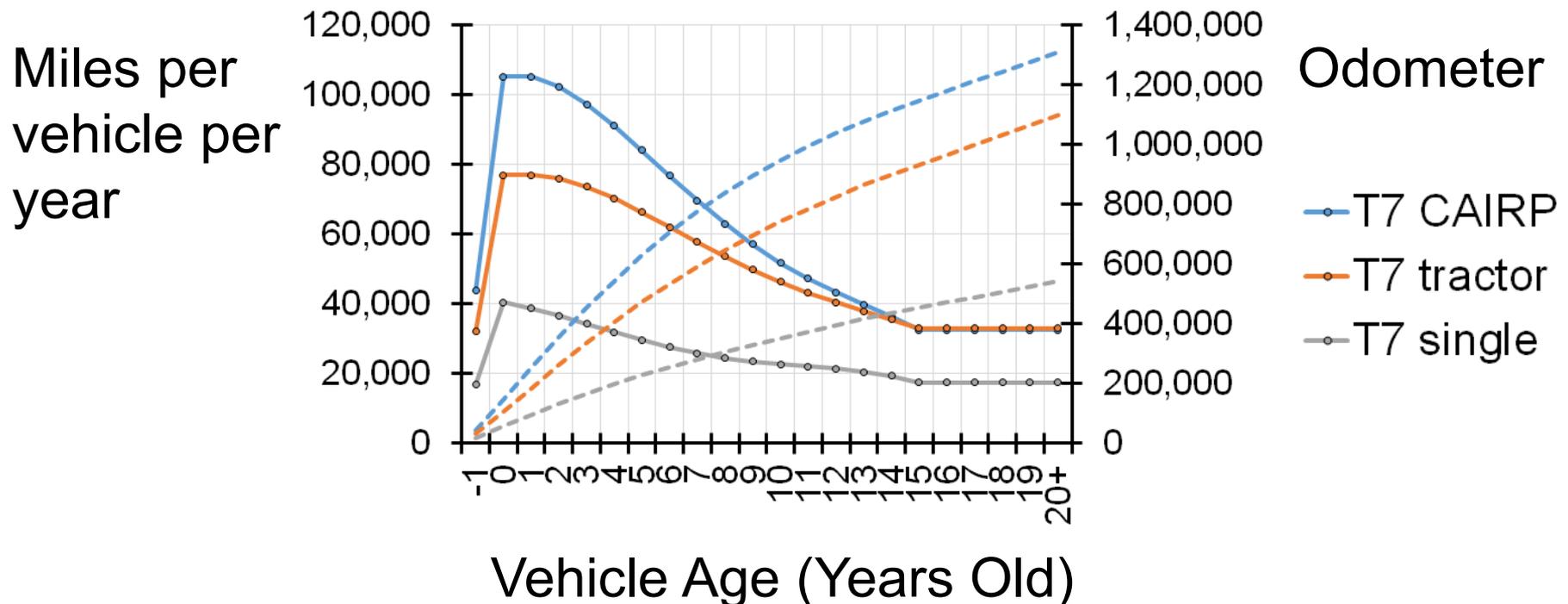
# Overview

- Mileage accrual rates
- Research objective
- Telematics data
- Results & comparison with survey data
- Summary

# Mileage accrual rates 1 of 2

Emissions = Emission Factor X **Source Activity**

EMFAC example mileage accrual rates:





## Mileage accrual rates 2 of 2

Emissions = **Emission Factor** X Source Activity



Emission Factor

= **Base Emission Rate** X Correction Factors



Base Emission Rate =

Zero Mile Rate + Deterioration Rate X **Odometer**



# Research objective

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Update heavy-duty vehicle (HDV) annual mileage accrual rates in EMFAC model

New data requirements:

- Recent within 5 years
- California-specific
- Differences by weight, body, vocation



# Telematics data

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- Method of harvesting data from vehicles
  - Connected vehicles
  - Navigation devices
  - Mobile phone apps
  - Location-based services
  - Data loggers
- Geotab, Inc. fleet management
  - Customers include HDV truck fleets
  - Geotab loggers collect GPS & engine data

