

The Effects of Ultra-Low Sulfur Gasoline on Emissions from Tier 2 Vehicles in the In-Use Fleet

Final Report

Appendix E Plots of All Pollutants and Bags

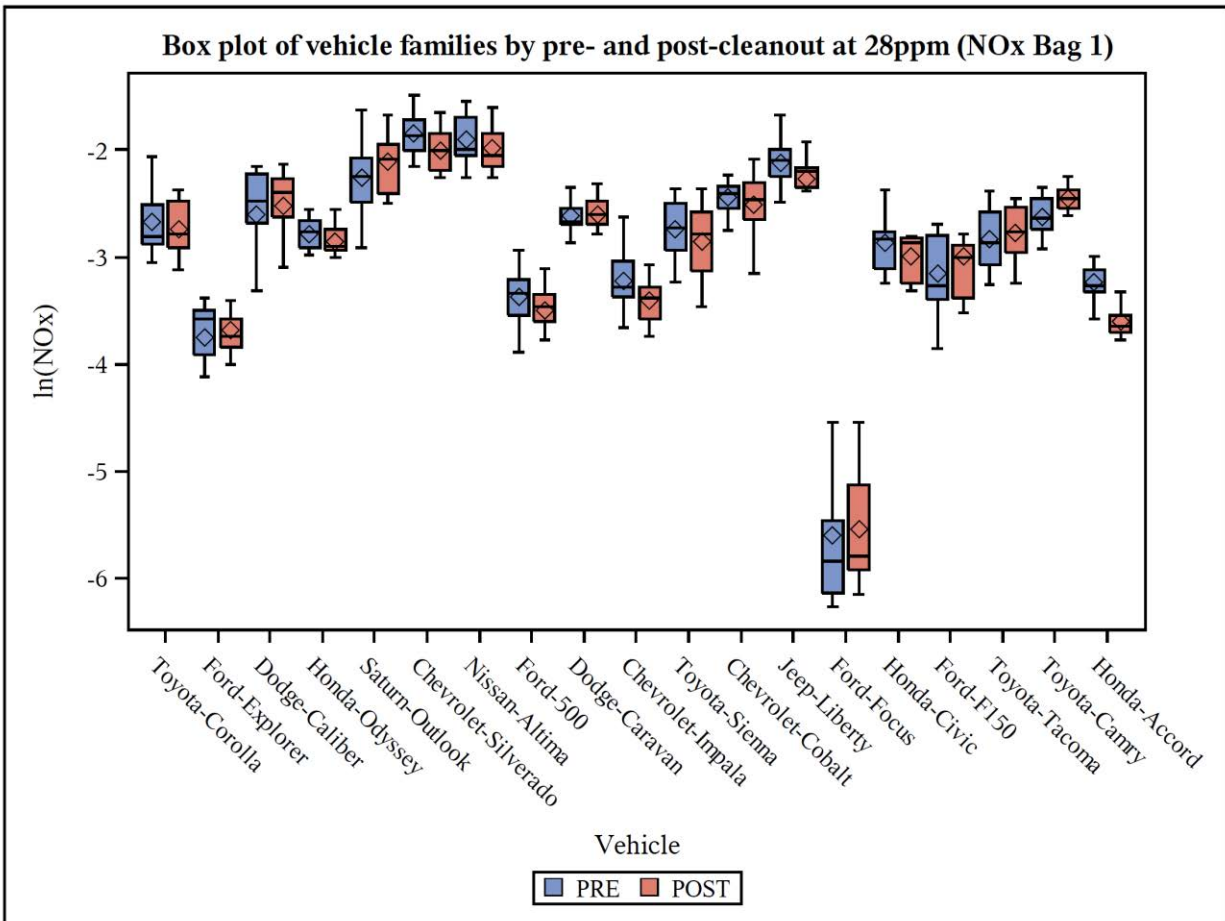
Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

NOTICE

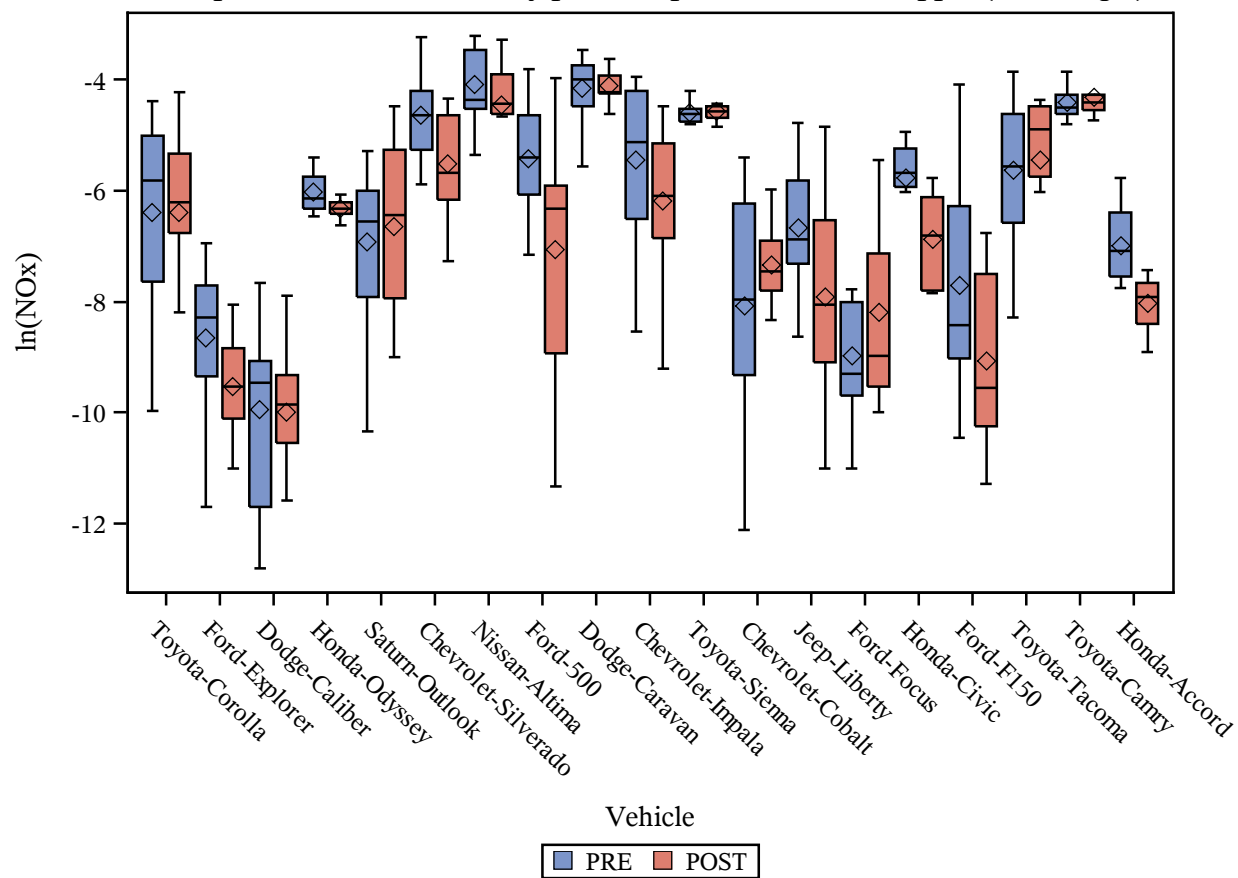
This technical report does not necessarily represent final EPA decisions or positions. It is intended to present technical analysis of issues using data that are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments.

Appendix E. Plots of all pollutants and bags

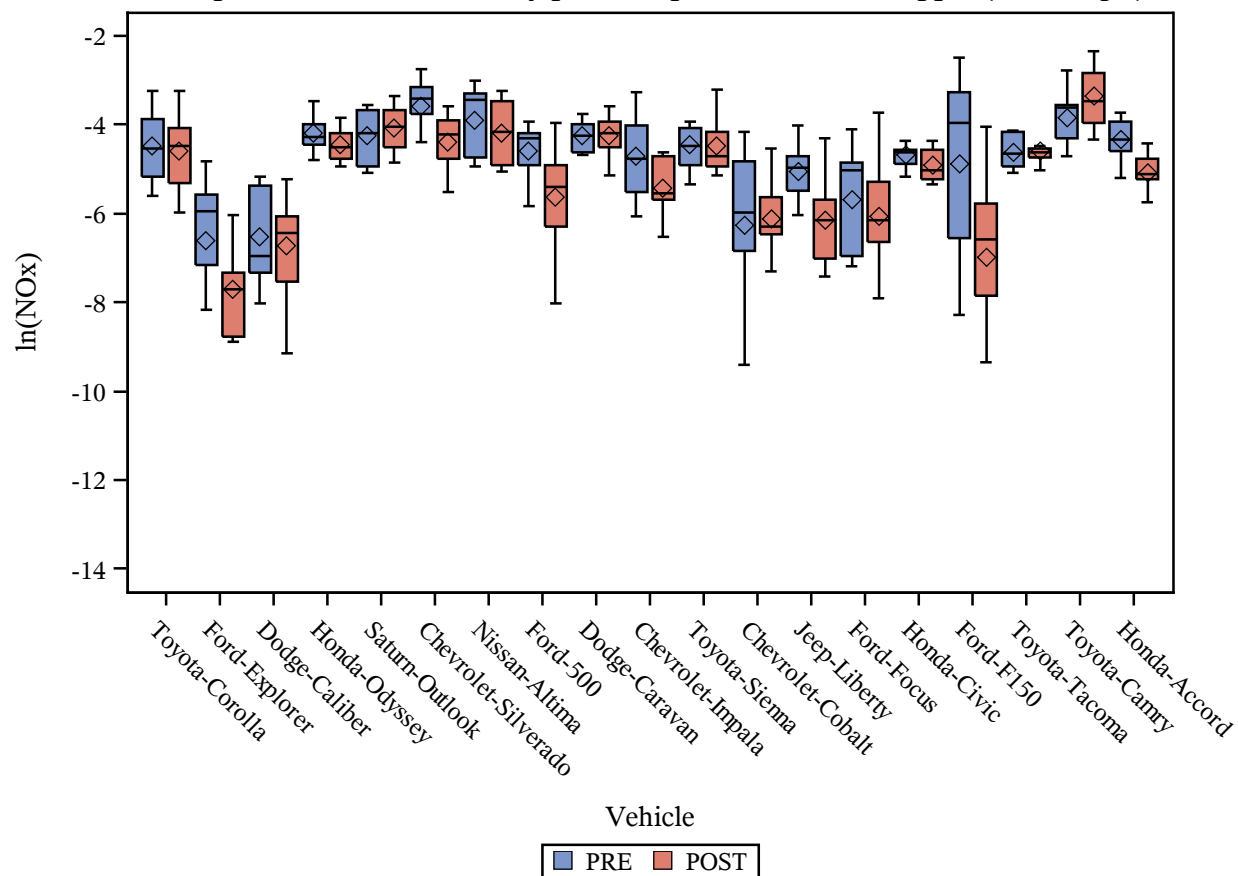
E.1. Effect of Clean-out at 28ppm



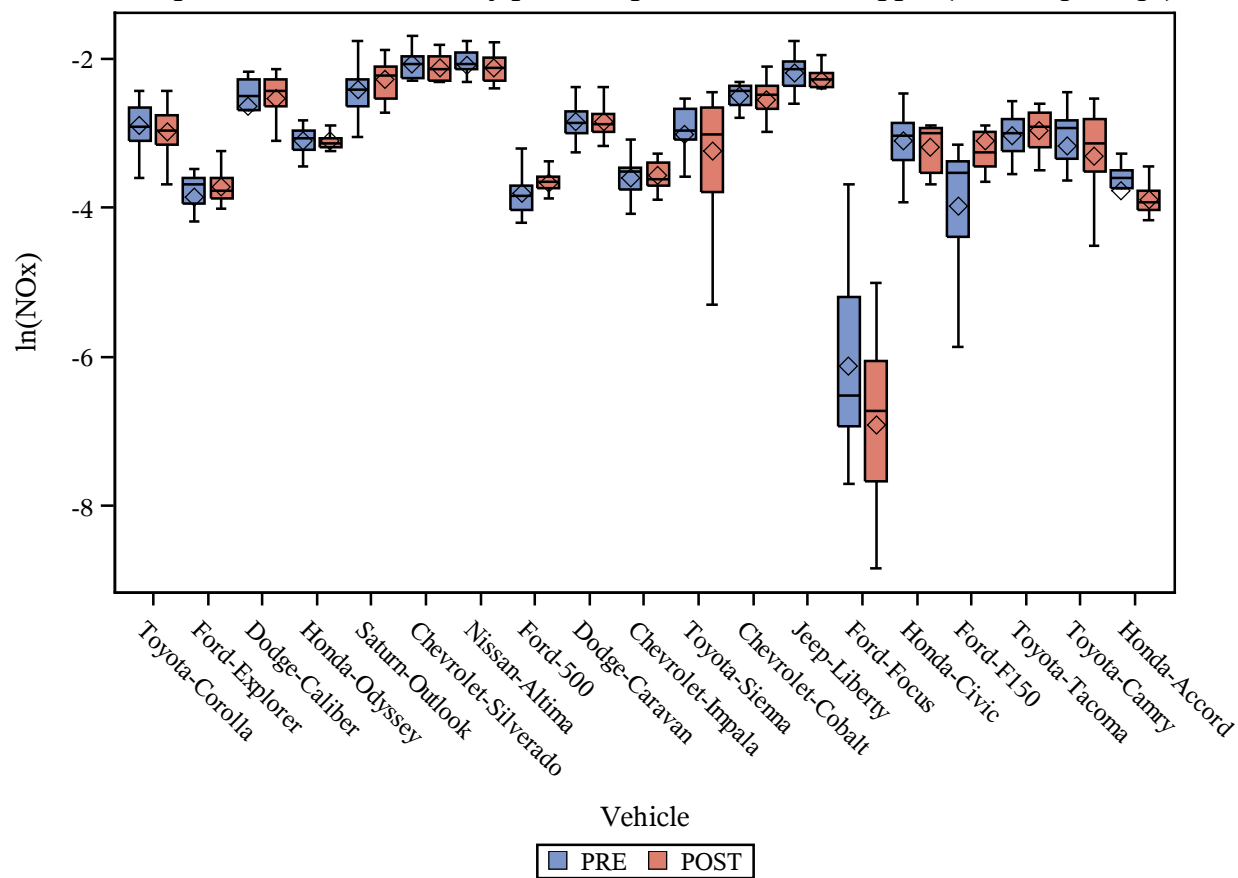
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NOx Bag 2)



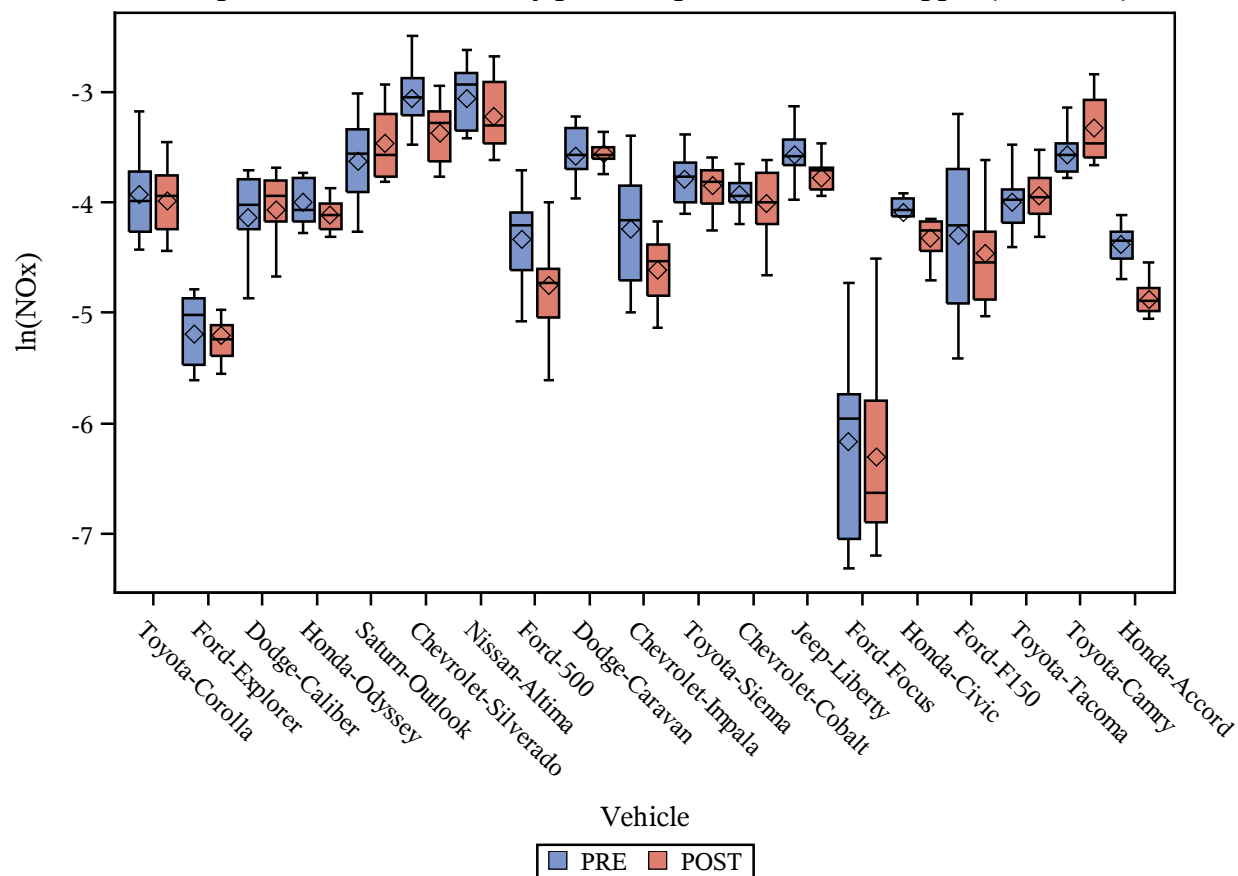
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NOx Bag 3)



