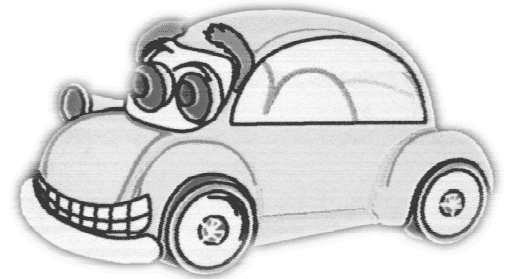


# ***Sensitivity Testing of MOBILE6.0***

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# Introduction

- Motivation
  - Many MOBILE6 commands require numerical data concerning vehicle fleets and activity and other conditions.
  - MOBILE6 default inputs are national averages and may not be representative of a specific locality.

# Prioritize Data Collection

- Identify which inputs have substantial effects on emissions
- Provide an illustration of how inputs were varied and how the results were quantified
  - Quick look at summary tables
  - Examples of results for major and intermediate effects categories

# MOBILE6 Basics

- Tailpipe emissions increase linearly with the age or mileage of the vehicle.
- Additive and multiplicative adjustments (e.g., additive start emissions) to the emission lines are determined from analysis of emissions data.

# Procedure Used

- Determine methods to vary input data relative to the default
- MOBILE6 “composite” emissions results were determined over a range of inputs
- Comparisons were made relative to a set of standard emissions for all pollutants and a range of calendar years