# Geotab

Global leader in telematics,  
providing open platform fleet  
management solutions

**>1.7 M**

connected  
vehicles, globally

**>40 B**

data records  
processed daily

Richest telematics dataset in  
the world

GPS, traffic, accelerometer,  
engine data,  
weather, driver behaviour

310,000 heavy duty trucks

Patented method of moving  
data efficiently from vehicle  
to server



Point cloud image of 1-day data density  
from Geotab's database

## Scope of Geotab data pull

- Gross vehicle weight  $\geq$  14,000 lbs.
- January to December, 2018
- $\geq$  30 days of reporting
- Any travel inside California

## Geotab groups data to protect privacy

- N=116,693 trucks → 890 unique data records
- Between 3 and 3,400 trucks on a record
- The 890 resulted from project requirements:
  - » Vehicle model year
  - » Weight
  - » Body style
  - » Vocation

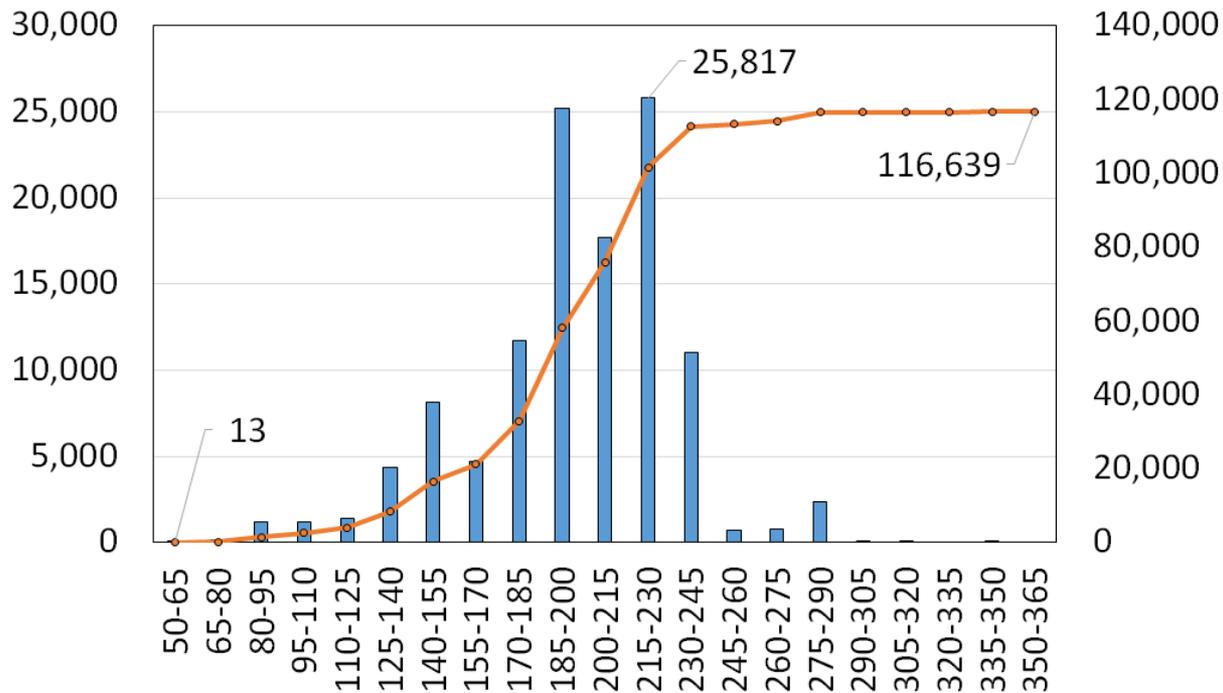
## Each record provided:

- Vehicle count
- Vehicle-days logged
- Calendar days elapsed
- Several VMT metrics
  - Key was “VMT per day” (per vehicle, equal-weighted average)
  - Percentiles and standard deviation of “VMT per day”

## Transformations to the Geotab data

- Scale “VMT per day” to annual
- Align Geotab categories to EMFAC ones
- Plot profiles of annual mileage accrual by age
- Fit trendlines to the data
- Comparison with other sources