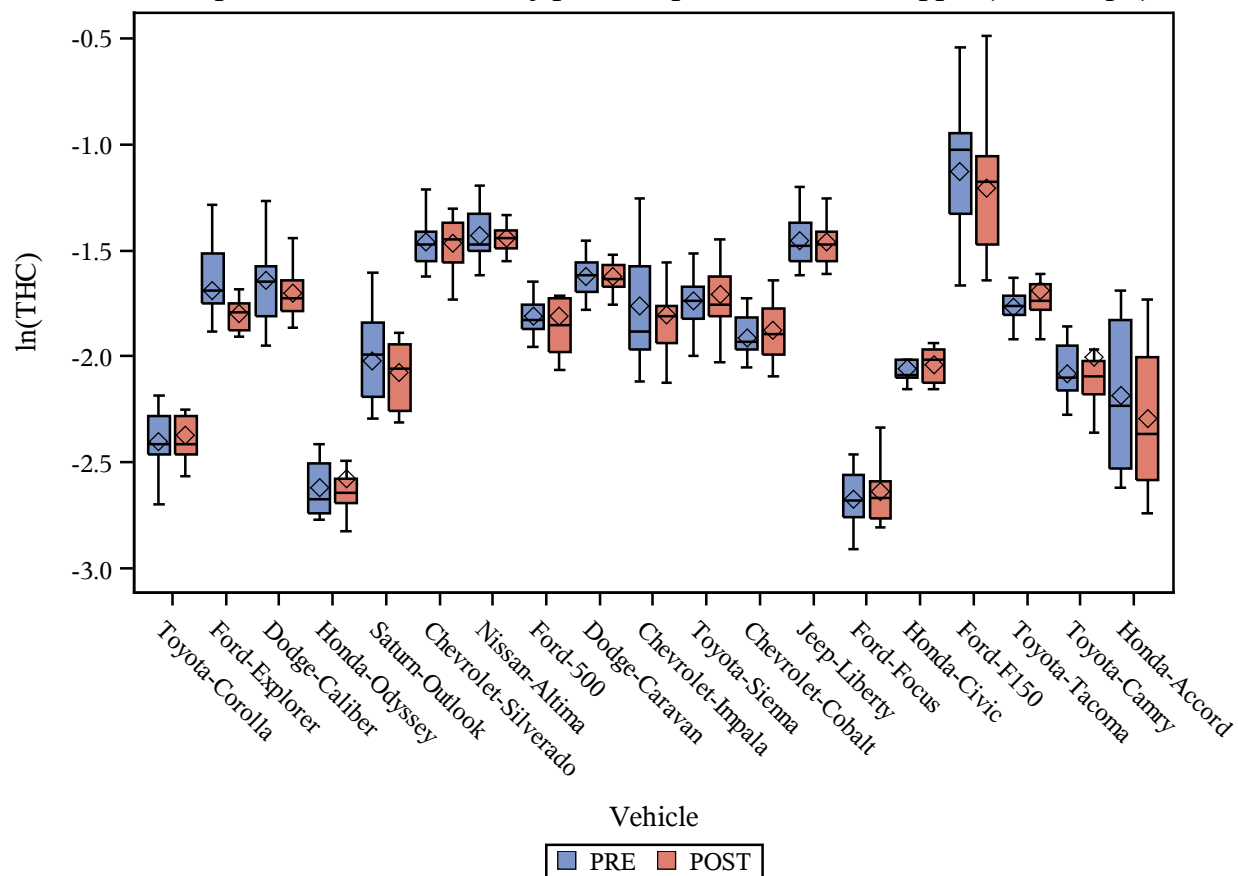
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NOx Bag1-Bag3)



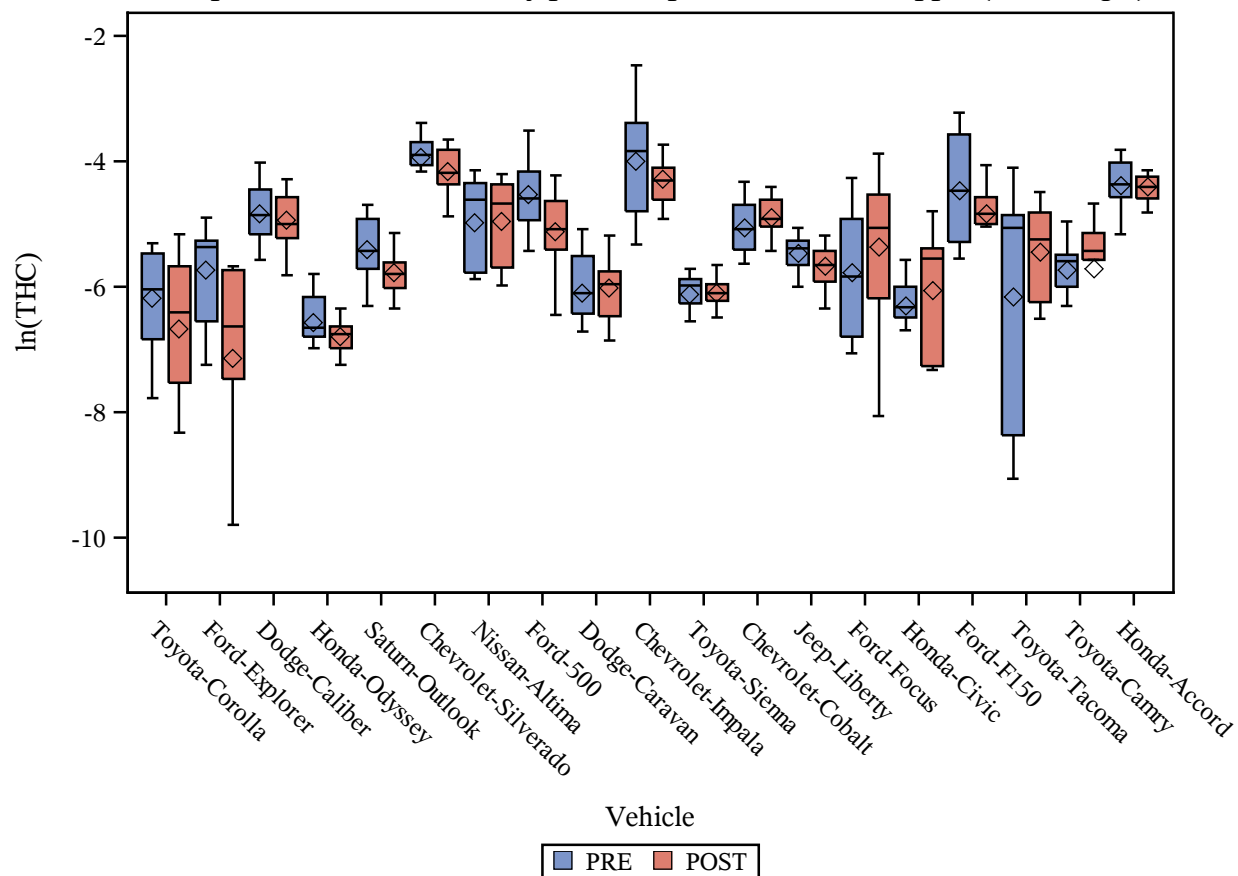
Box plot of vehicle families by pre- and post-cleanout at 28ppm (Wtd NOx)

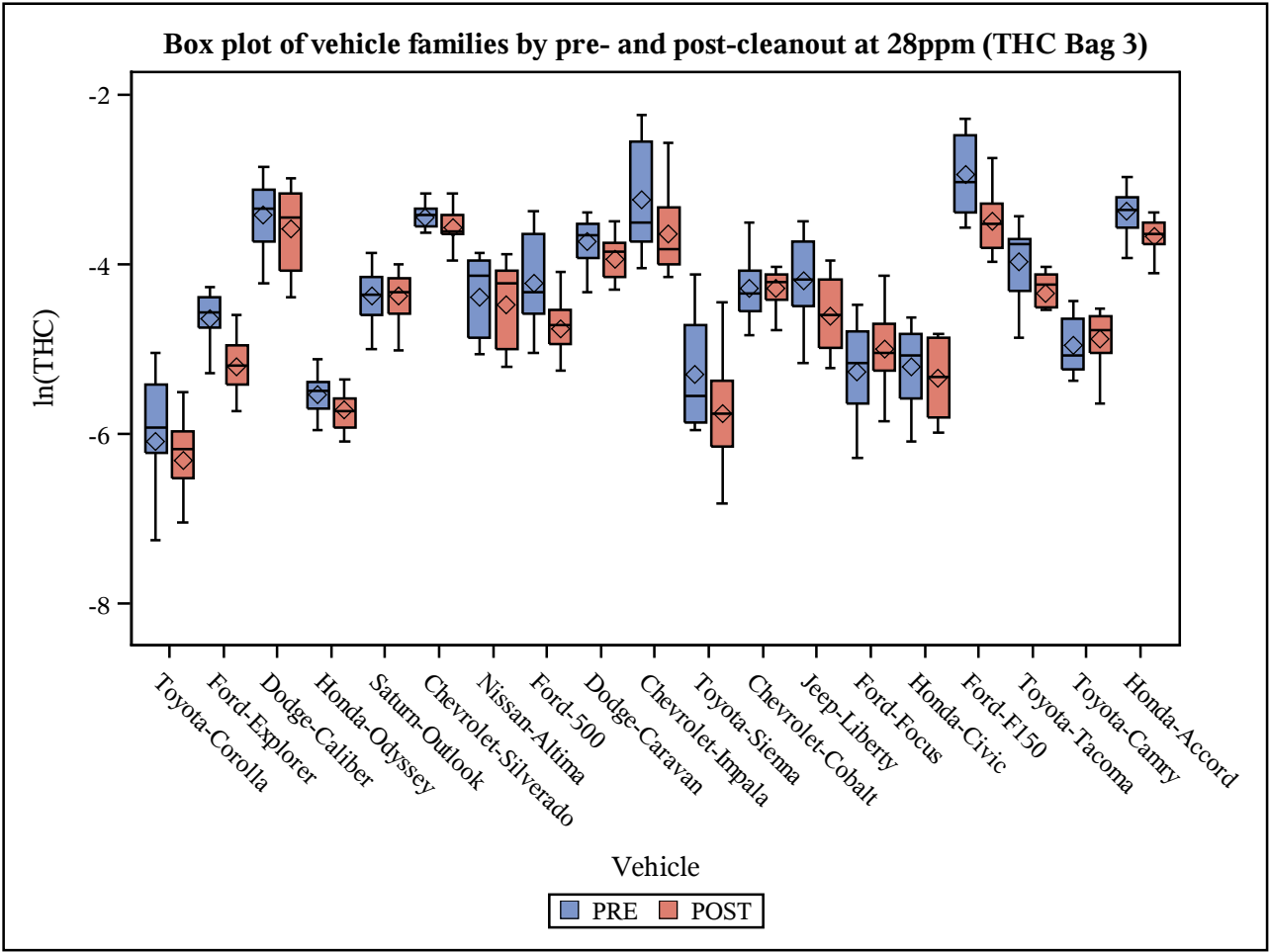


Box plot of vehicle families by pre- and post-cleanout at 28ppm (THC Bag 1)

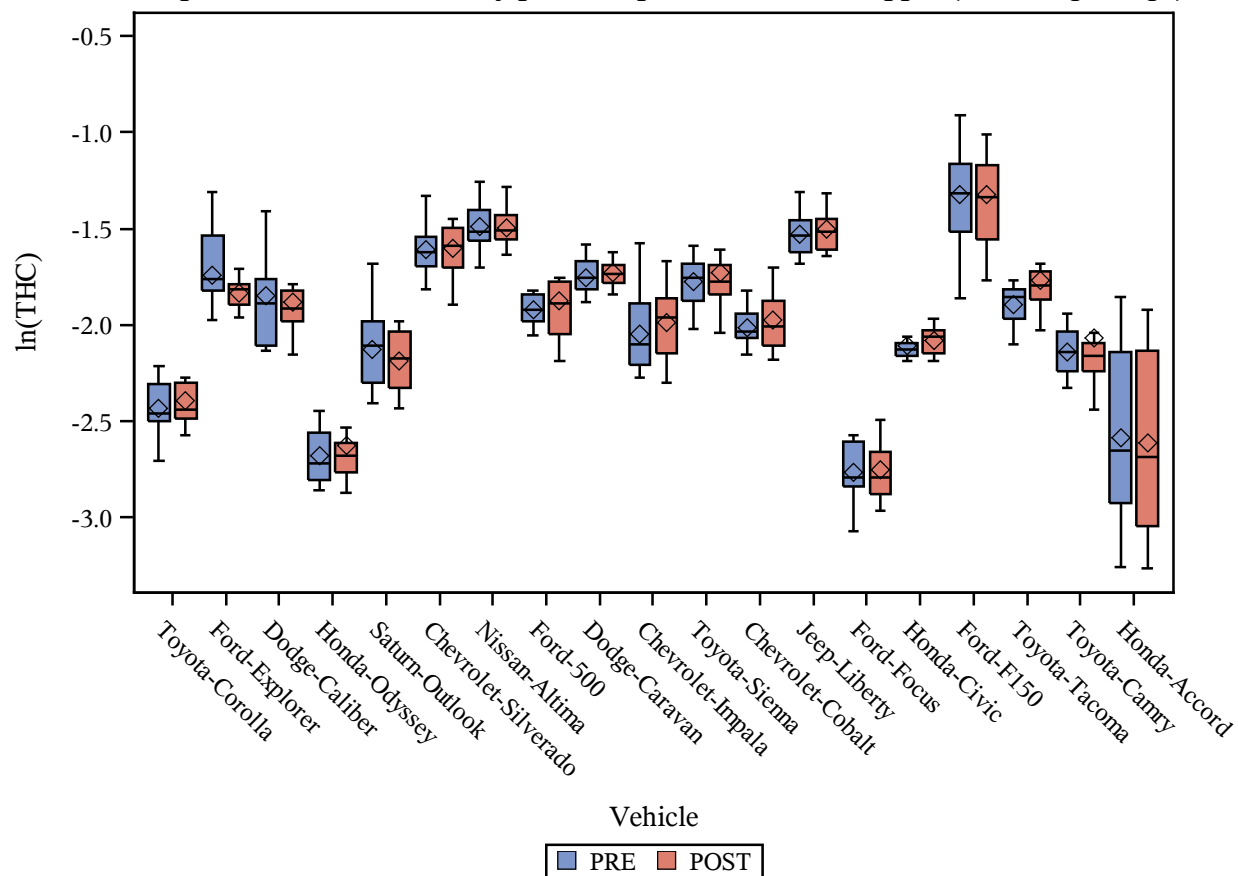


Box plot of vehicle families by pre- and post-cleanout at 28ppm (THC Bag 2)