# Variation of Daily Temperature Cycles

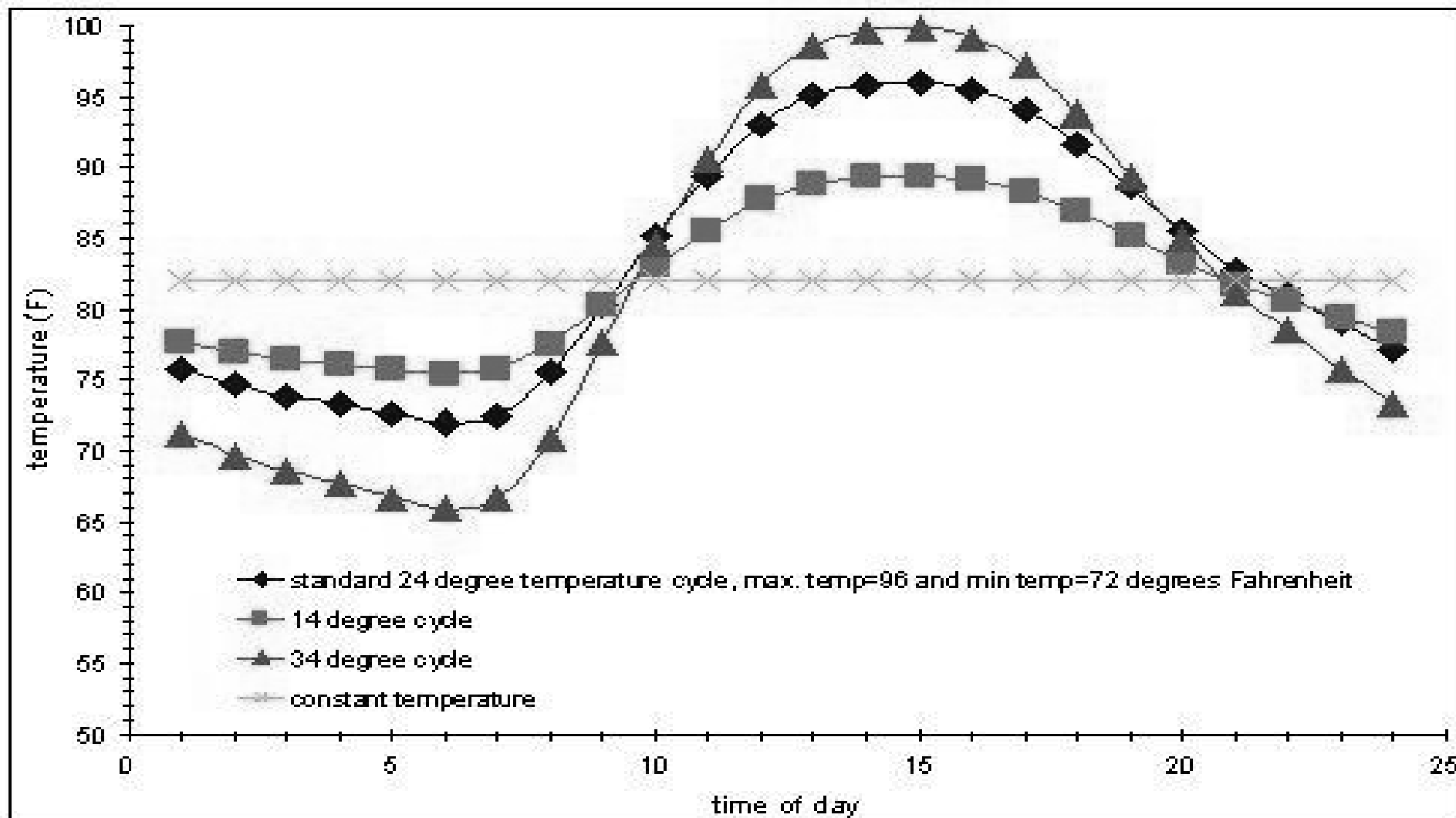
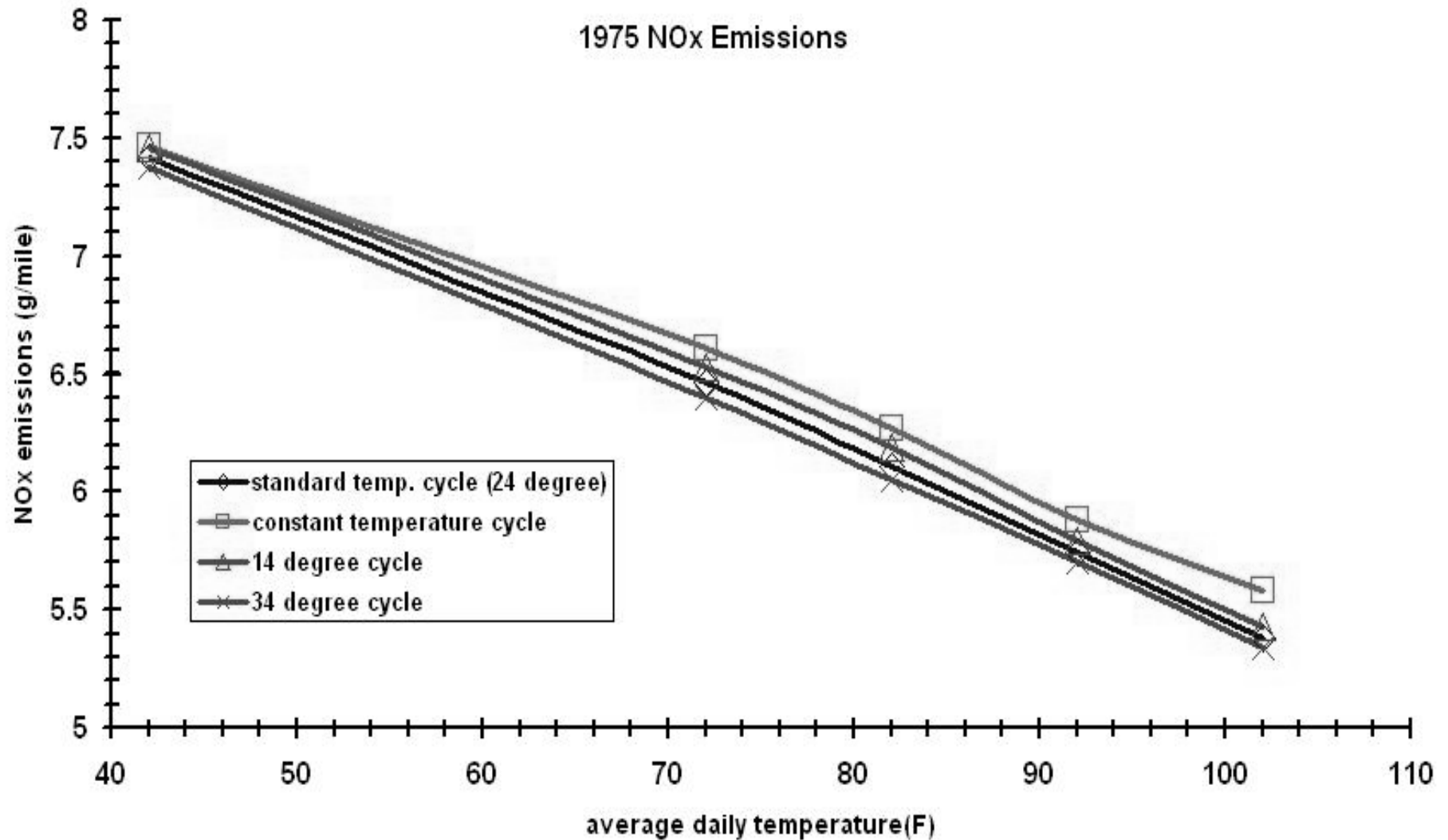
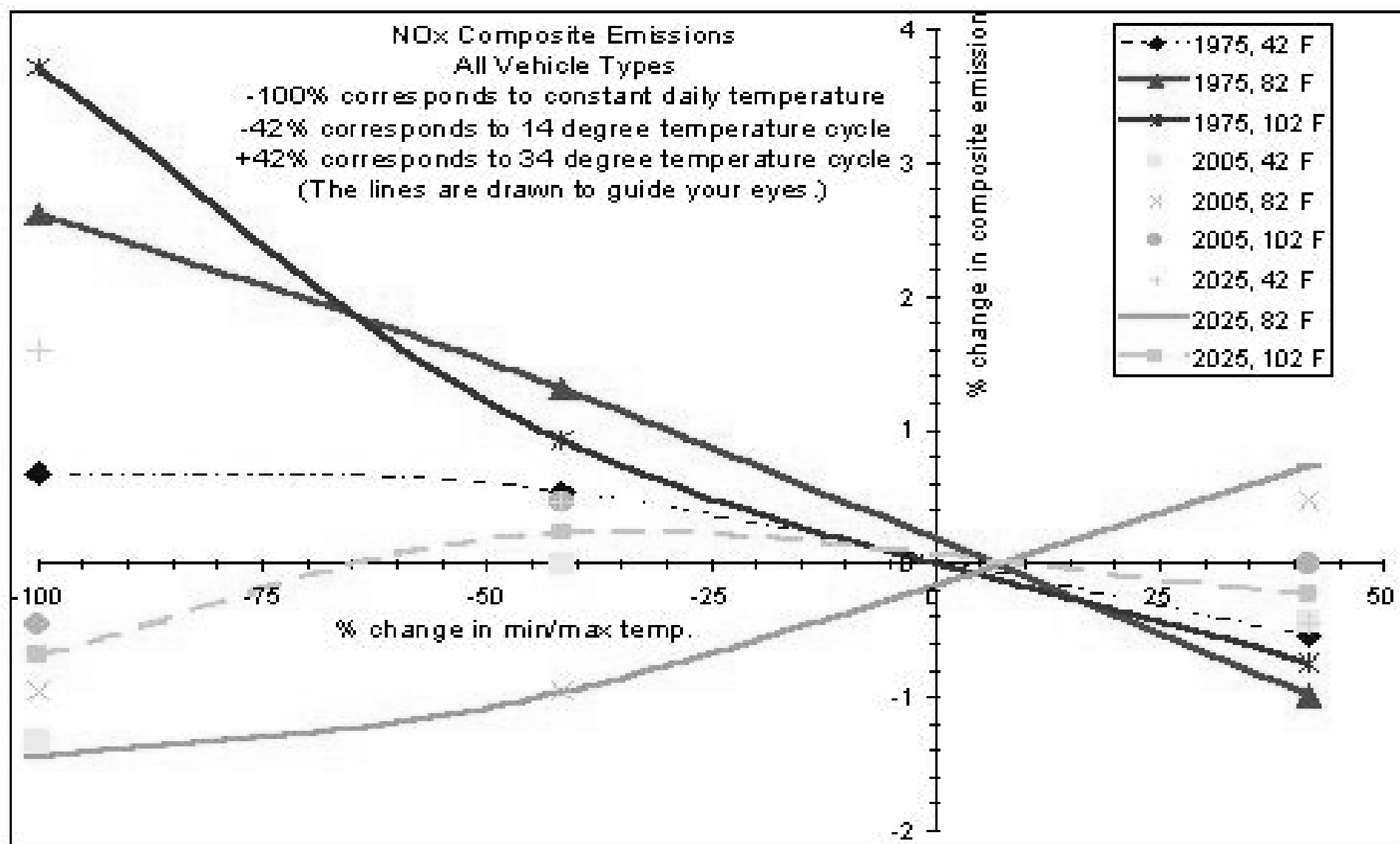


Figure 1. Variations of daily temperature cycles by using the MIN/MAX TEMPERATURE command. The figure has four variations all with a daily average temperature of about 82 ° F.