## Scale “VMT per day” to annual



Number of vehicles

Cumulative vehicles

Average Calendar Days Elapsed around Logging in 2018

## Scale “VMT per day” to annual

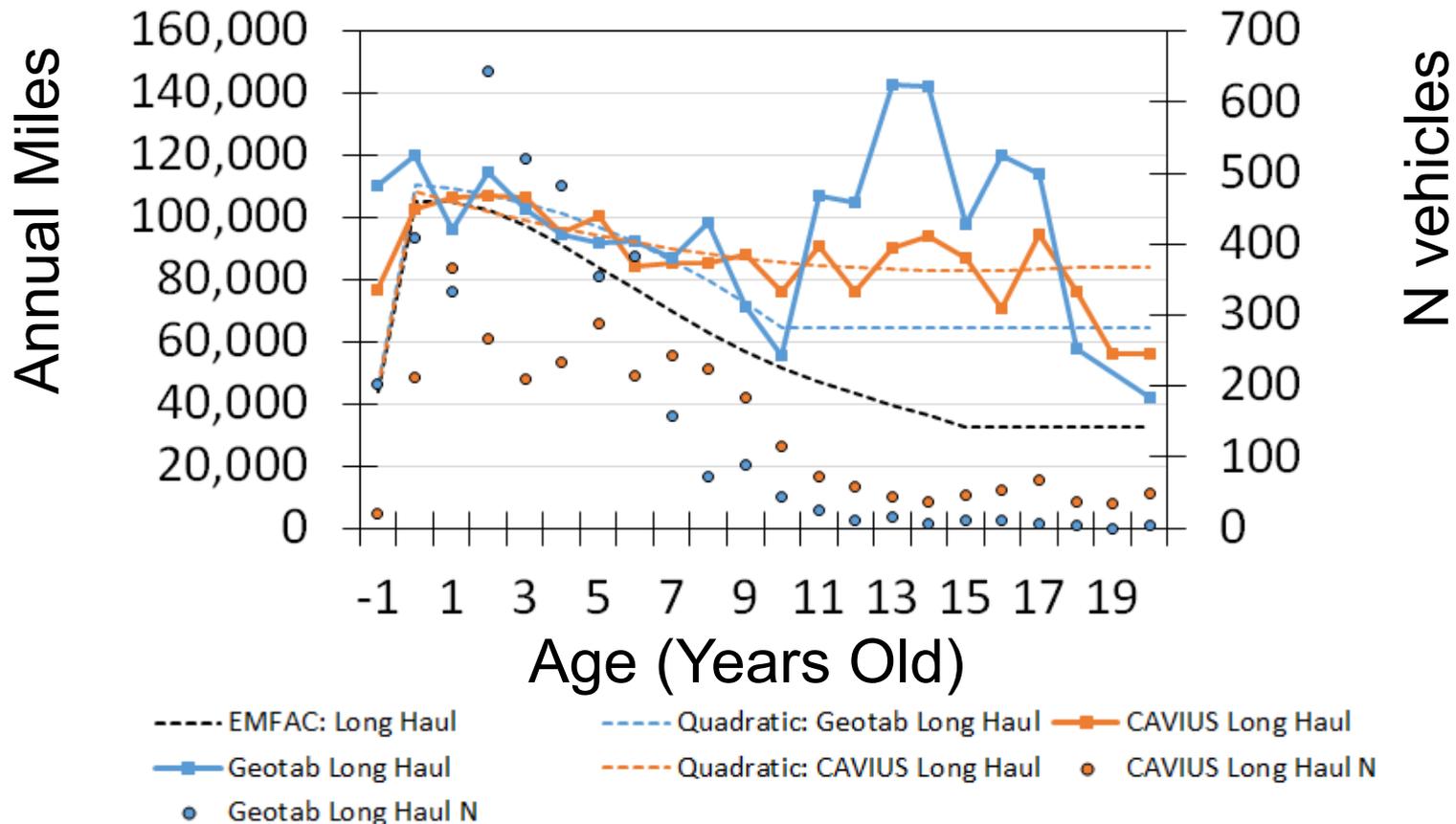
Annual miles accrued = (VMT per day) X (**Scalar**)

$$\text{Scalar} = \frac{\text{Vehicle Days Logged}}{\text{Calendar Days Elapsed}} \times 365 \text{ days}$$