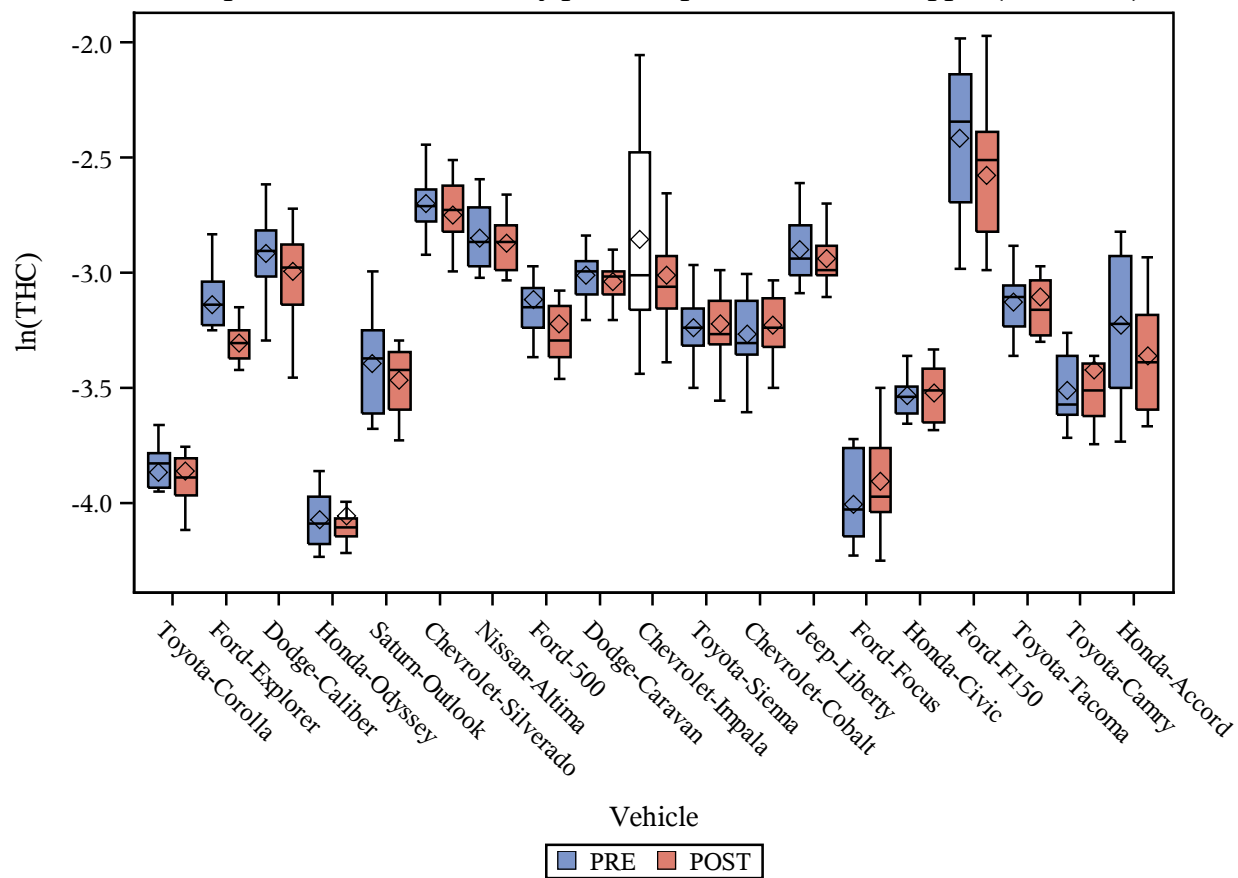




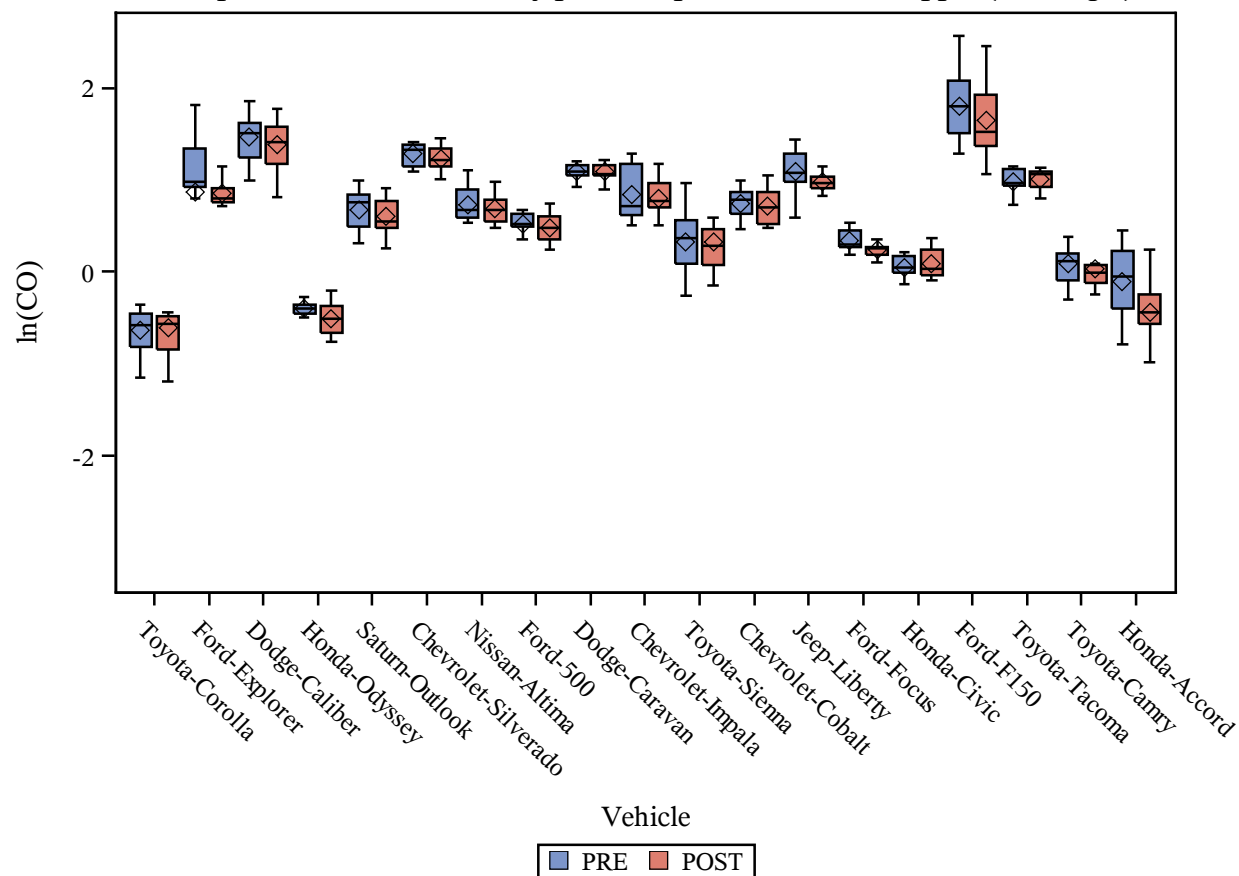
Box plot of vehicle families by pre- and post-cleanout at 28ppm (THC Bag1-Bag3)



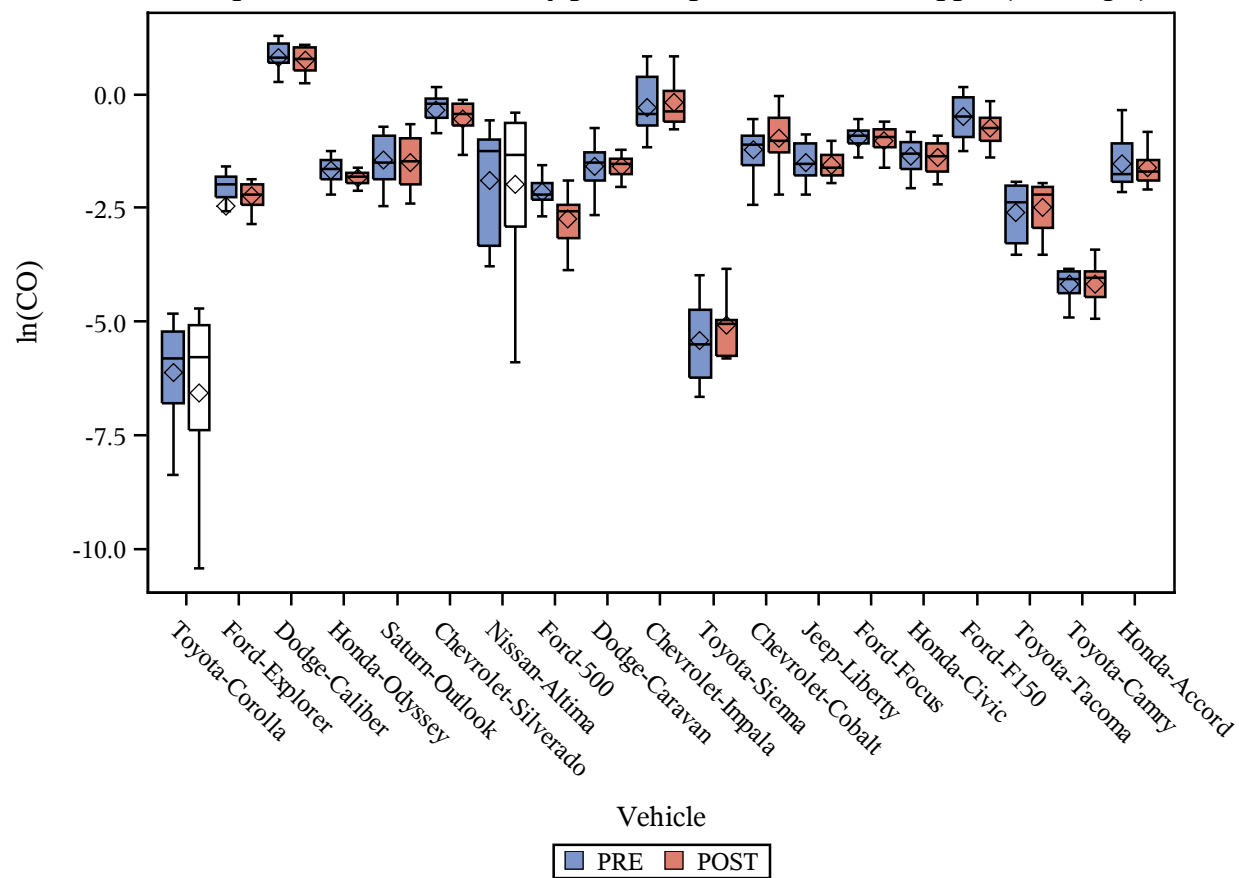
Box plot of vehicle families by pre- and post-cleanout at 28ppm (Wtd THC)



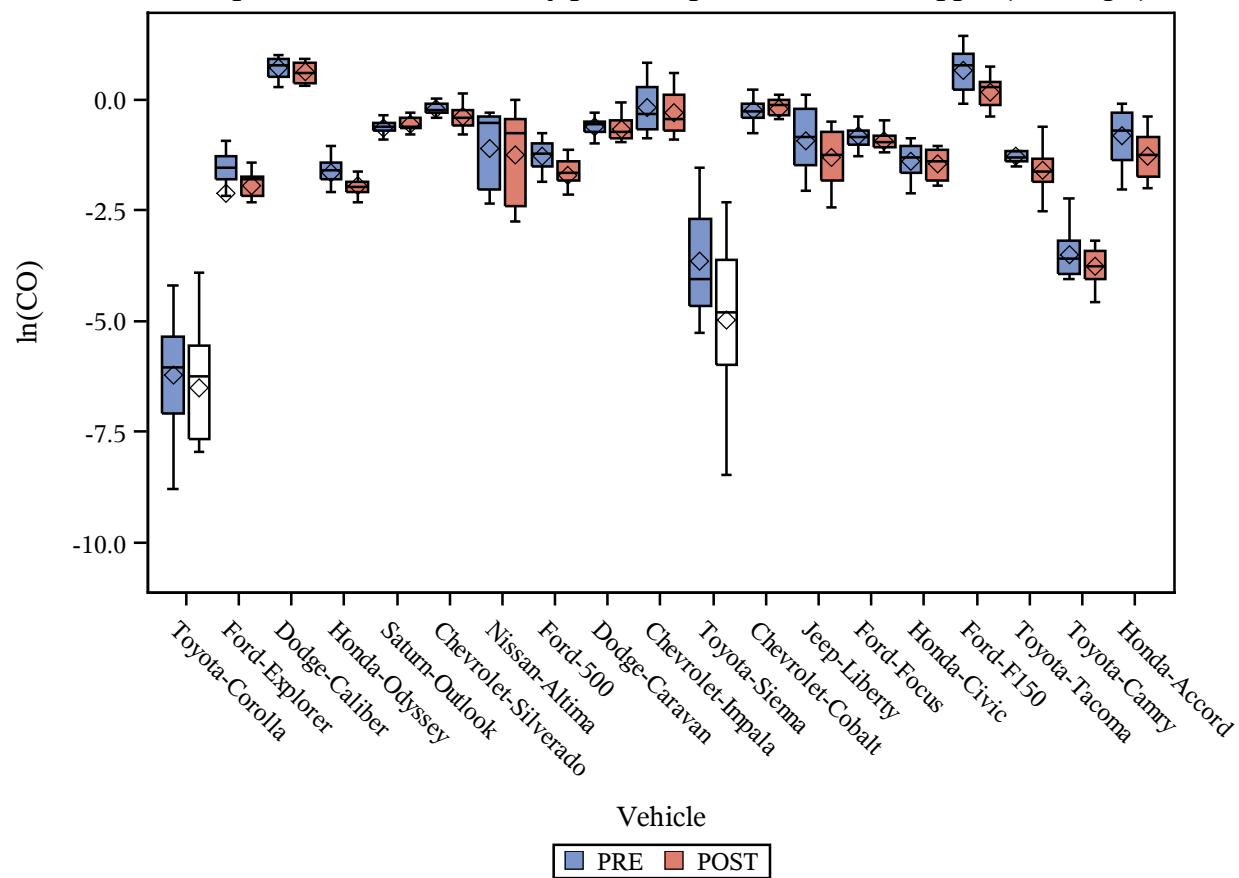
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CO Bag 1)



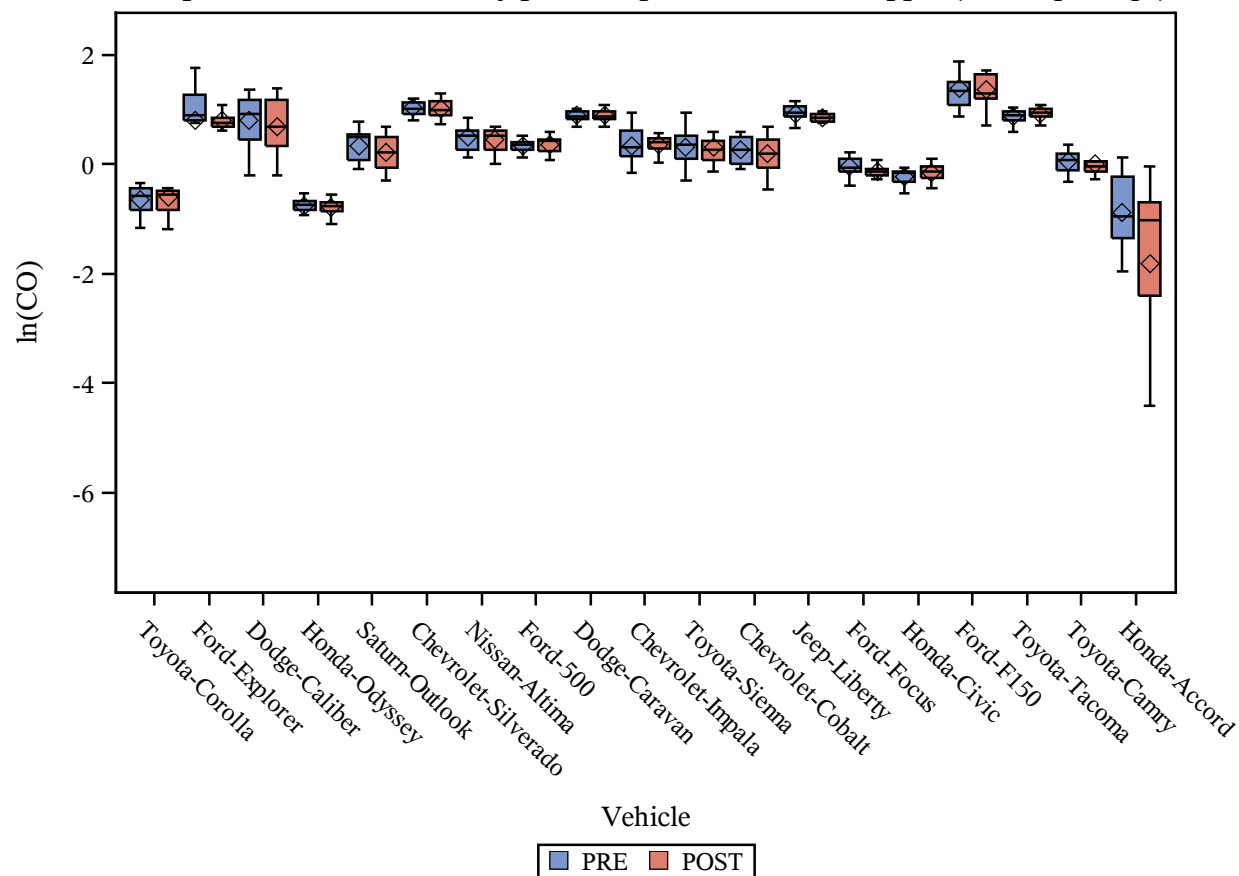
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CO Bag 2)



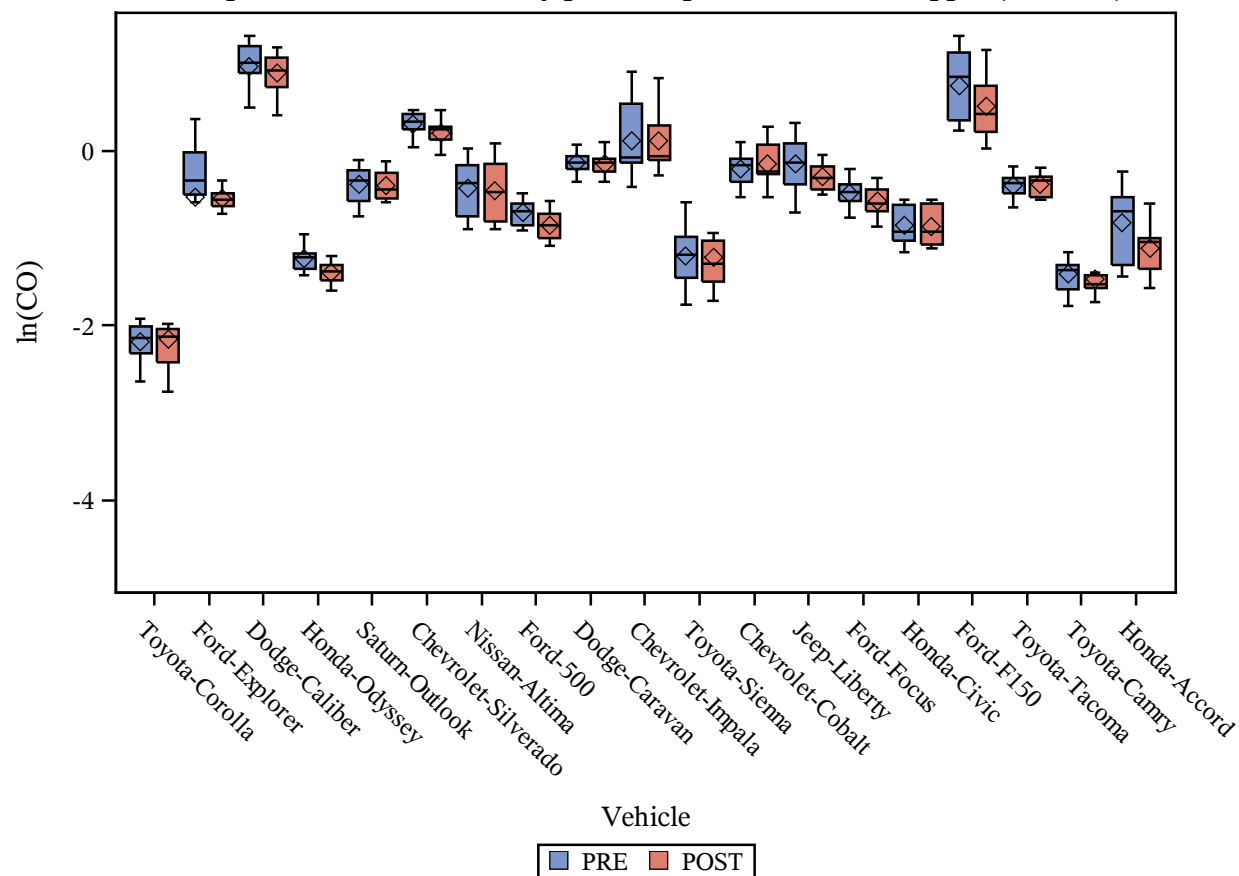
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CO Bag 3)