# NOx as a Function of Average Daily Temperature and Temperature Cycle



# Change in NOx as a Function of Changes in Temperature Cycle





# Organization of the Results

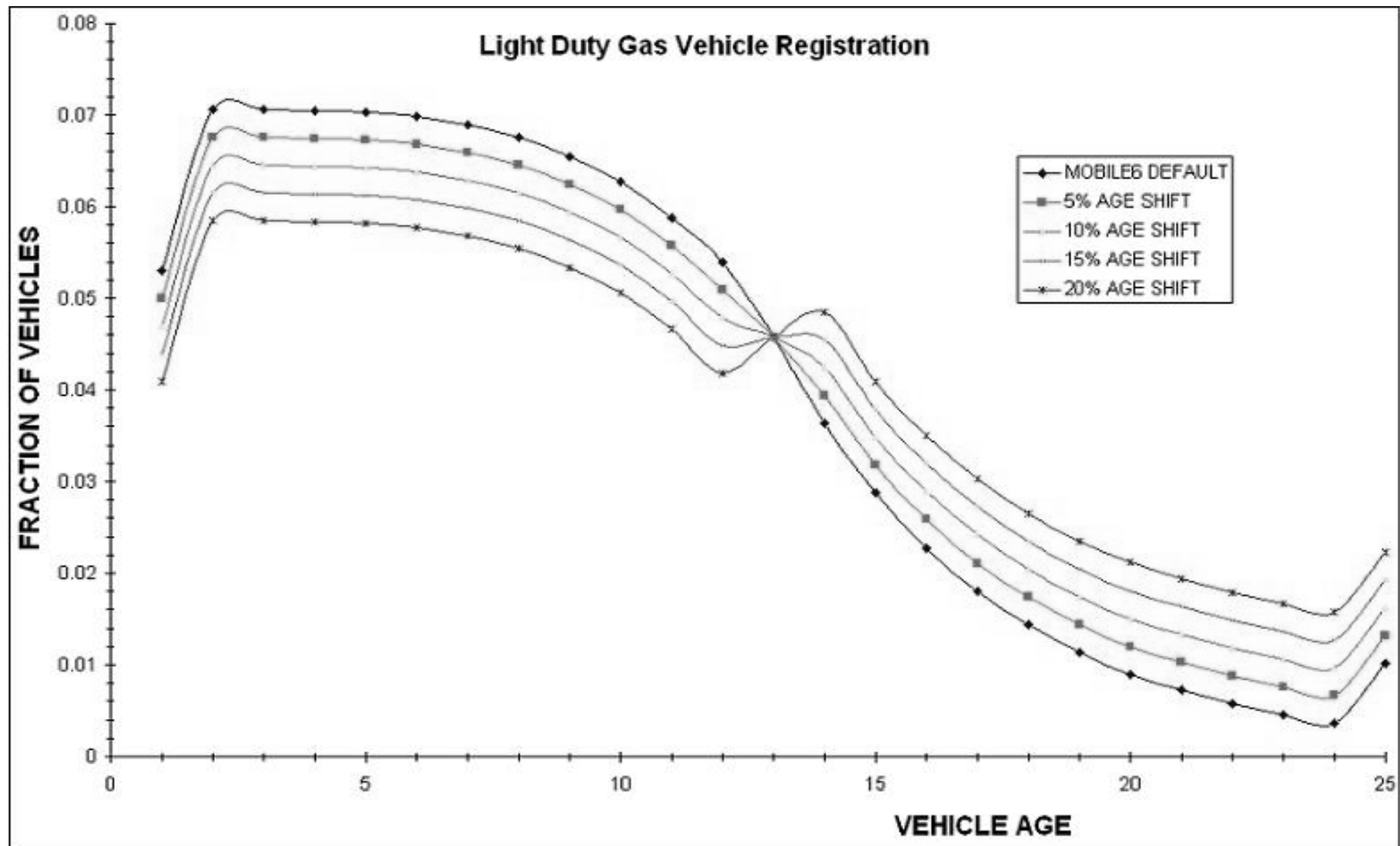
- About 20 Inputs, 3 Pollutants, 5 Calendar Years, and at Least 5 Variations for Each Input
  - Major Effects
    - Inputs which have more than a 20% affect on emissions
  - Intermediate Effects
    - Inputs which have between 5% and 20% affect on emissions
  - Minor Effects
    - Inputs which have less than 5% affect on emissions