- Derived scalars different for each record
- Most common scalar 185-200 days

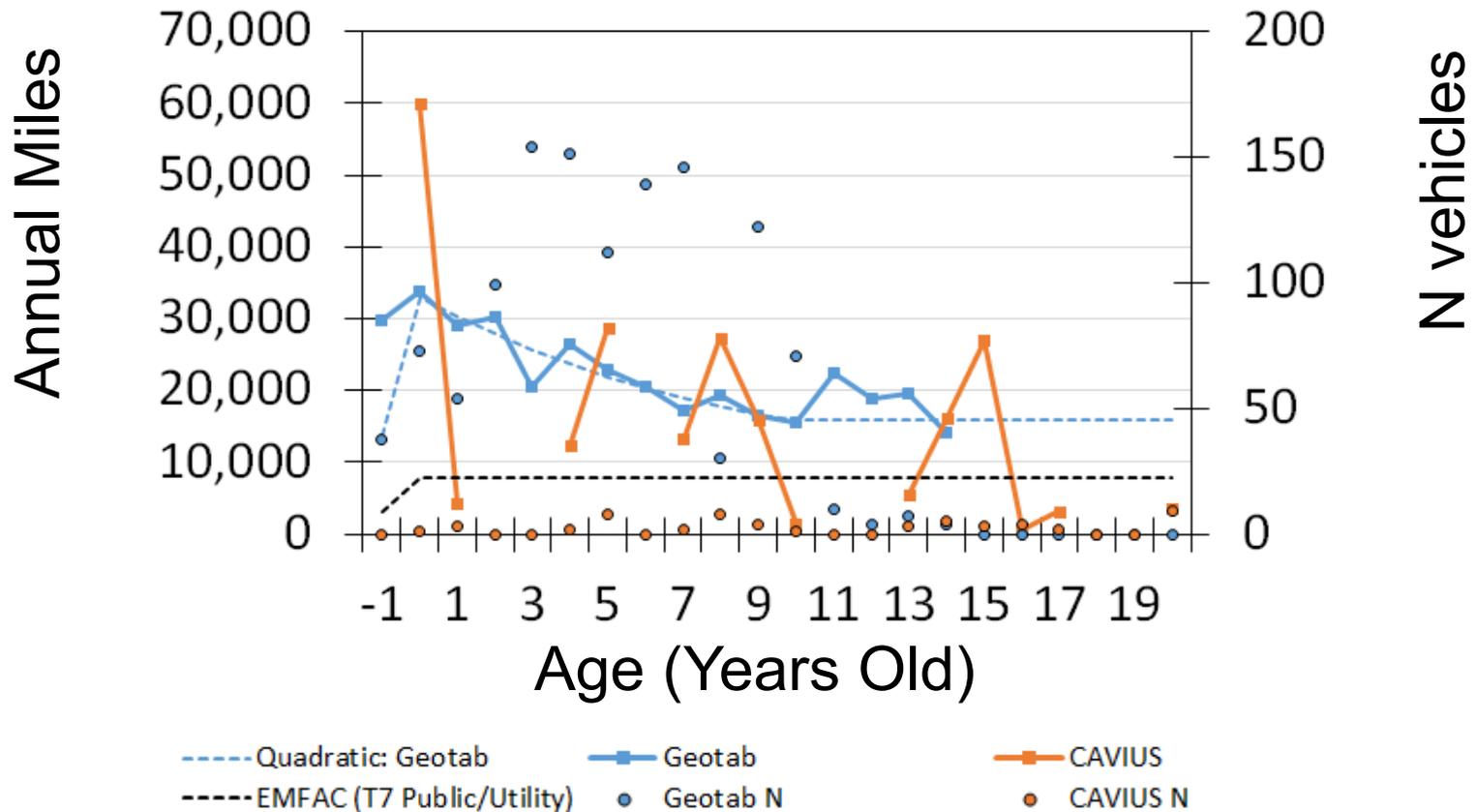
# Results 1 of 5

## Class 7-8 Interstate Tractor Trucks



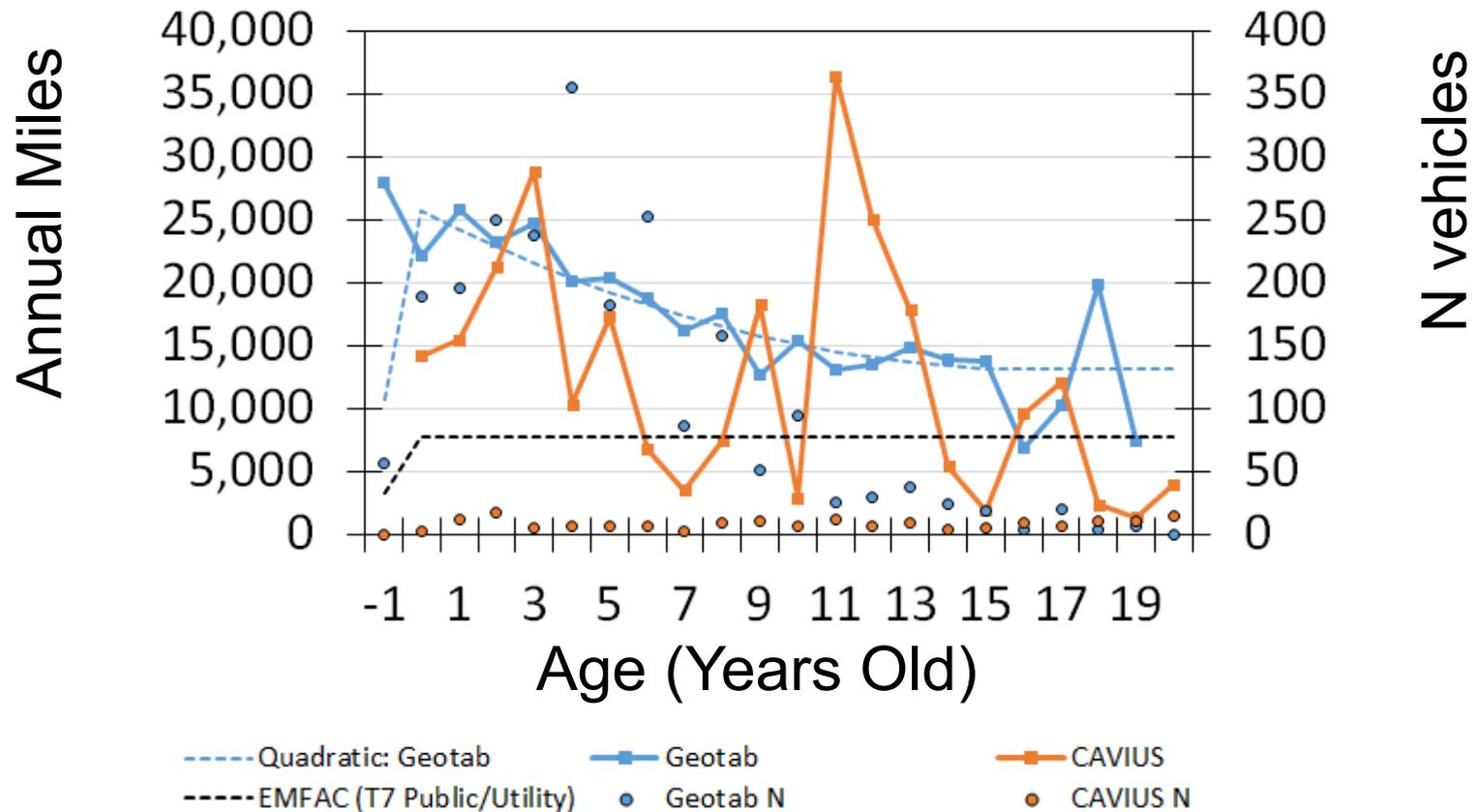