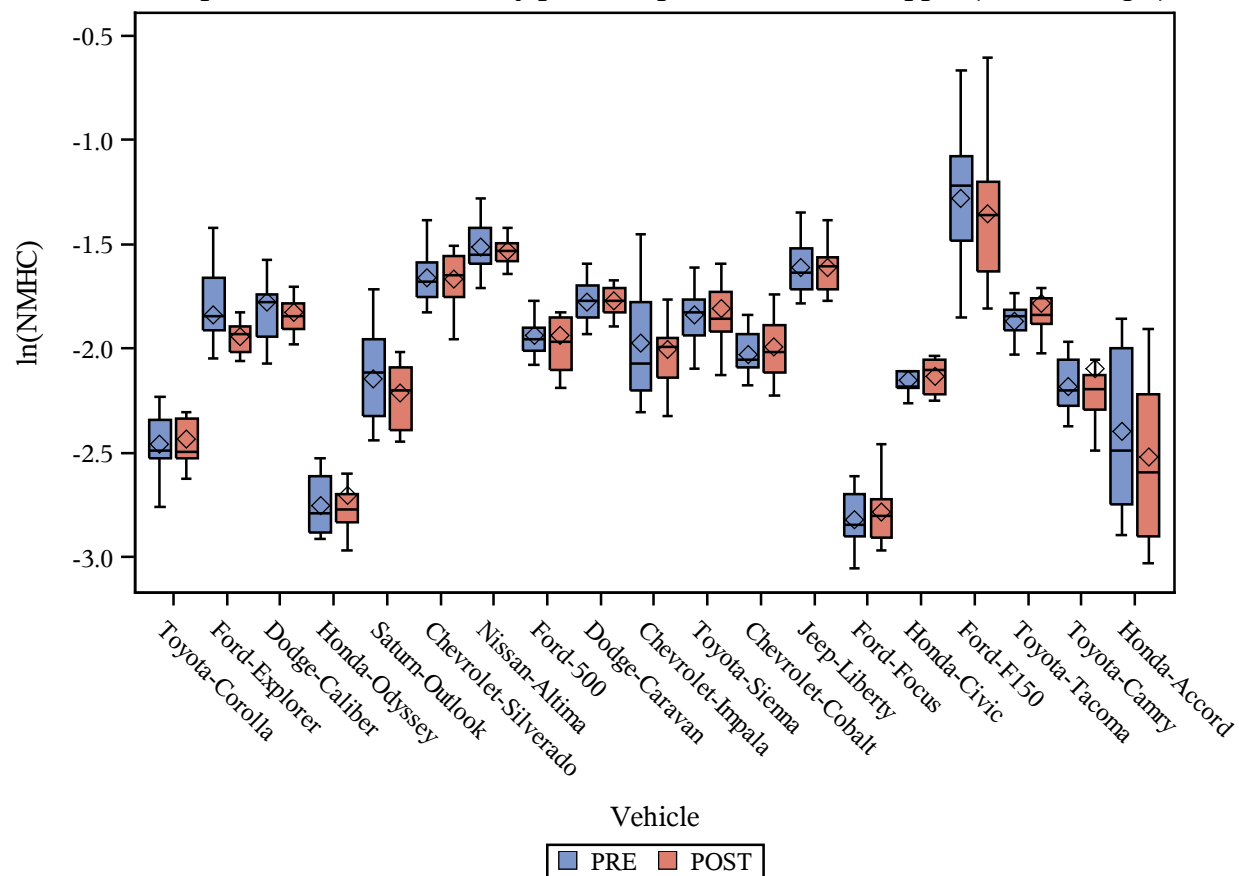
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CO Bag1-Bag3)



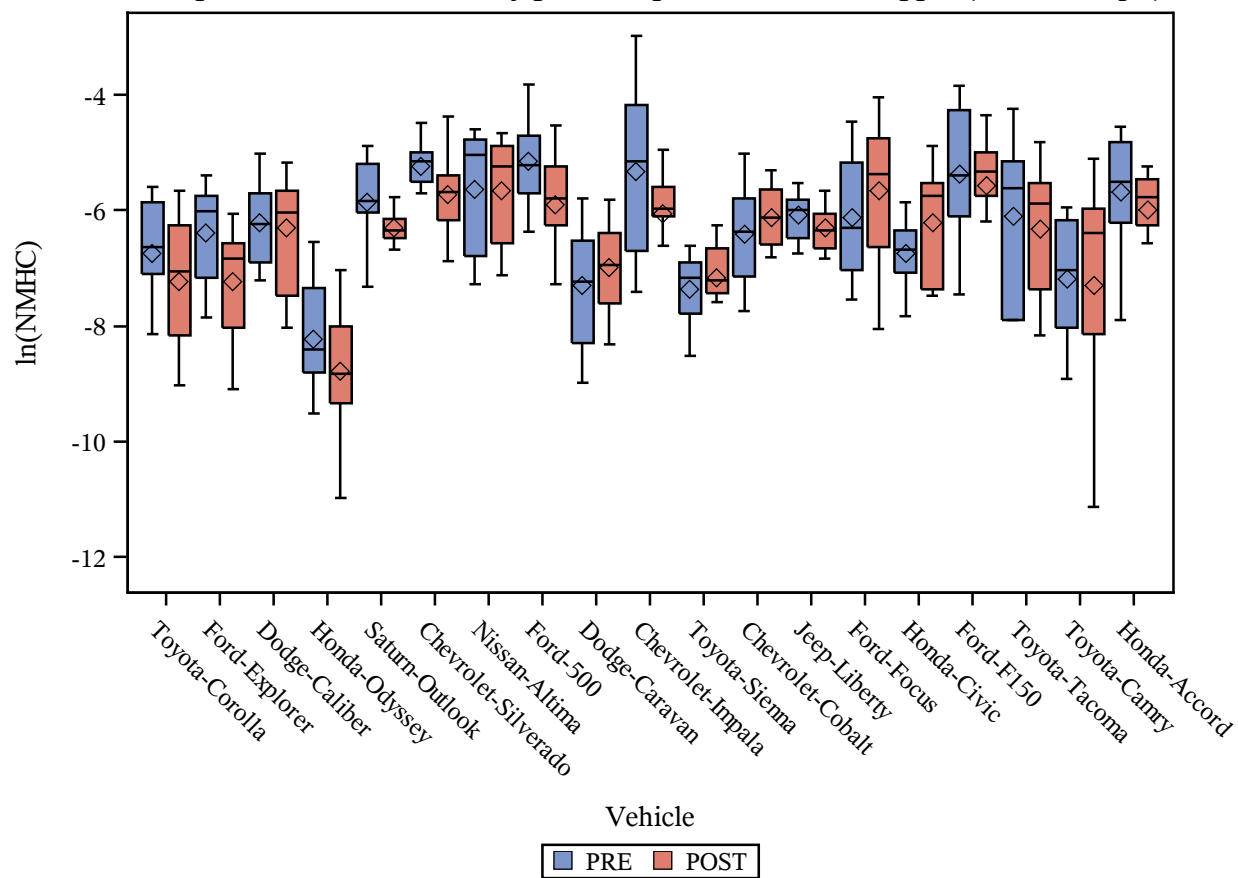
Box plot of vehicle families by pre- and post-cleanout at 28ppm (Wtd CO)



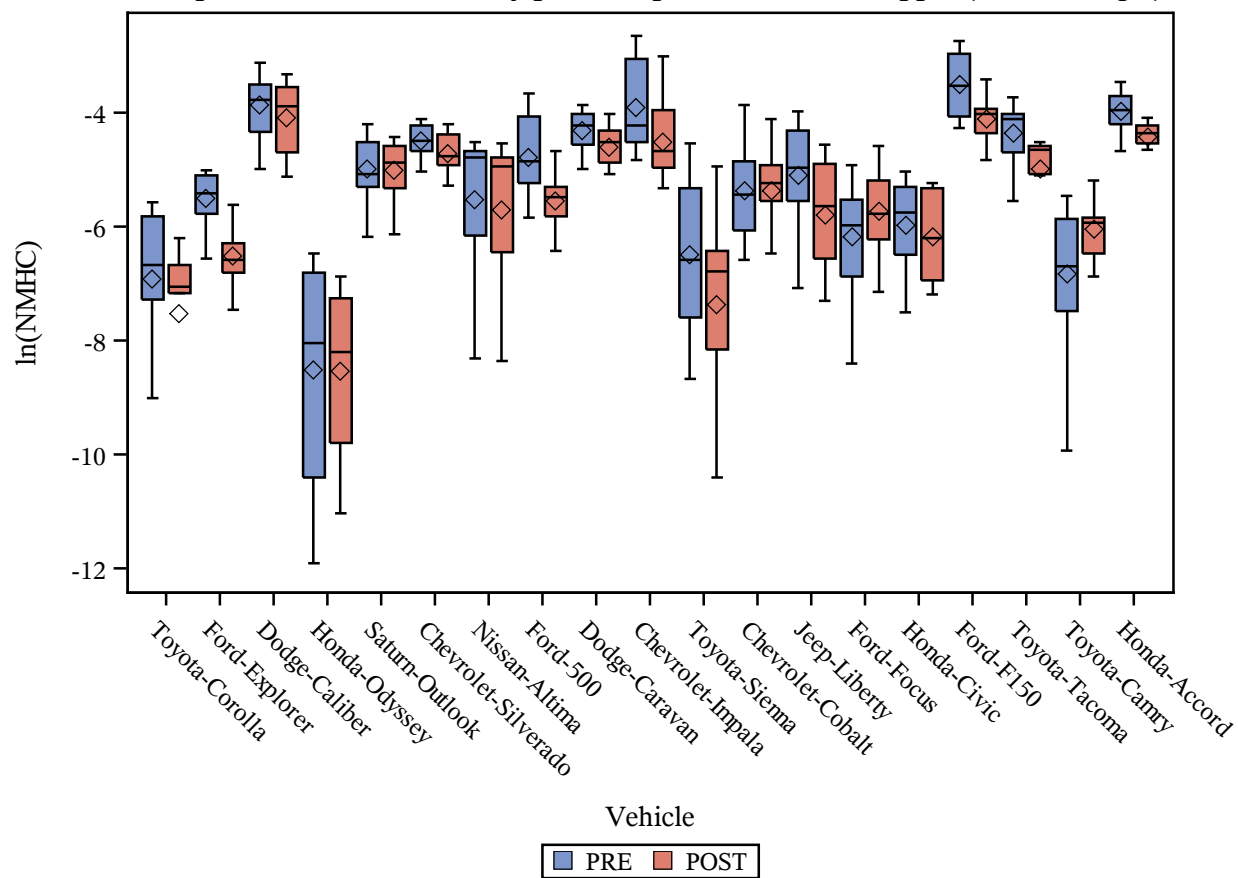
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NMHC Bag 1)



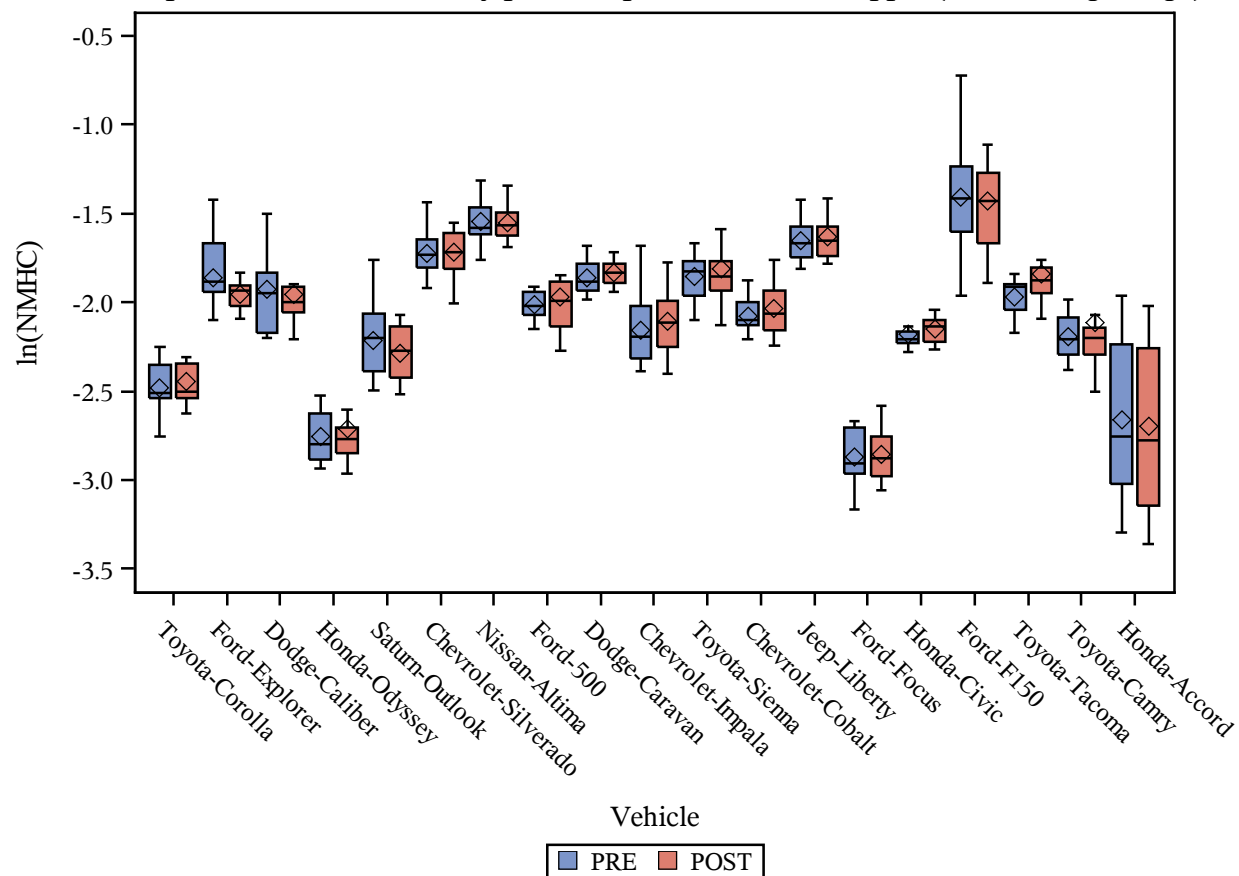
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NMHC Bag 2)



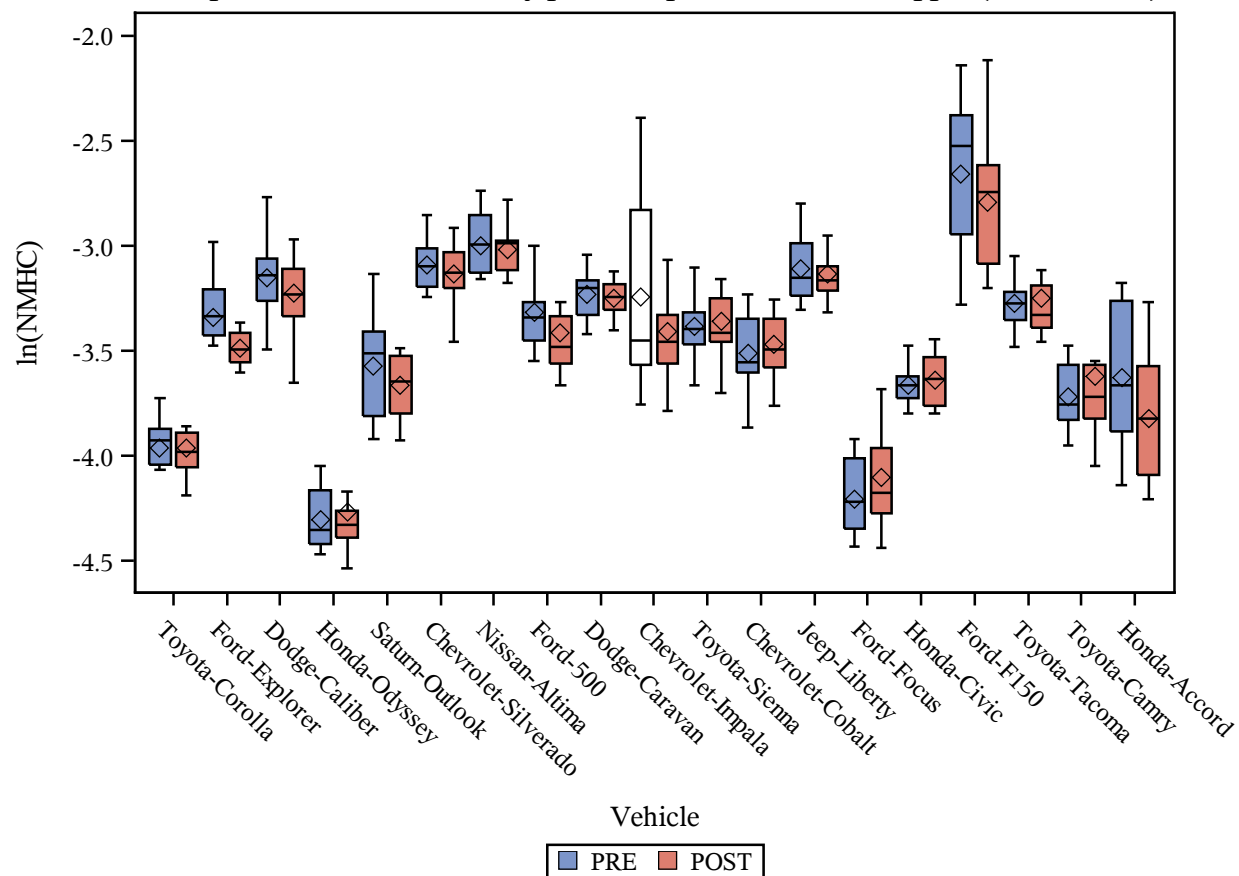
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NMHC Bag 3)