# RESULTS : MAJOR EFFECTS

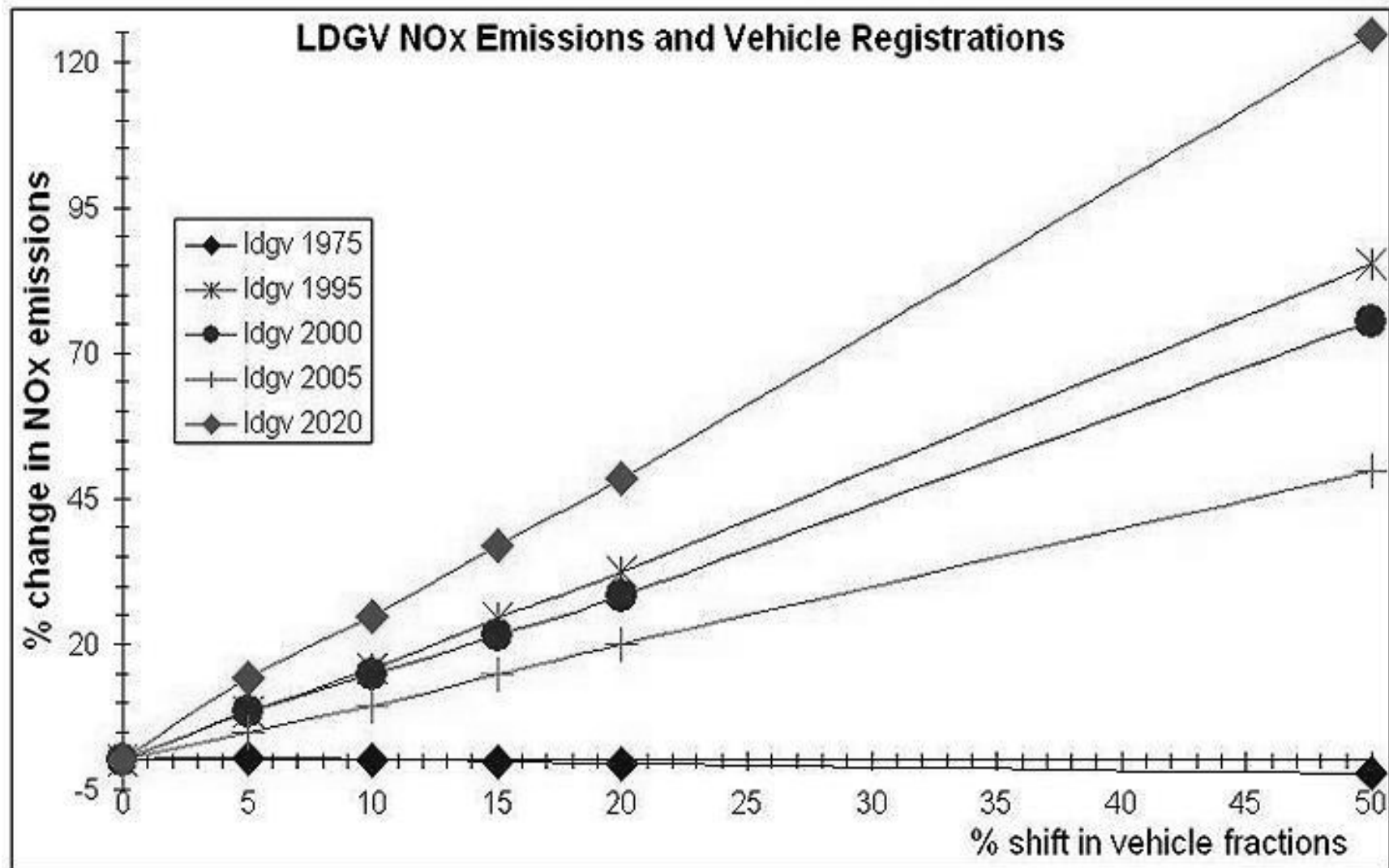
( HC, CO, and NOx emissions from LDGV and All Vehicles)

- Registration distribution command
- Min/Max temperature command
- Average speed command
- Speed VMT command (HC only)
- Fuel RVP (HC and CO)

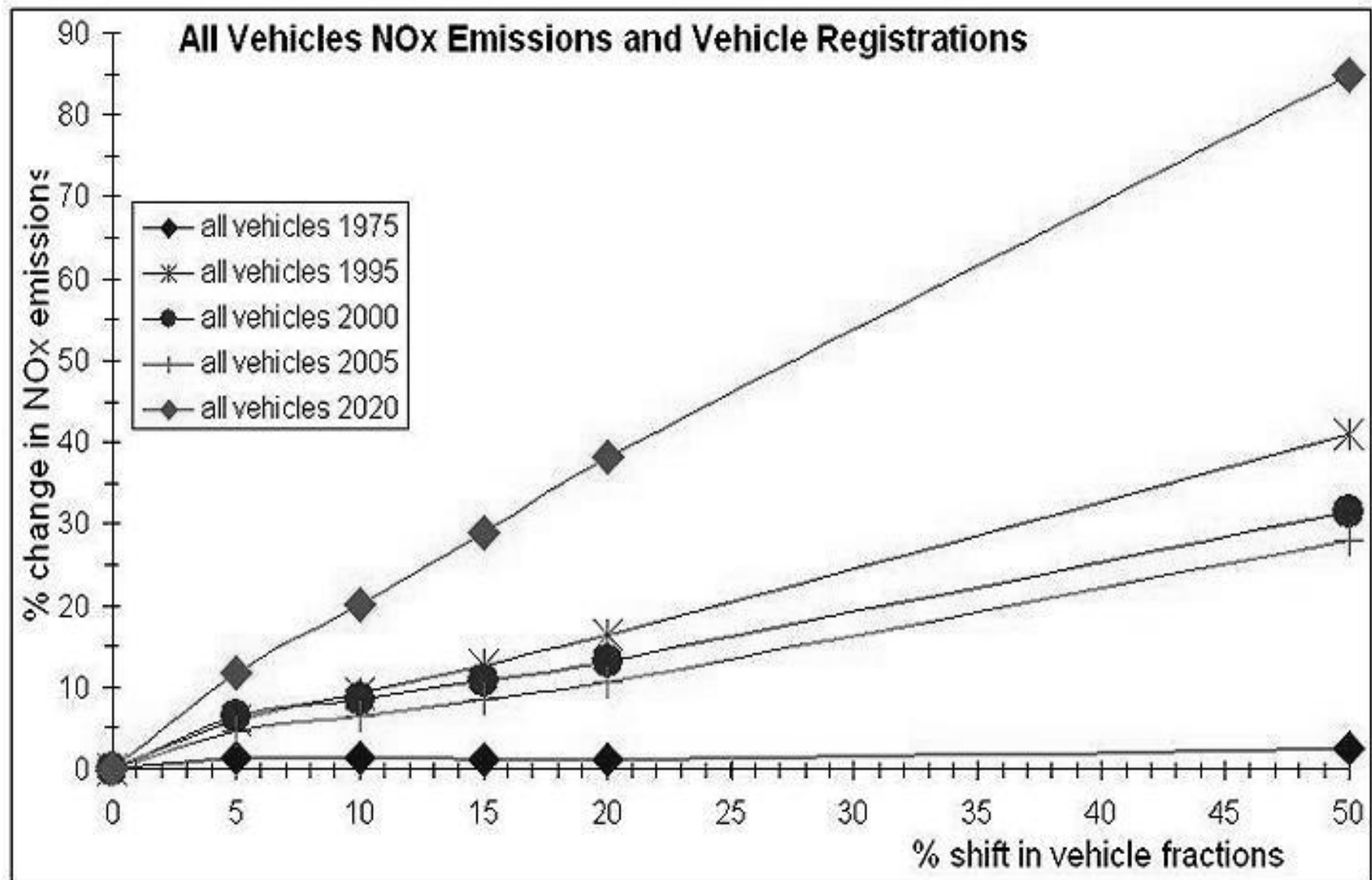
# Variation of Default Light Duty Gas Vehicle Registrations