# Results 2 of 5

## Class 7-8 Public/Utility Truck - Tractor



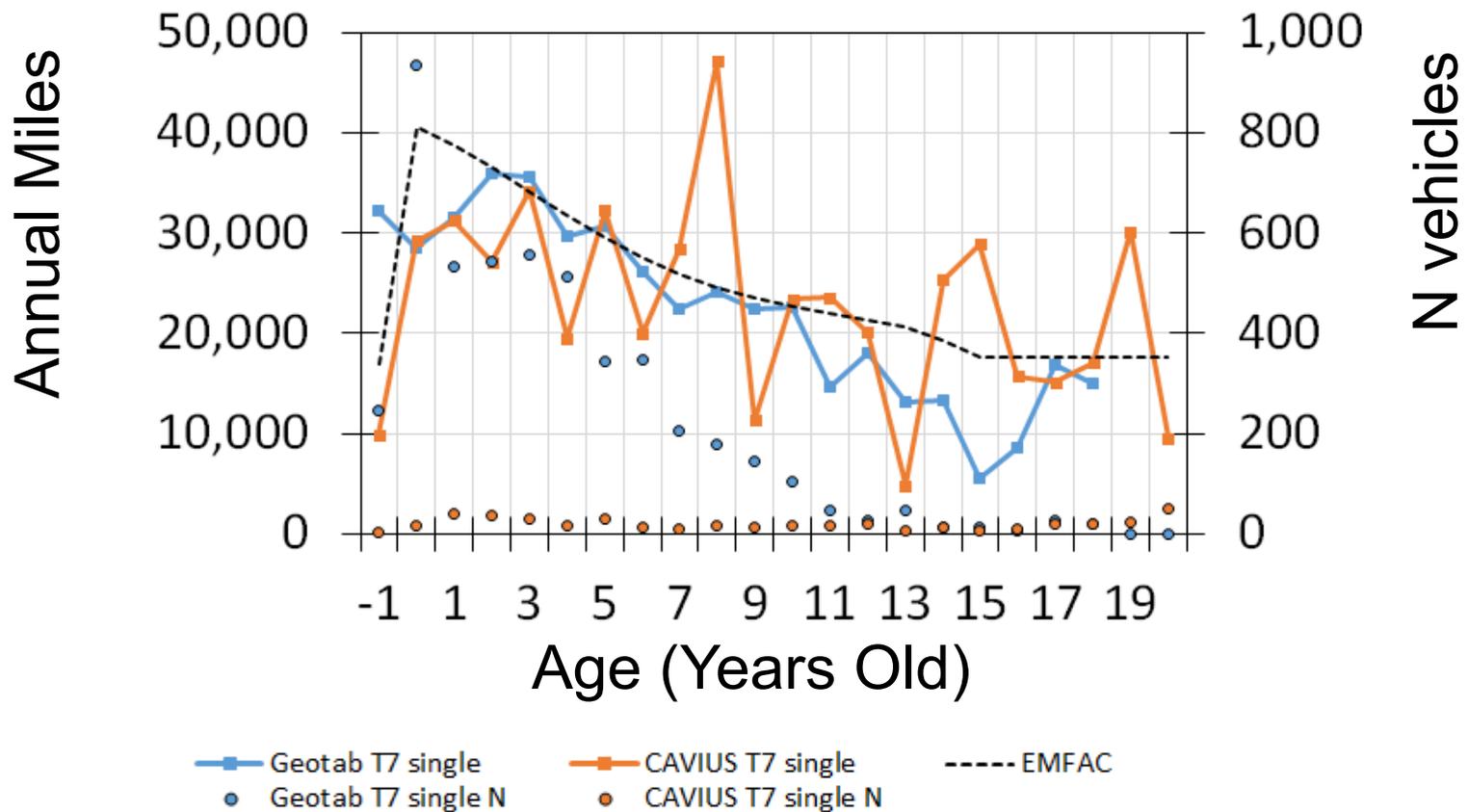
# Results 3 of 5

## Class 7-8 Public/Utility Truck - Single Unit