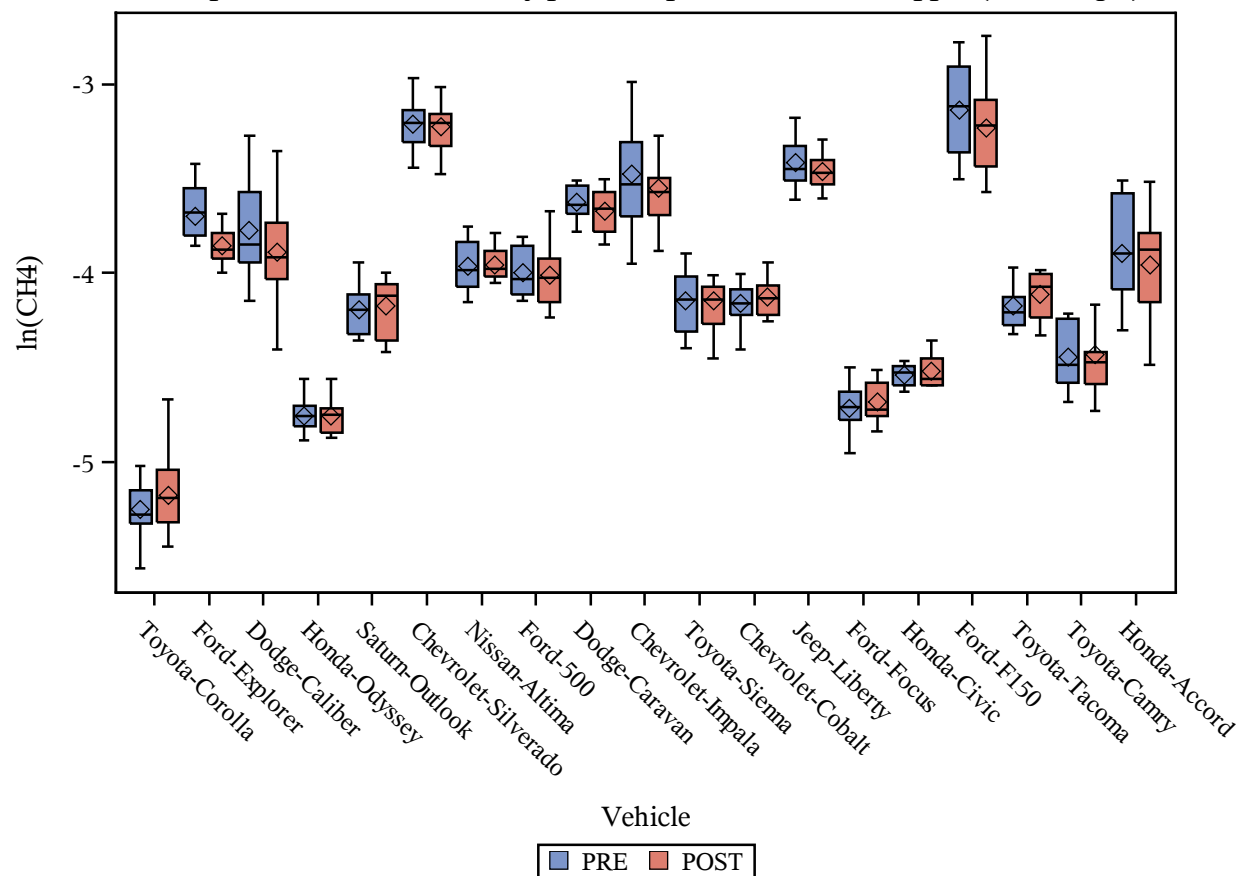
Box plot of vehicle families by pre- and post-cleanout at 28ppm (NMHC Bag1-Bag3)



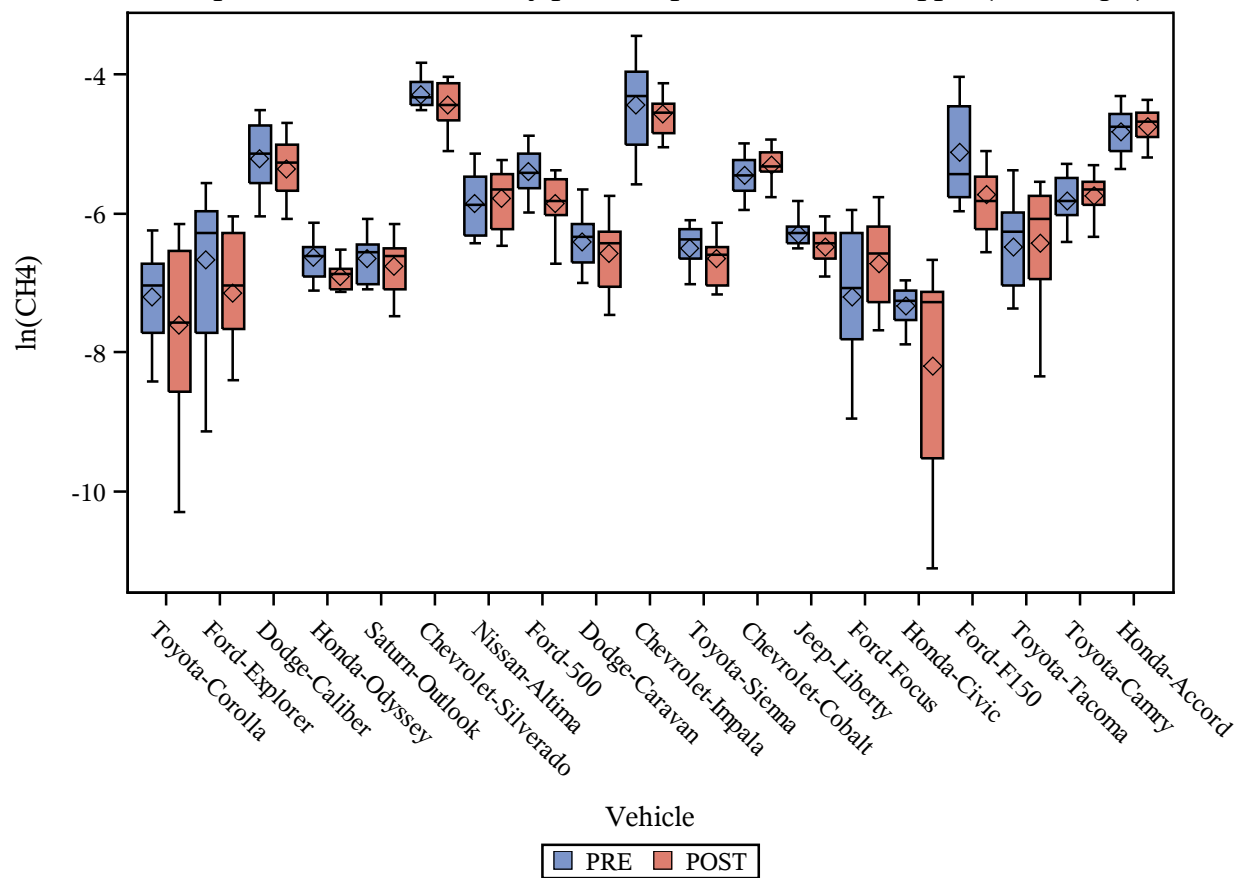
Box plot of vehicle families by pre- and post-cleanout at 28ppm (Wtd NMHC)



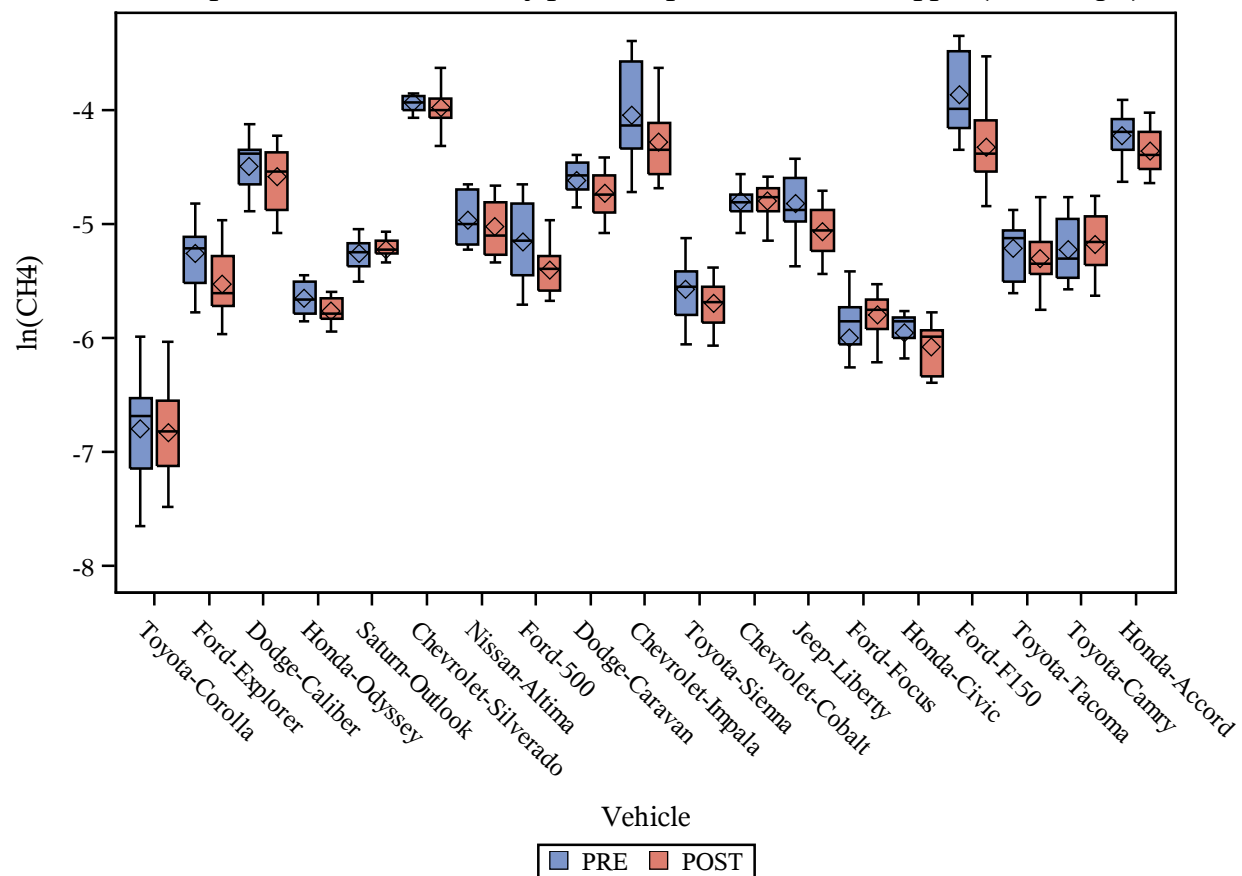
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CH4 Bag 1)



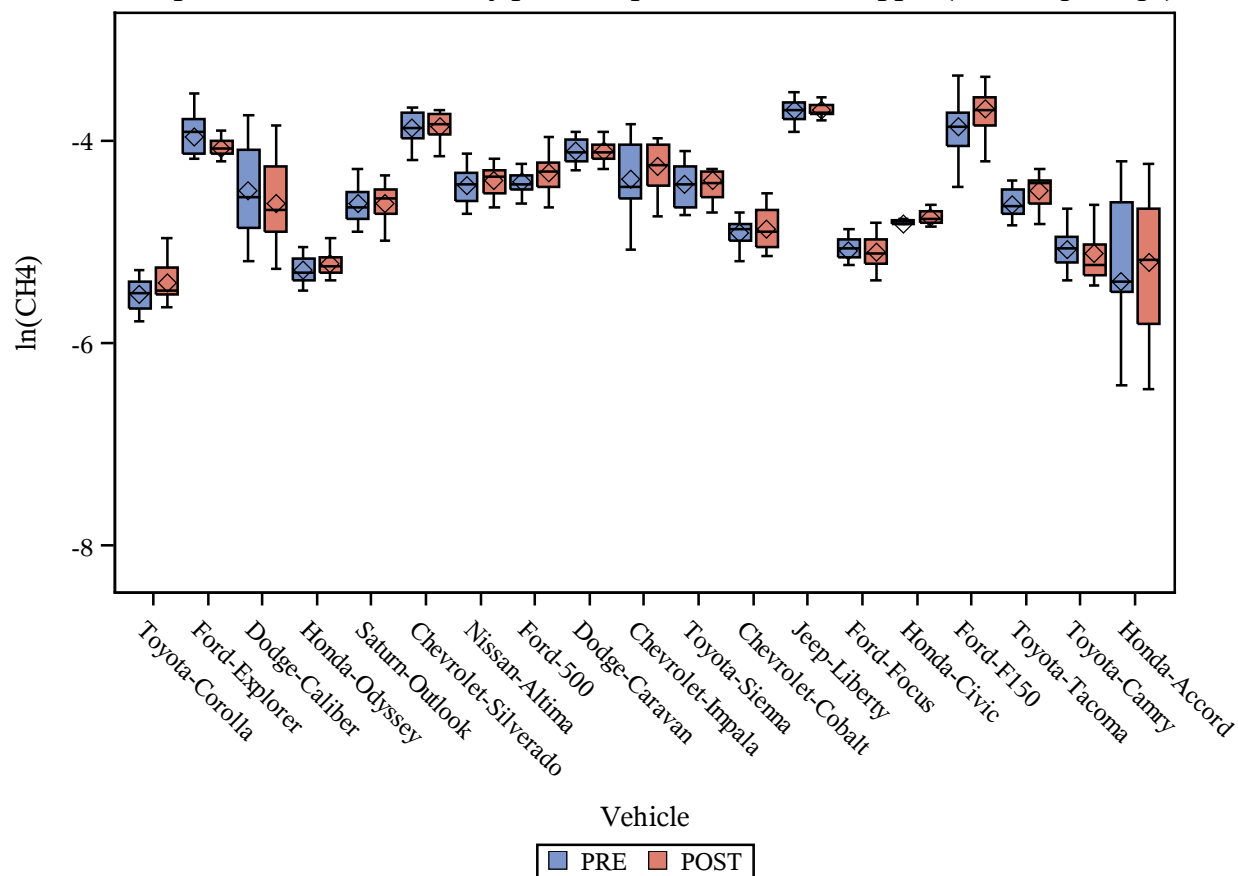
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CH4 Bag 2)



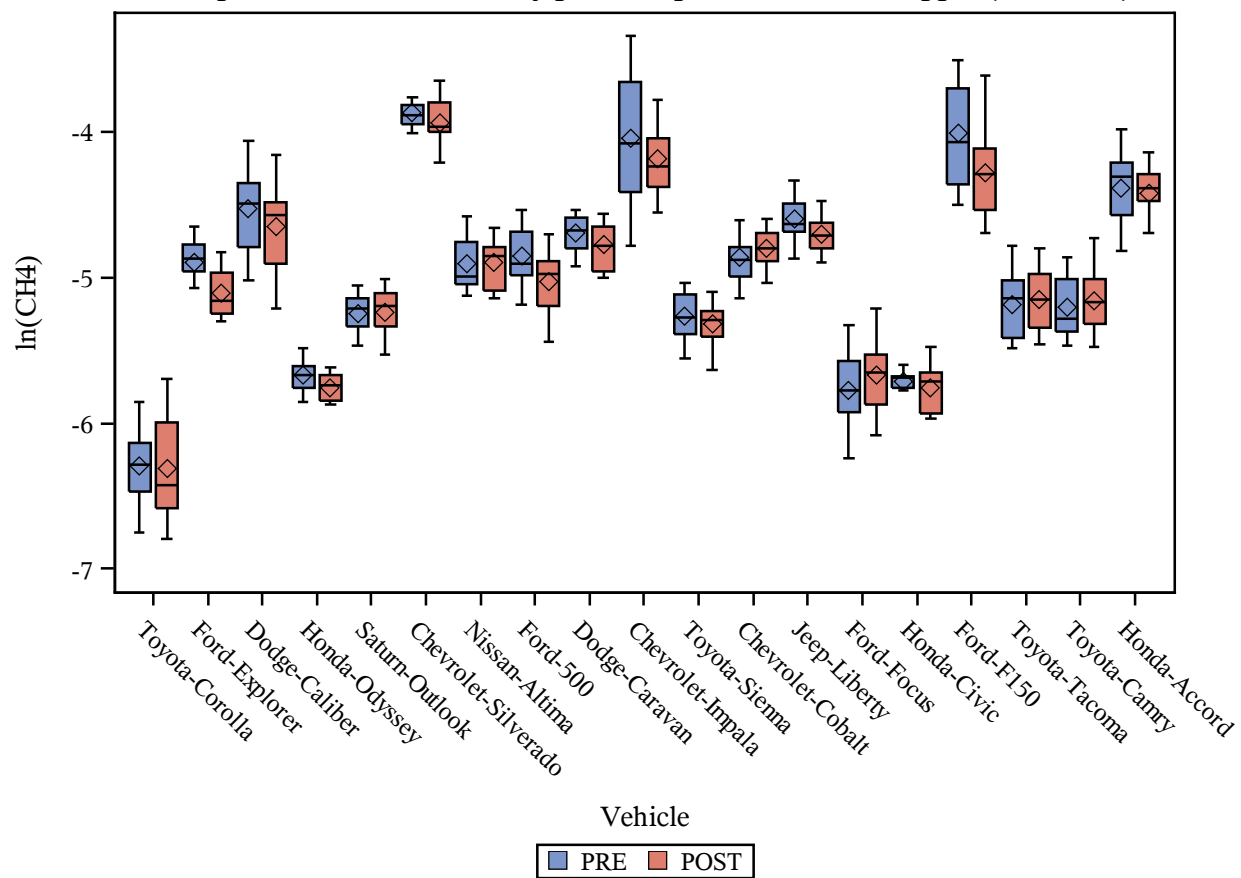
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CH4 Bag 3)