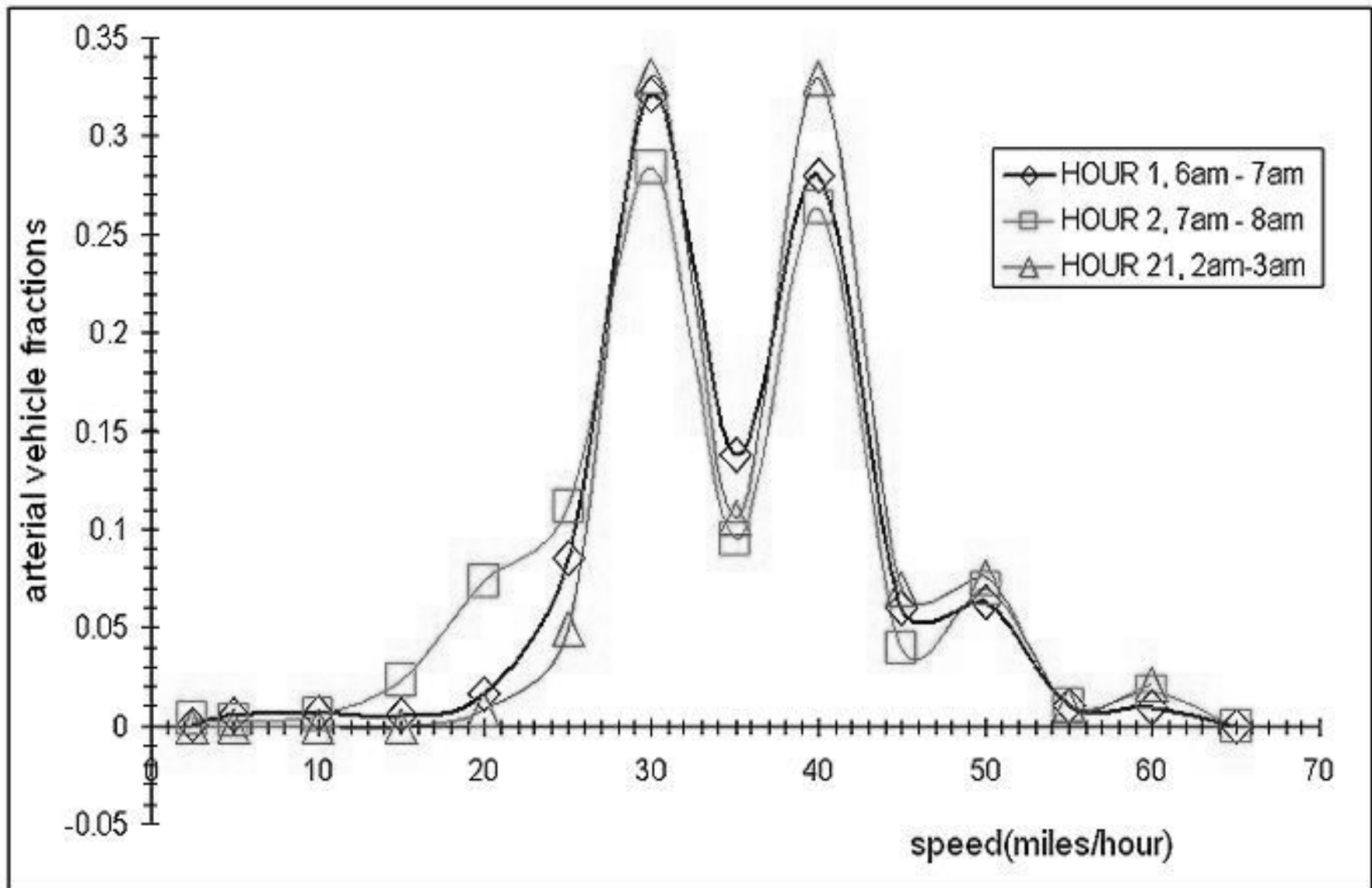
# Vehicle Registration/Vehicle Age Fractions vs. Light Duty Gas Vehicle NOx Emissions



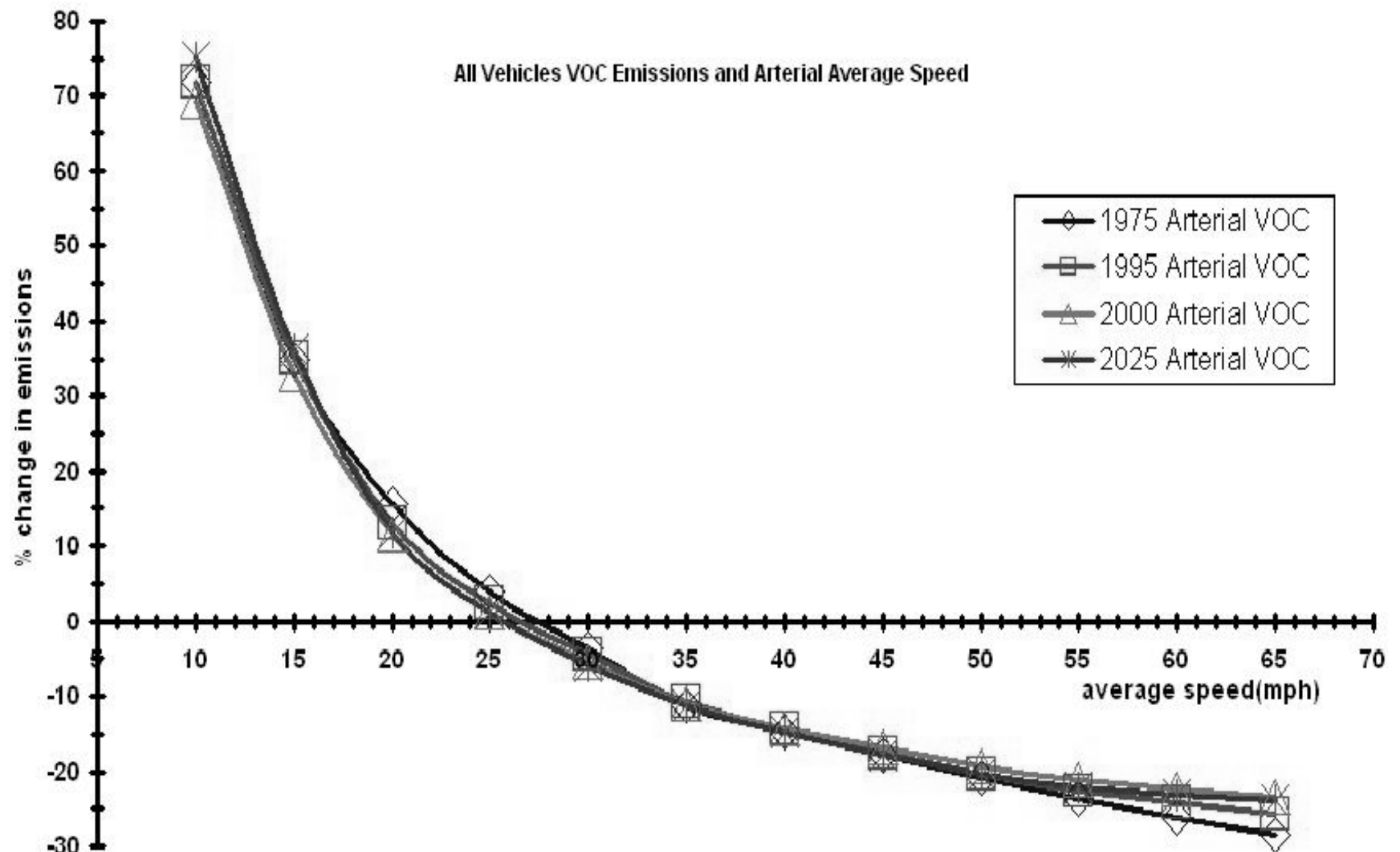
# Vehicle Registration/Vehicle Age Fractions and All Vehicles NOx Emissions