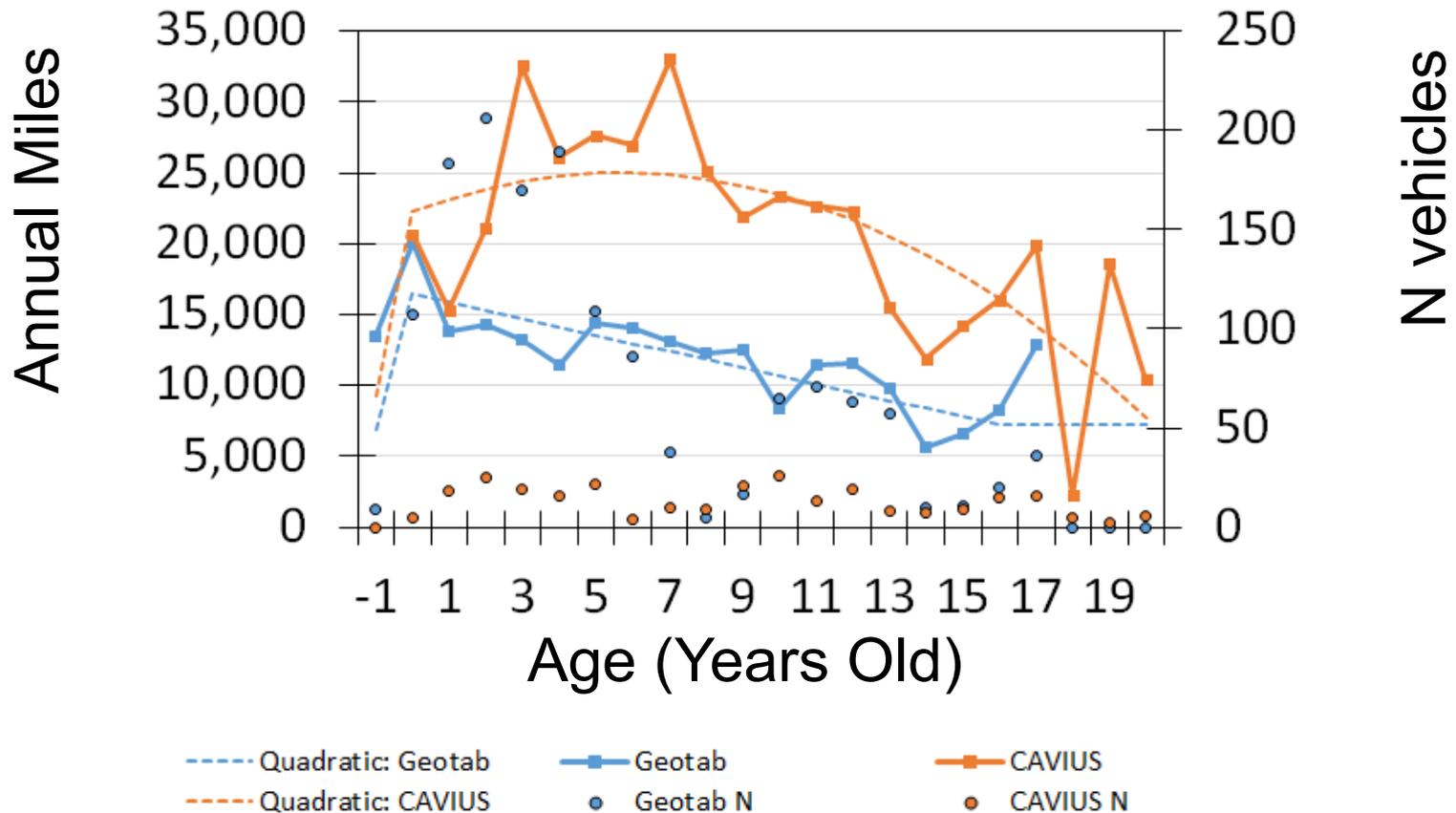
# Results 4 of 5

## Class 8 Single-Unit (“other” vocations)



# Results 5 of 5

## Class 4-7 Single Unit Delivery Trucks





# Summary

- EMFAC accrual profiles from 2002 VIUS outdated
- Geotab provided aggregated VMT summaries
- ERG produced 18 new accrual profiles for CARB to consider use in next EMFAC202x
- Recommended future refinement of “delivery truck” category