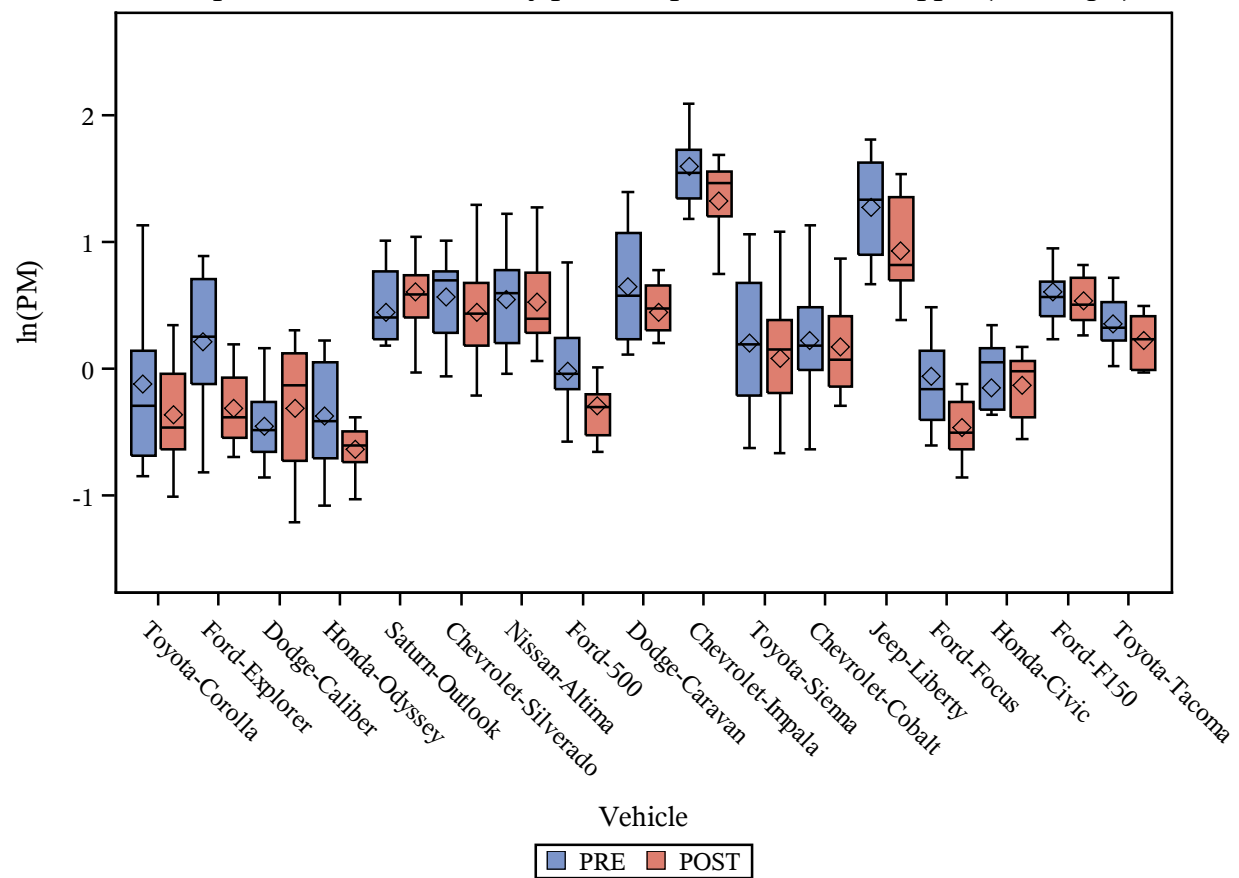
Box plot of vehicle families by pre- and post-cleanout at 28ppm (CH4 Bag1-Bag3)



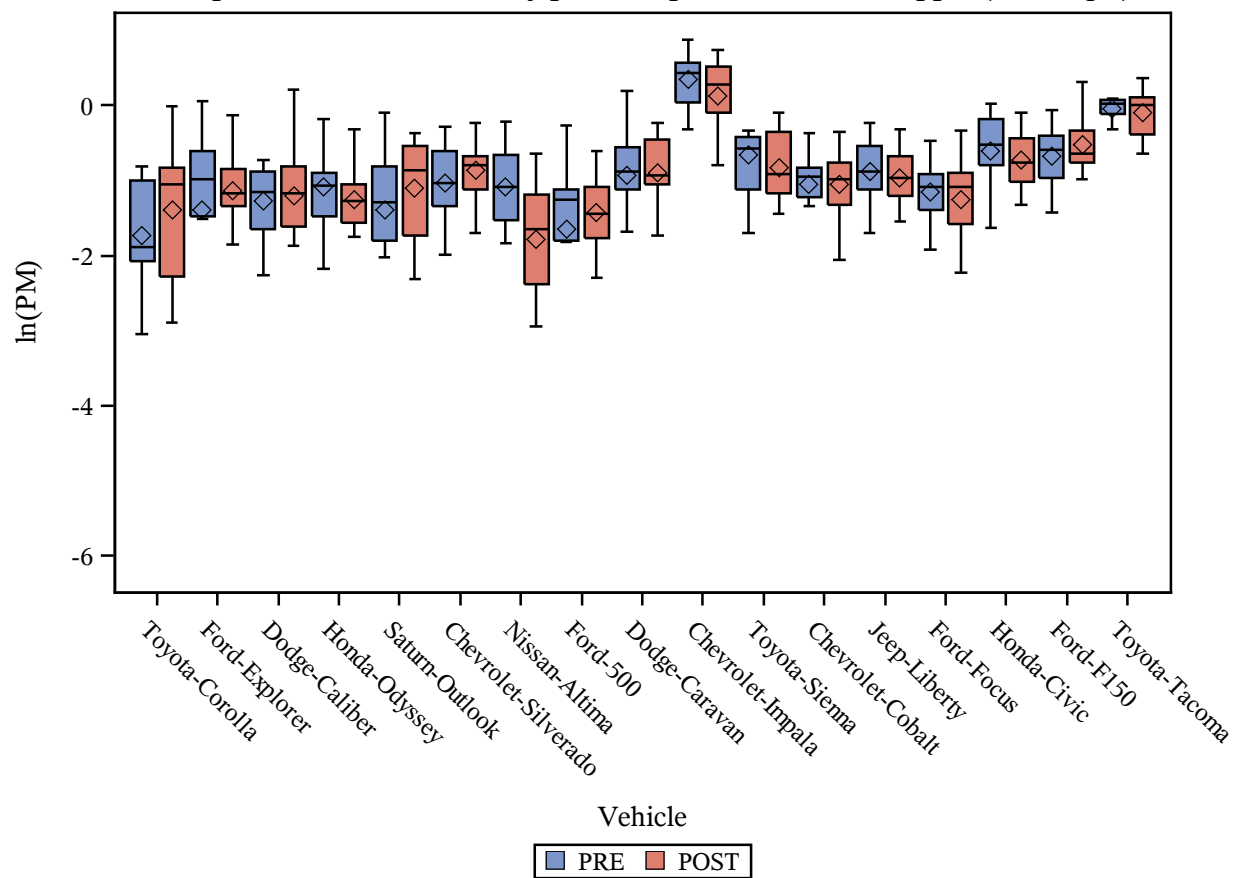
Box plot of vehicle families by pre- and post-cleanout at 28ppm (Wtd CH4)



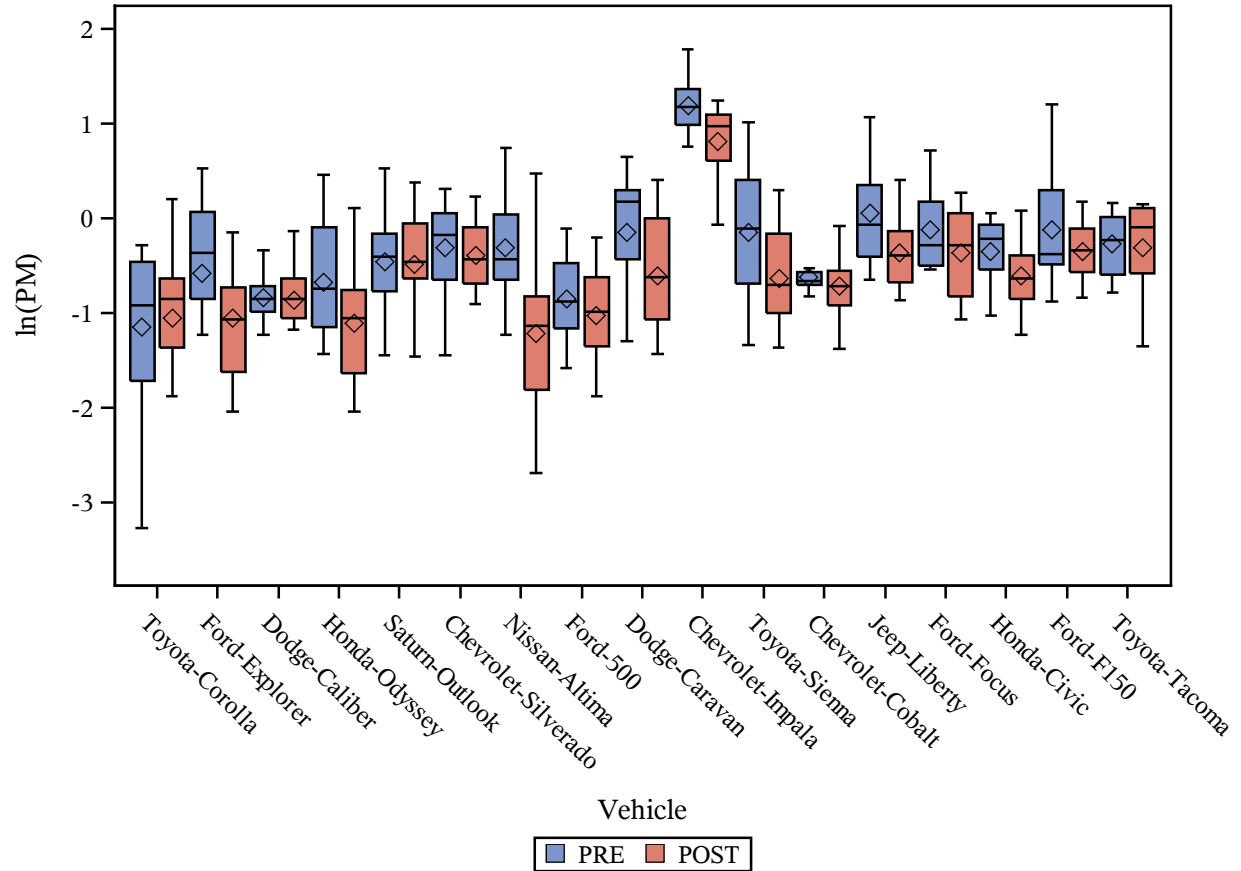
Box plot of vehicle families by pre- and post-cleanout at 28ppm (PM Bag 1)



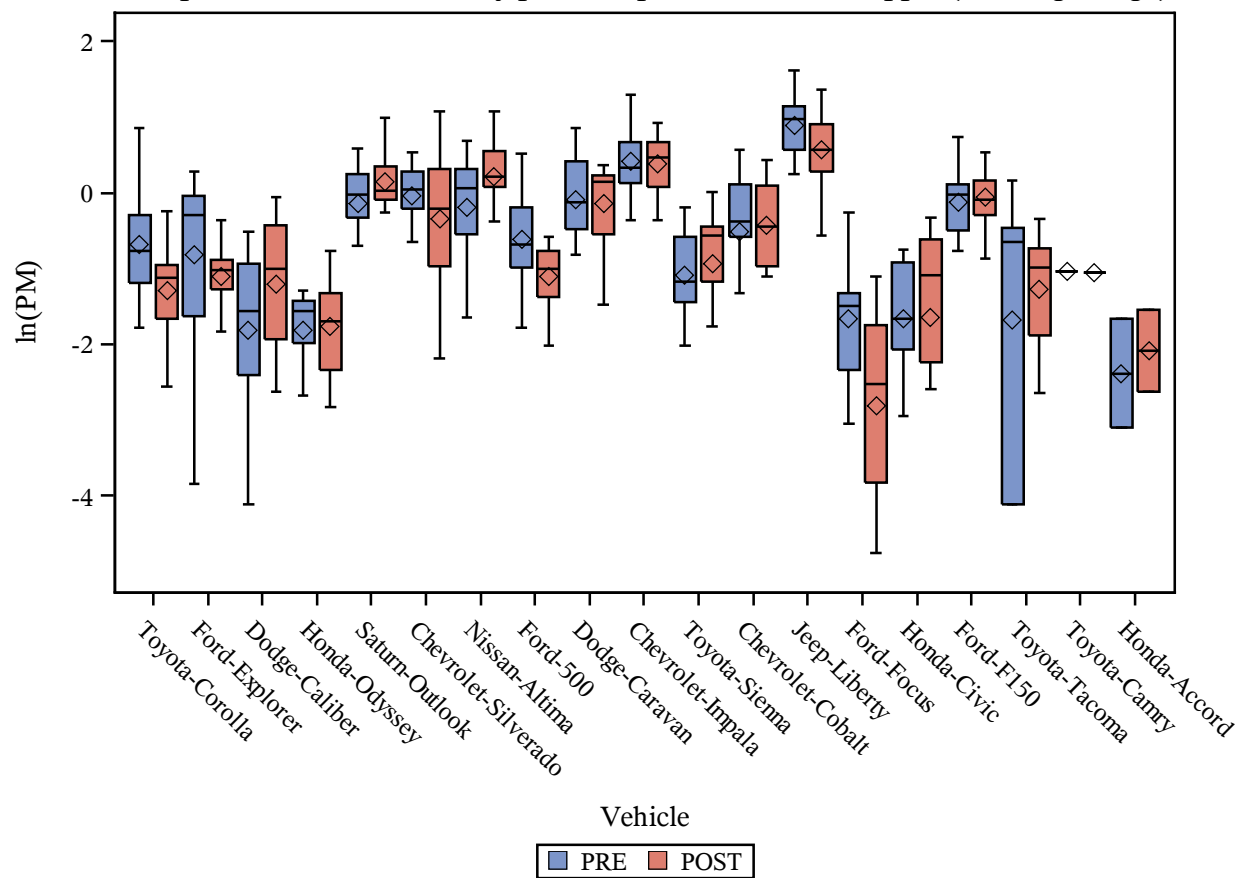
Box plot of vehicle families by pre- and post-cleanout at 28ppm (PM Bag 2)



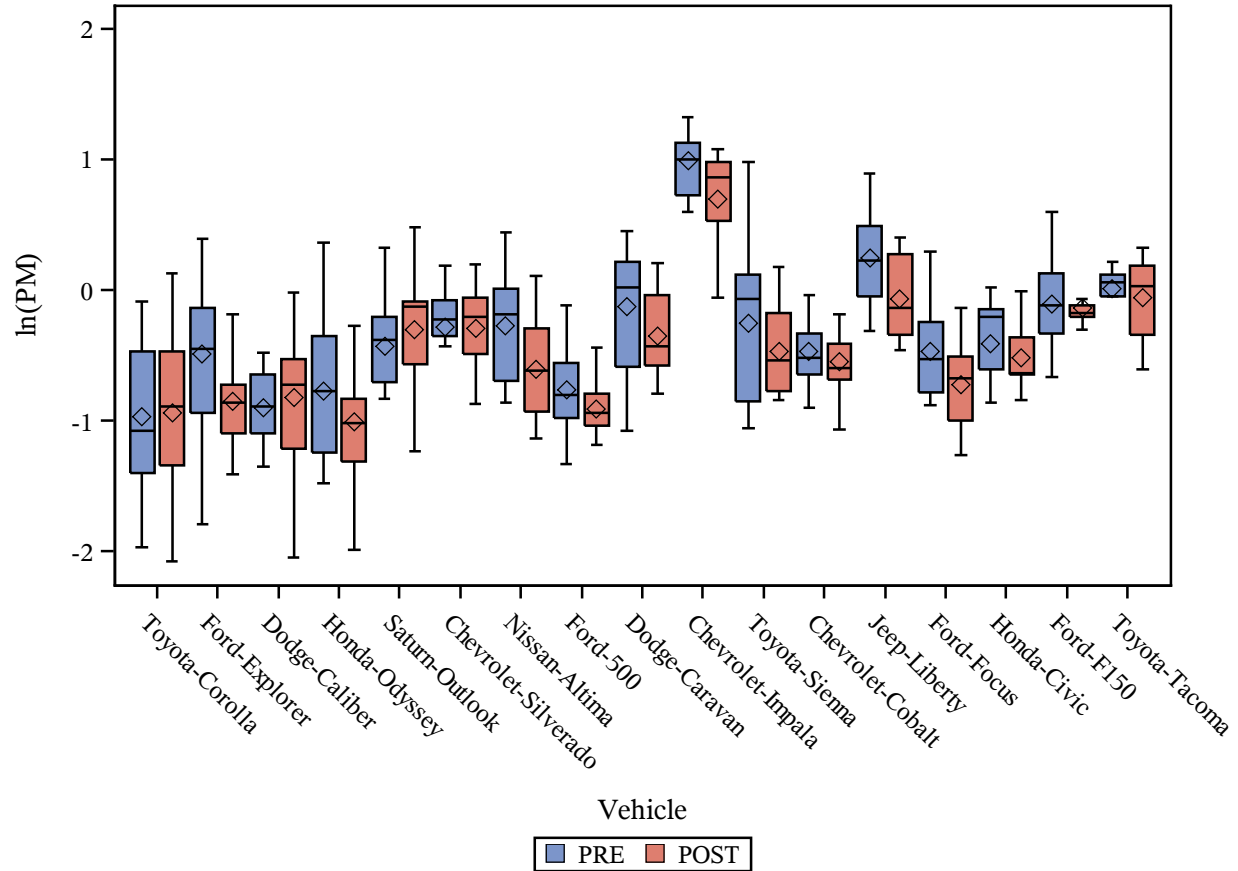
Box plot of vehicle families by pre- and post-cleanout at 28ppm (PM Bag 3)