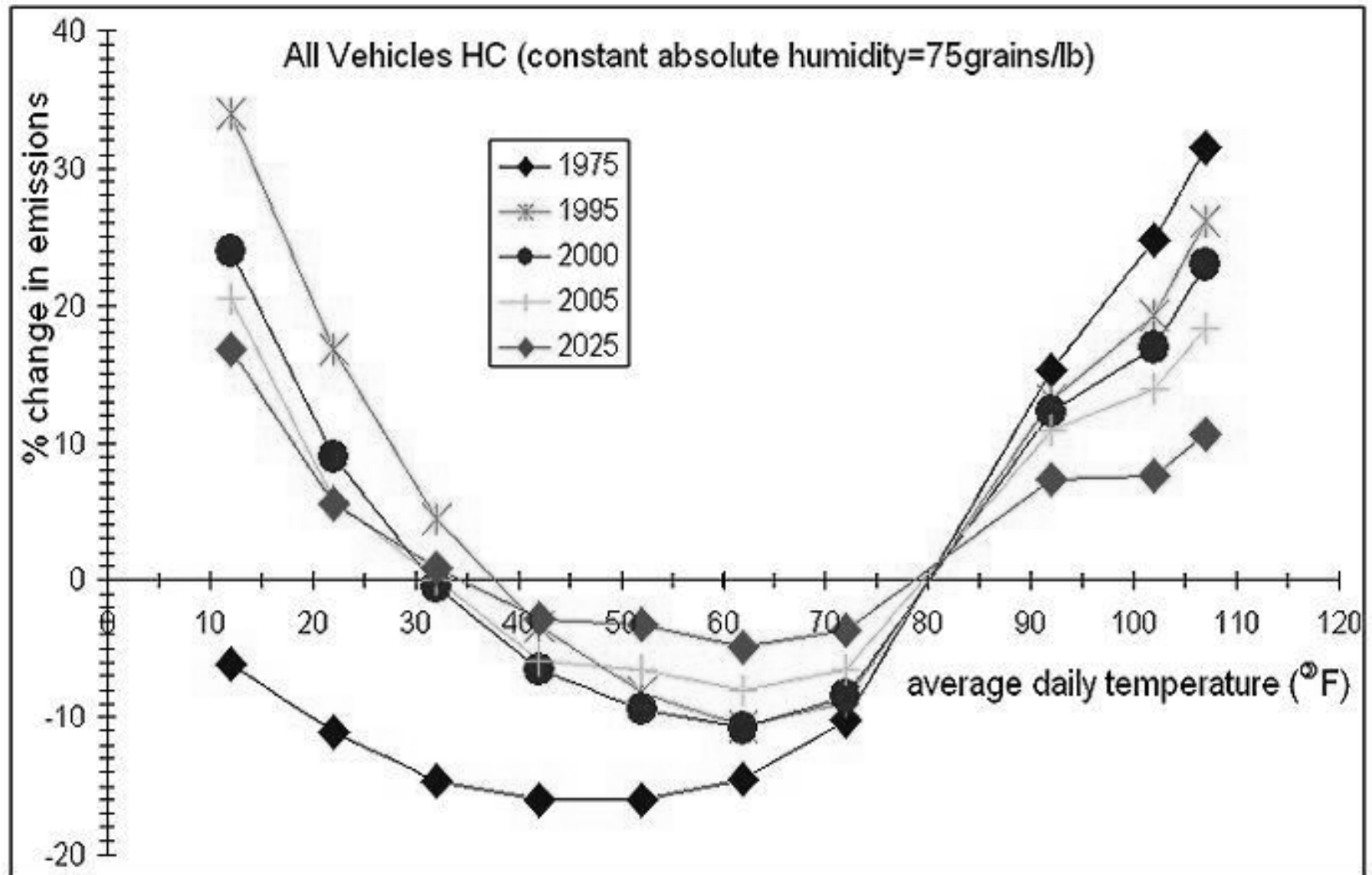
# Default Light Duty Gas Vehicle Arterial Fractions for Three Different Hours of the Day