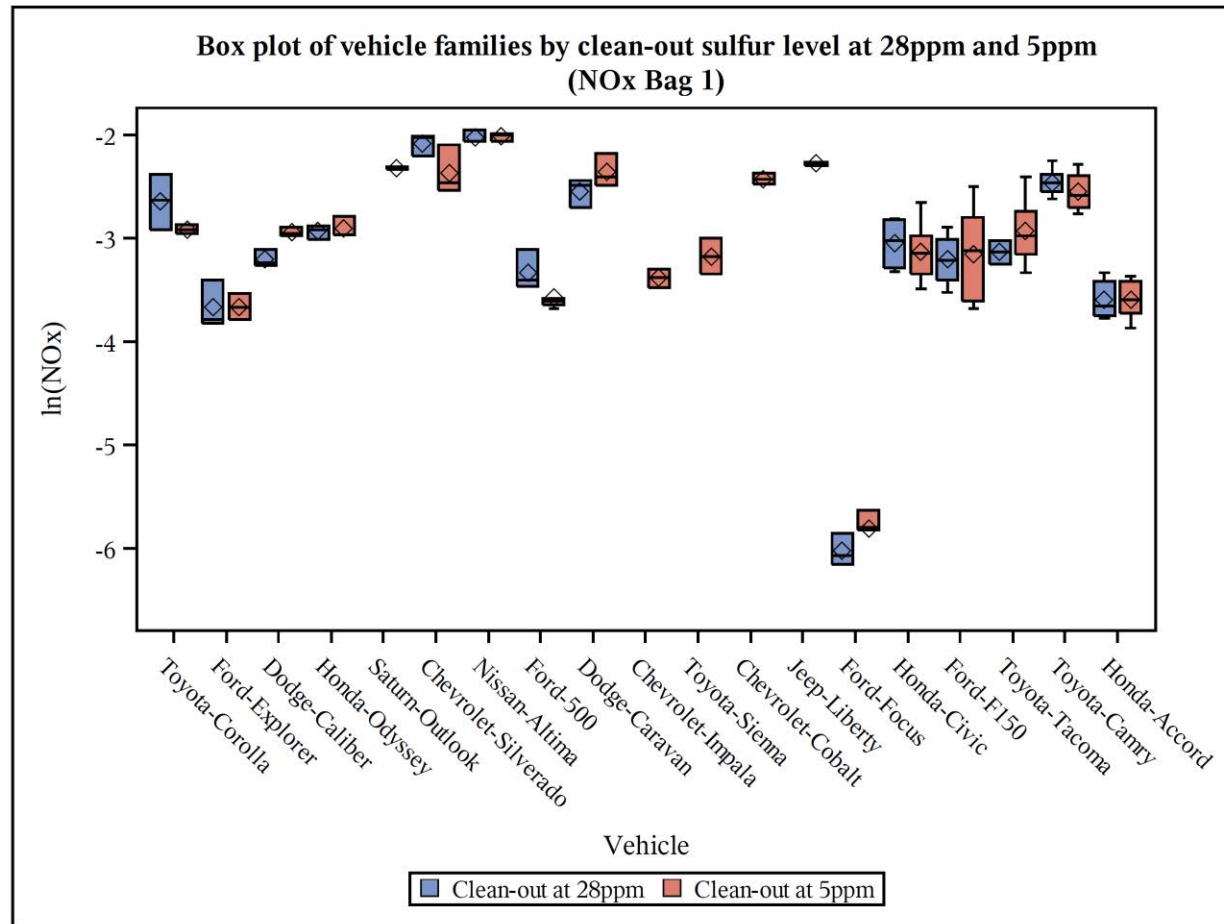
Box plot of vehicle families by pre- and post-cleanout at 28ppm (PM Bag1-Bag3)



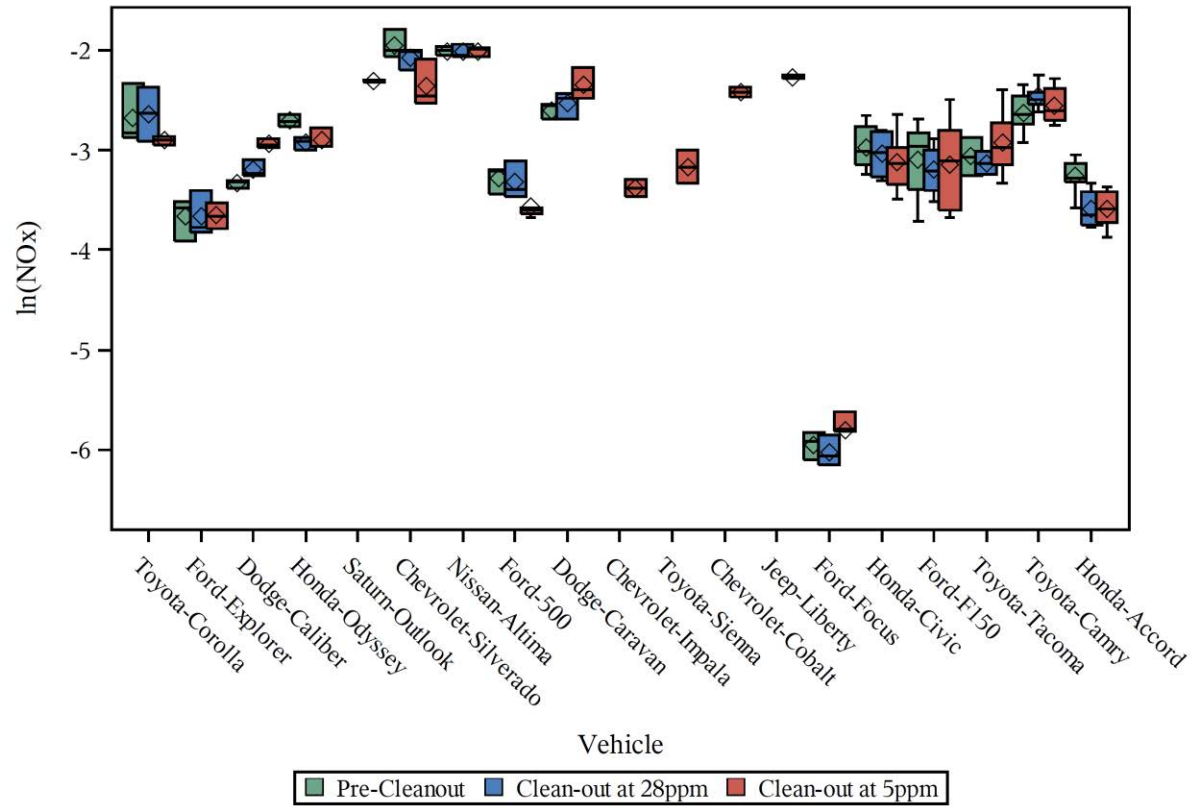
Box plot of vehicle families by pre- and post-cleanout at 28ppm (Wtd PM)



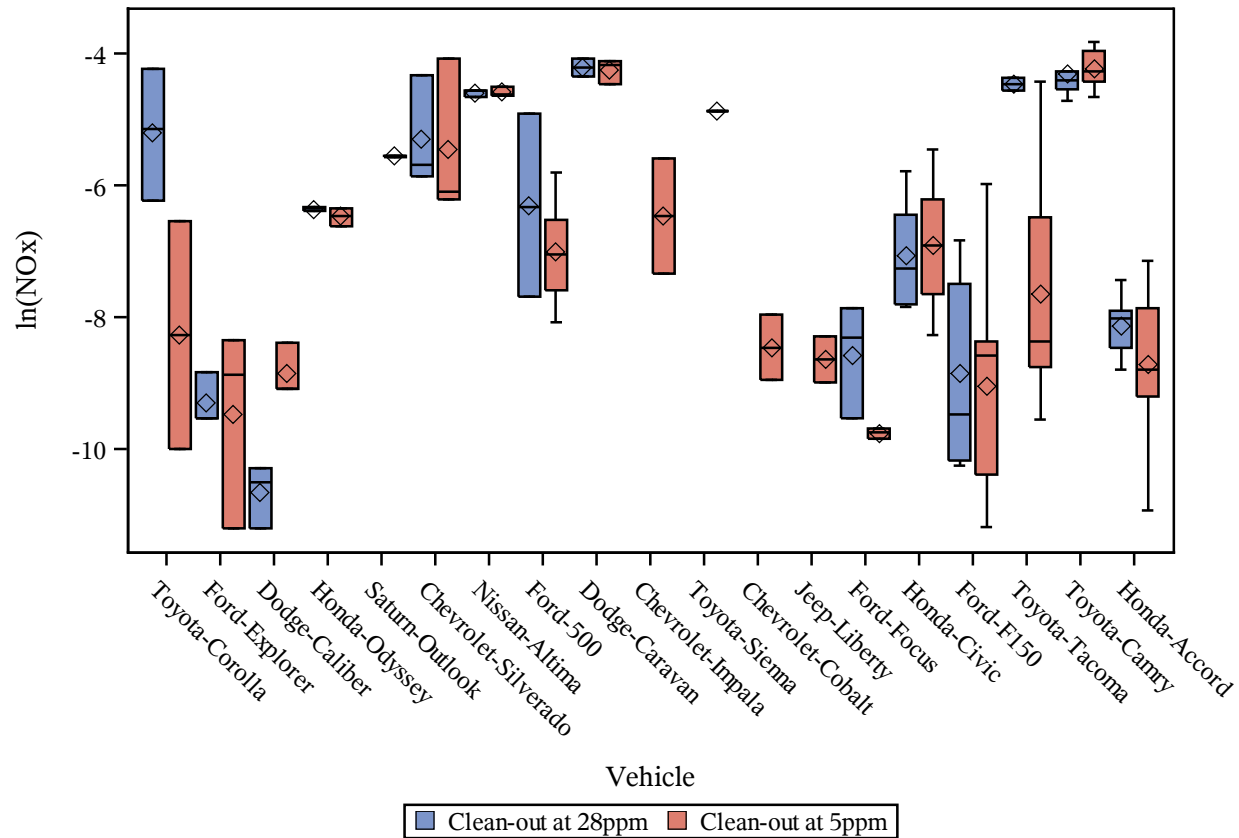
E.2. Effect of Clean-out at 5ppm



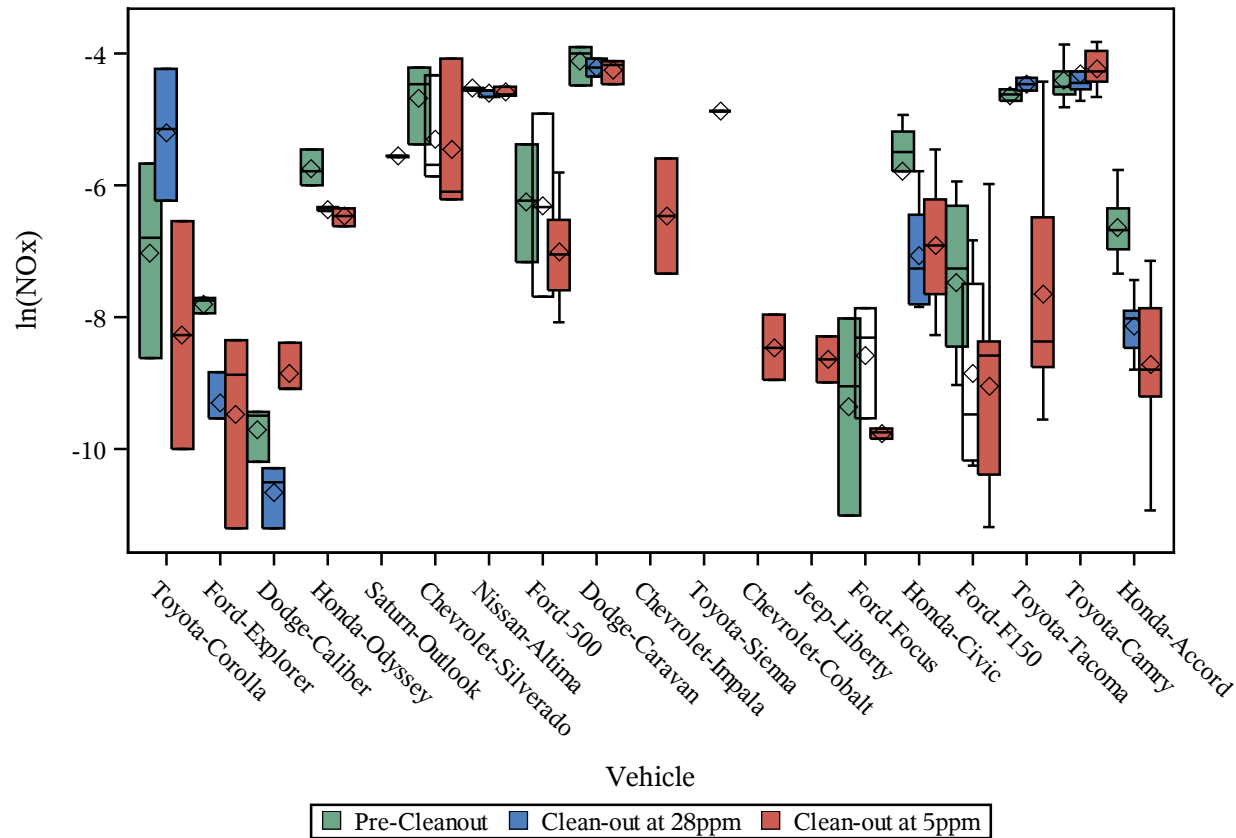
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NOx Bag 1)



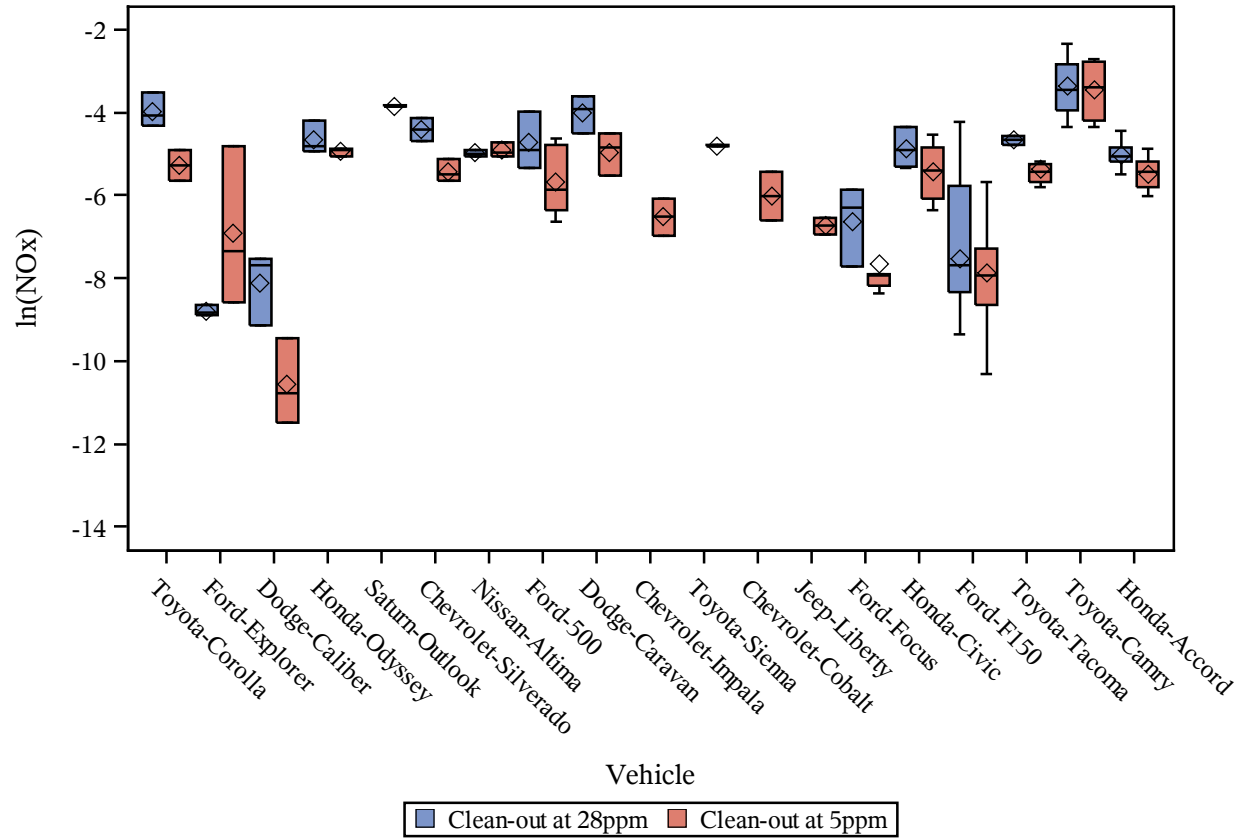
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(NOx Bag 2)



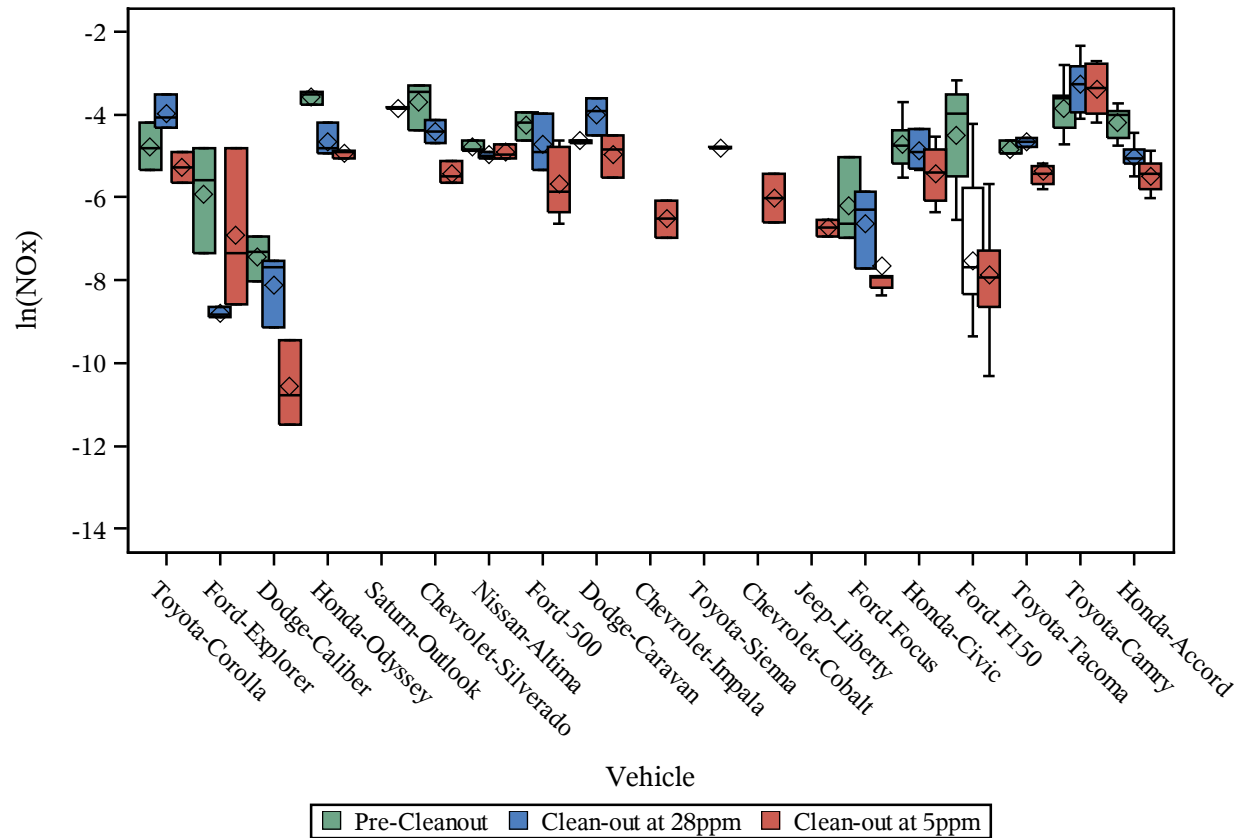
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NO_x Bag 2)