# VOC Emissions and Average Speed

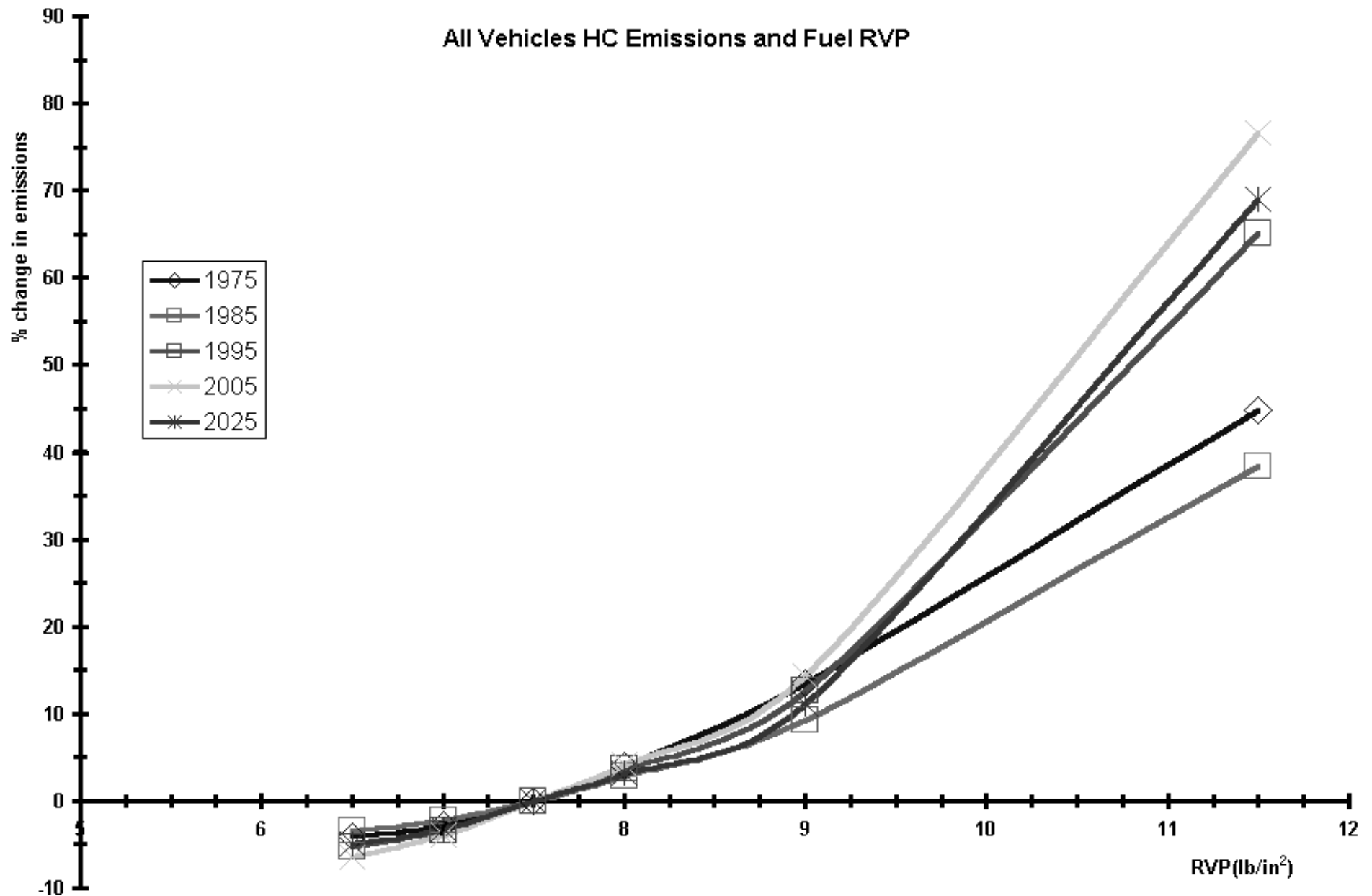


# HC Emissions and Average Daily Temperature





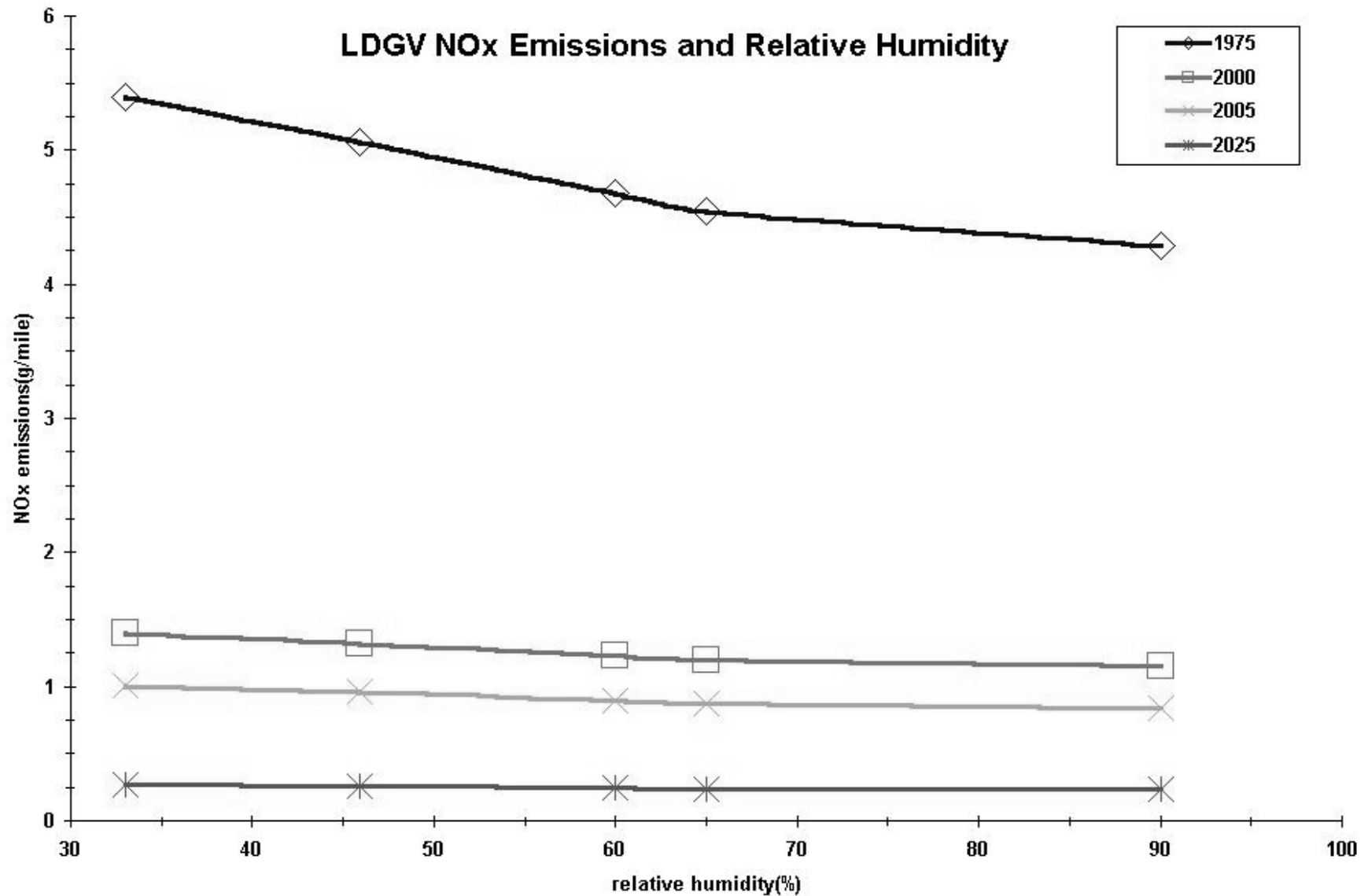
# HC Emissions and Fuel RVP



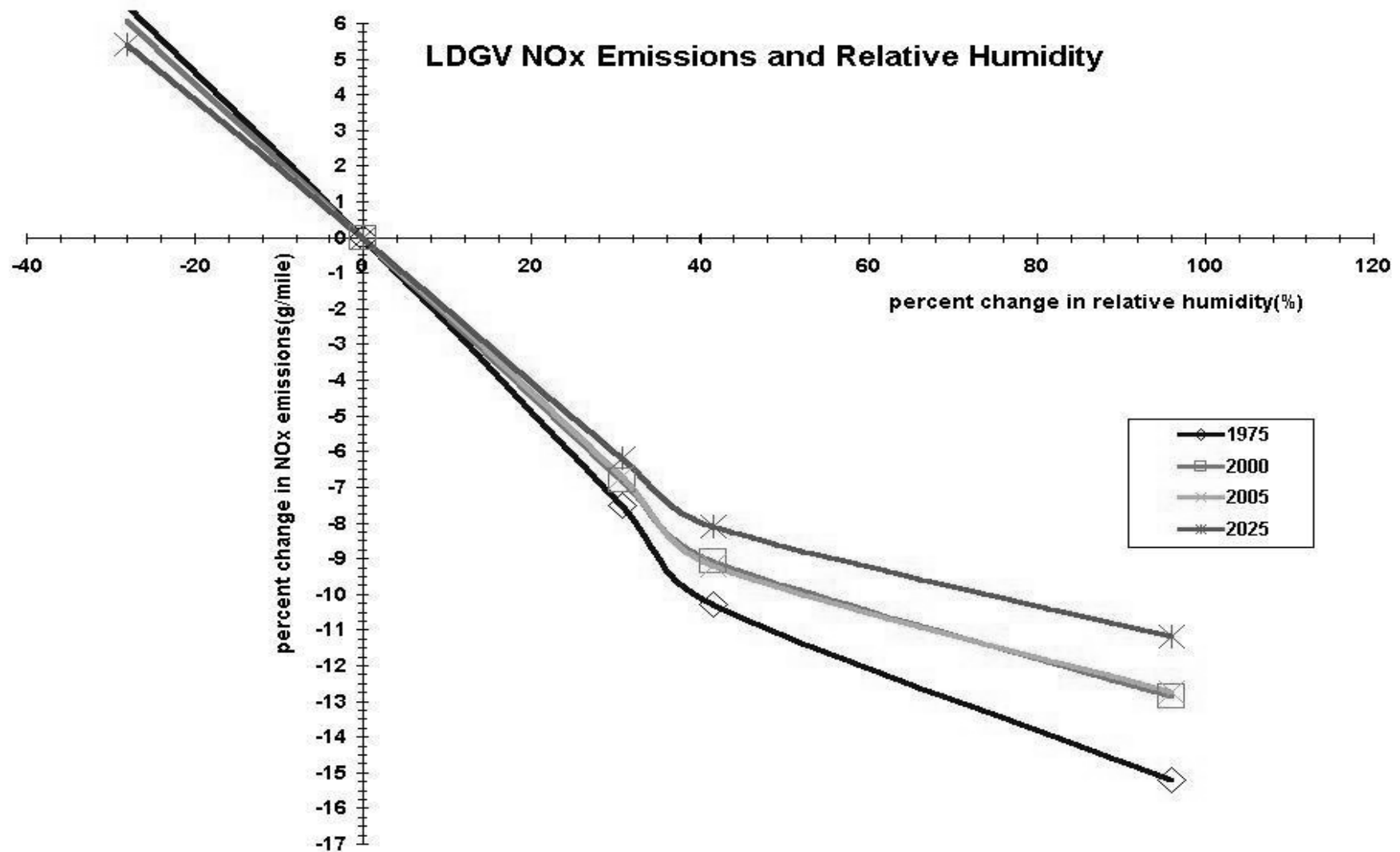
# Intermediate Effects

HC	NOx
<ul style="list-style-type: none"><li>• Altitude (high versus the default low altitude)</li><li>• Starts per day</li></ul>	<ul style="list-style-type: none"><li>• Absolute humidity</li><li>• Altitude (high versus the default low altitude)</li><li>• Air conditioning</li><li>• Mileage accumulation</li><li>• Starts per day</li><li>• Speed VMT</li></ul>

# LDGV NOx Emissions and Humidity



# Change in Light-Duty Gasoline Vehicle NOx as a Function of Percent Change in Humidity



# Minor Effects

HC	NOx
<ul style="list-style-type: none"><li>• Absolute humidity</li><li>• Air conditioning</li><li>• Facility VMT</li><li>• Hourly temperature</li><li>• Mileage accumulation</li><li>• Fuel program/sulfur content</li><li>• Oxygenated fuels</li><li>• Temperature cycles</li><li>• Average daily temperature and humidity</li></ul>	<ul style="list-style-type: none"><li>• Facility VMT</li><li>• Hourly temperature</li><li>• Fuel program/sulfur content</li><li>• Oxygenated fuels</li><li>• Temperature cycles</li><li>• Average daily temperature and humidity</li></ul>

# Conclusions

- Four major parameters affect MOBILE6 emissions:
  - Vehicle Registrations or Age Distribution
    - The most important parameter for HC and NO<sub>x</sub> and the second most important parameter for CO
    - Results reflect basic assumption of worsening emissions with age and improvements in technology and standards with model year

# Conclusions

- Average Daily (MIN/MAX) Temperature
  - Second most important parameter for HC and NO<sub>x</sub>
  - The most important parameter for CO, especially for temperatures below 55 ° F
- Area Wide and Freeway Average Speed commands
  - Should be used with realization that they cause large changes in the underlying assumptions about roadway type VMT fractions and these changes yield large changes in emissions
- Fuel RVP
  - Large increases in HC and CO emissions for RVP values above 7.5lb/in<sup>2</sup>

# Conclusions

- Four parameters have an intermediate affect MOBILE6 emissions
  - Absolute humidity and air conditioning (NO<sub>x</sub>)
  - Altitude
  - Starts per day
  - Mileage accumulation (NO<sub>x</sub> and CO)
- Other parameters have a minor affect



# Conclusions

- Results of this study should be used in conjunction with EPA guidance on local inputs
- Complete set of results on all the input parameters studied is available on OTAQ's website