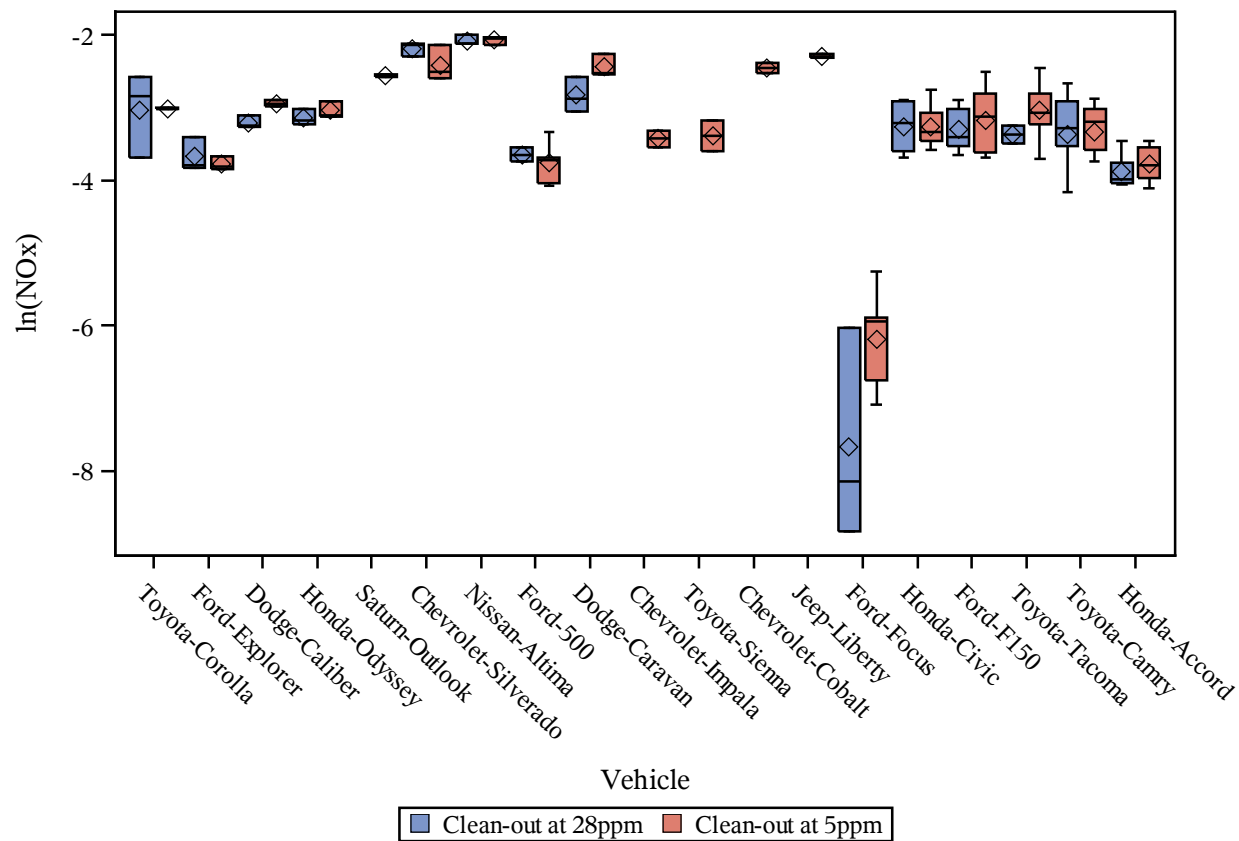
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(NOx Bag 3)



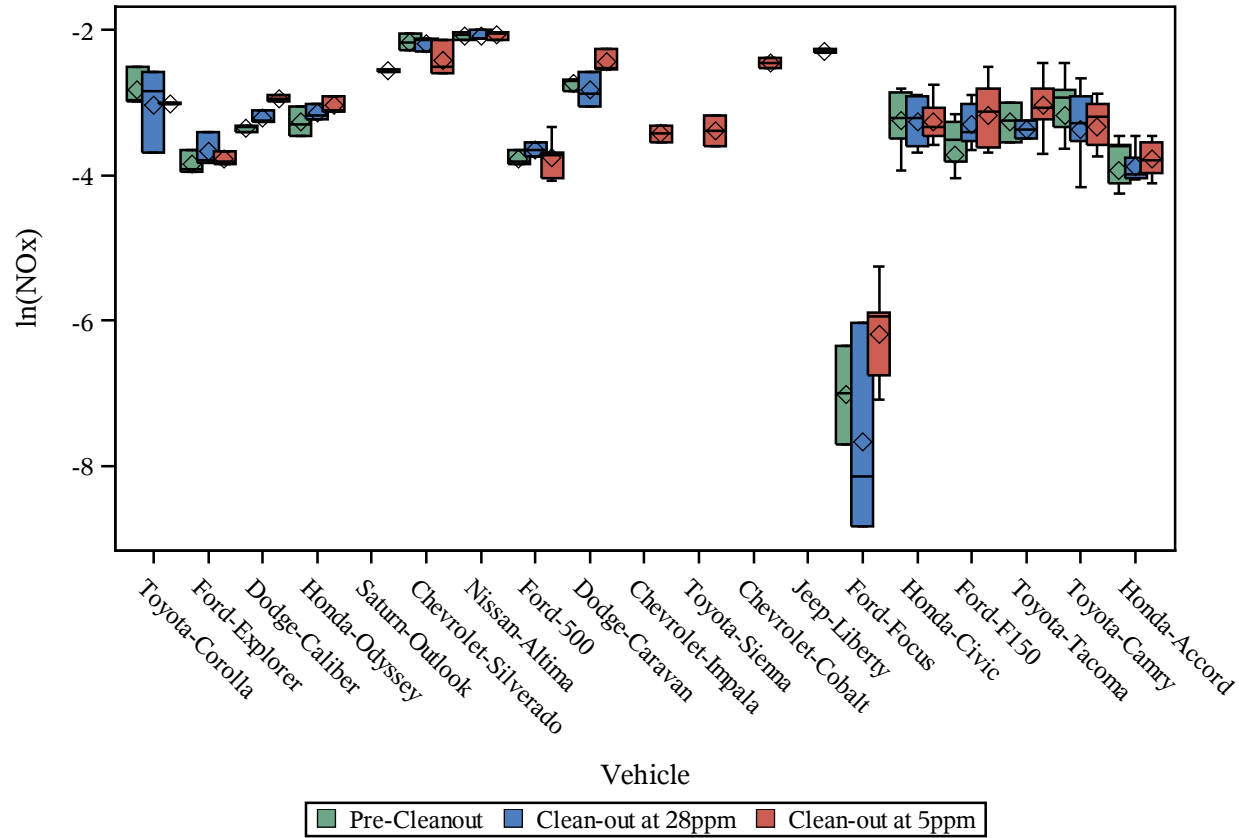
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NO_x Bag 3)



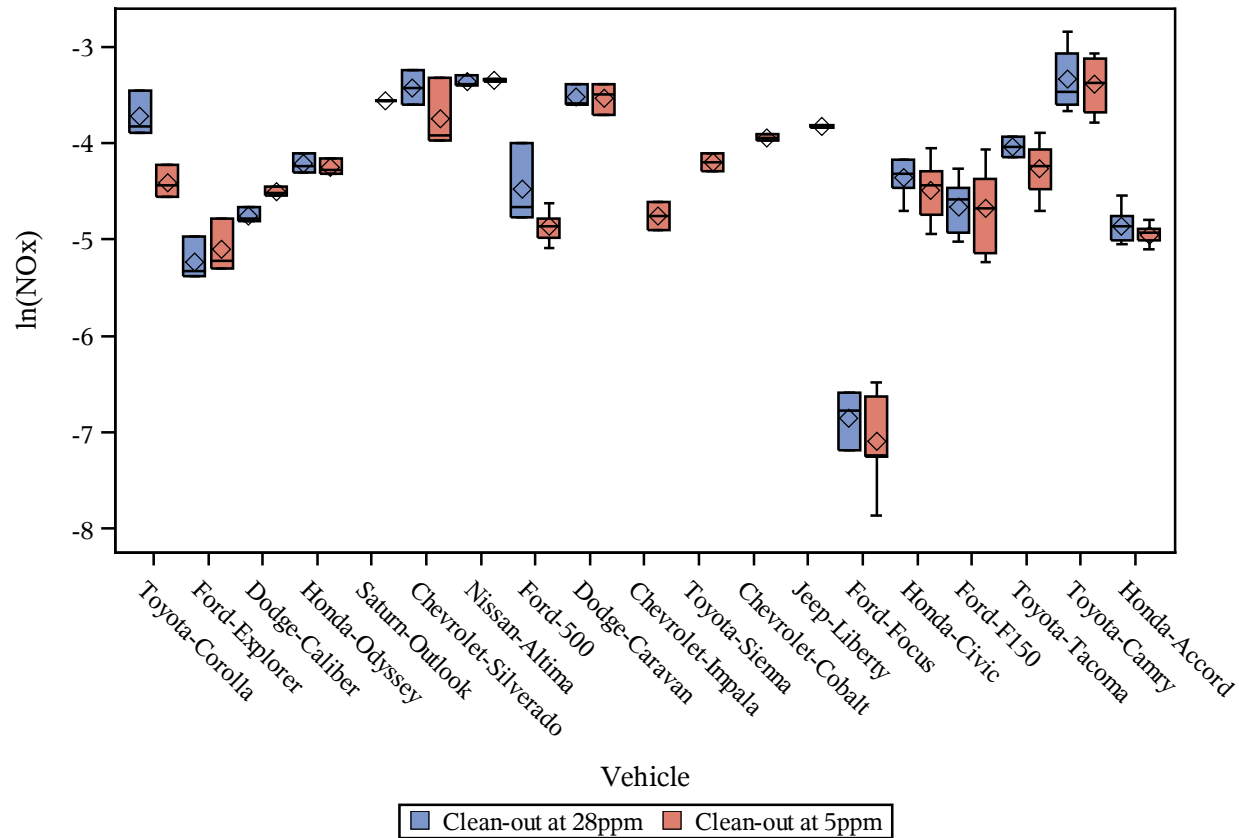
Box plot of vehicle family emissions by clean-out sulfur level at 28ppm and 5ppm
(NOx Bag1-Bag3)



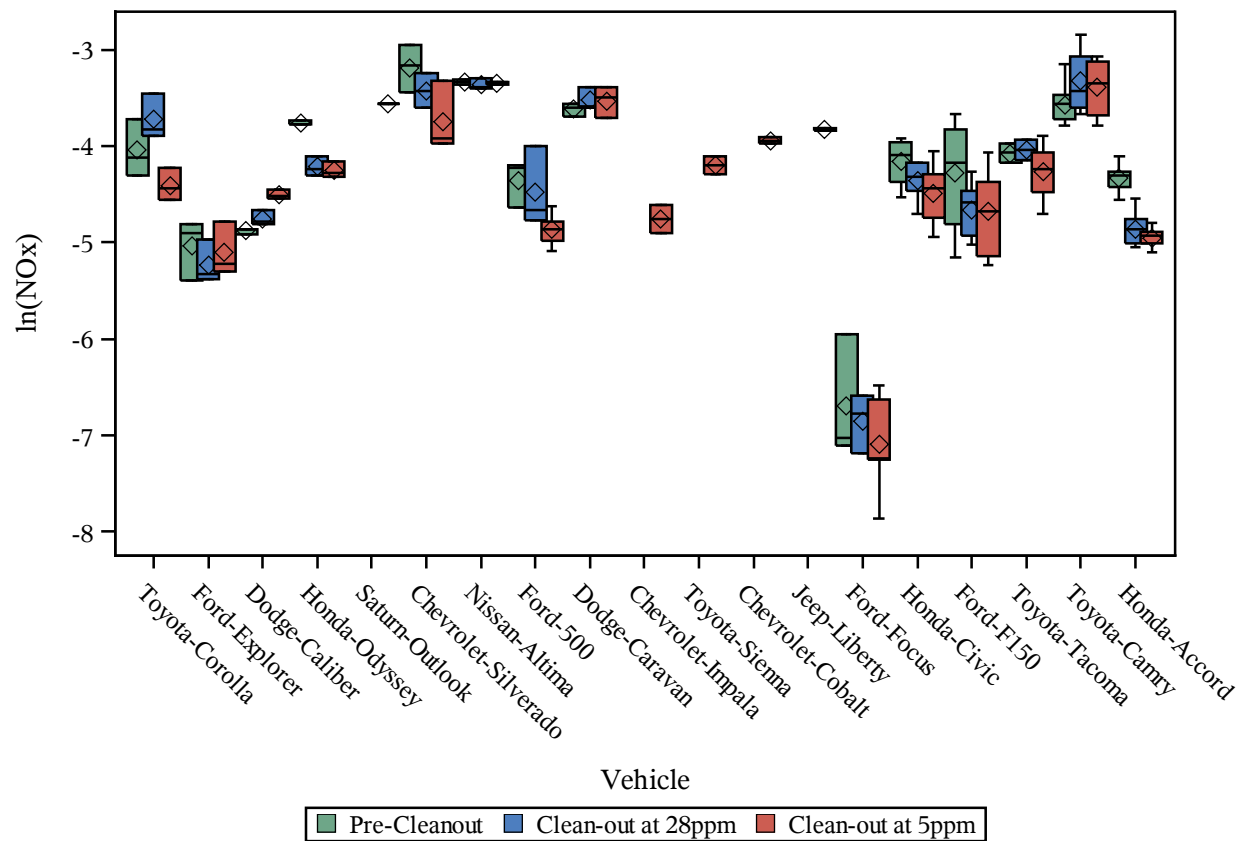
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NO_x Bag1-Bag3)



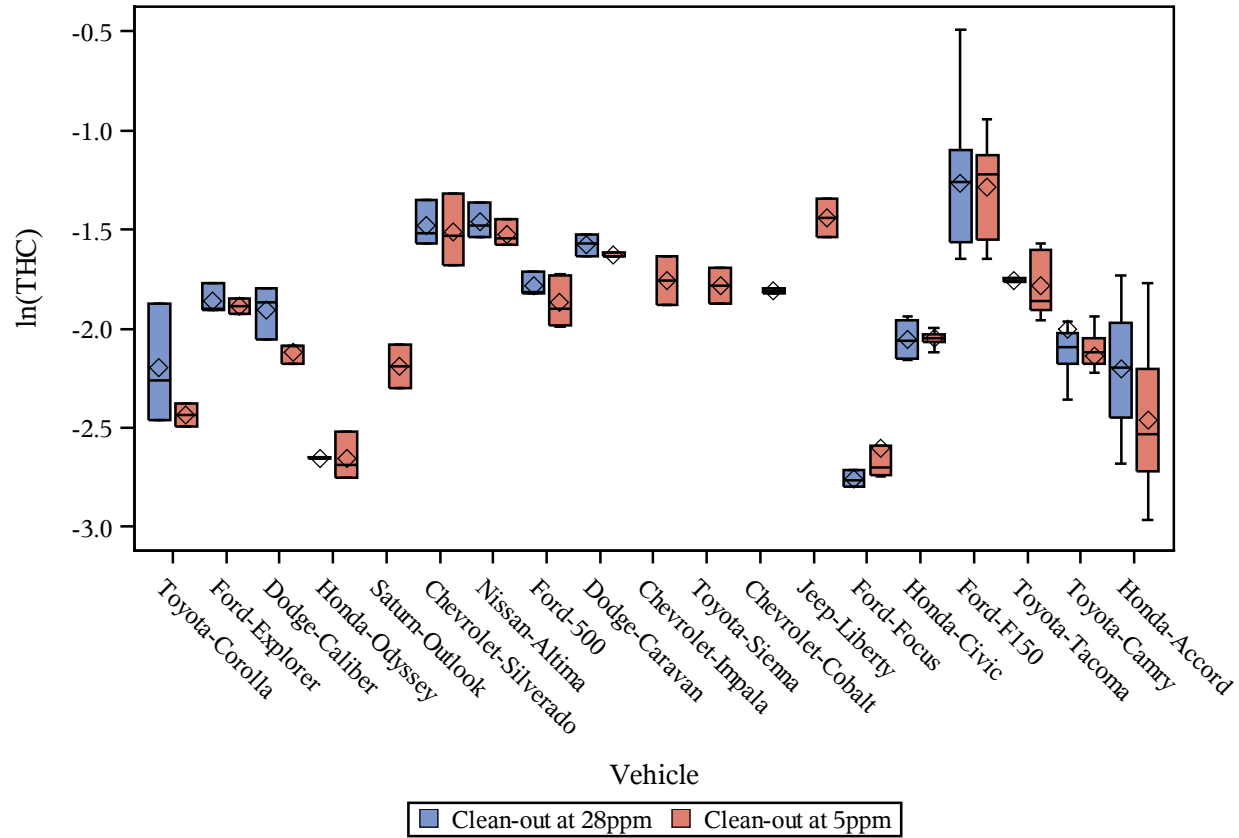
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(Wtd NO_x)



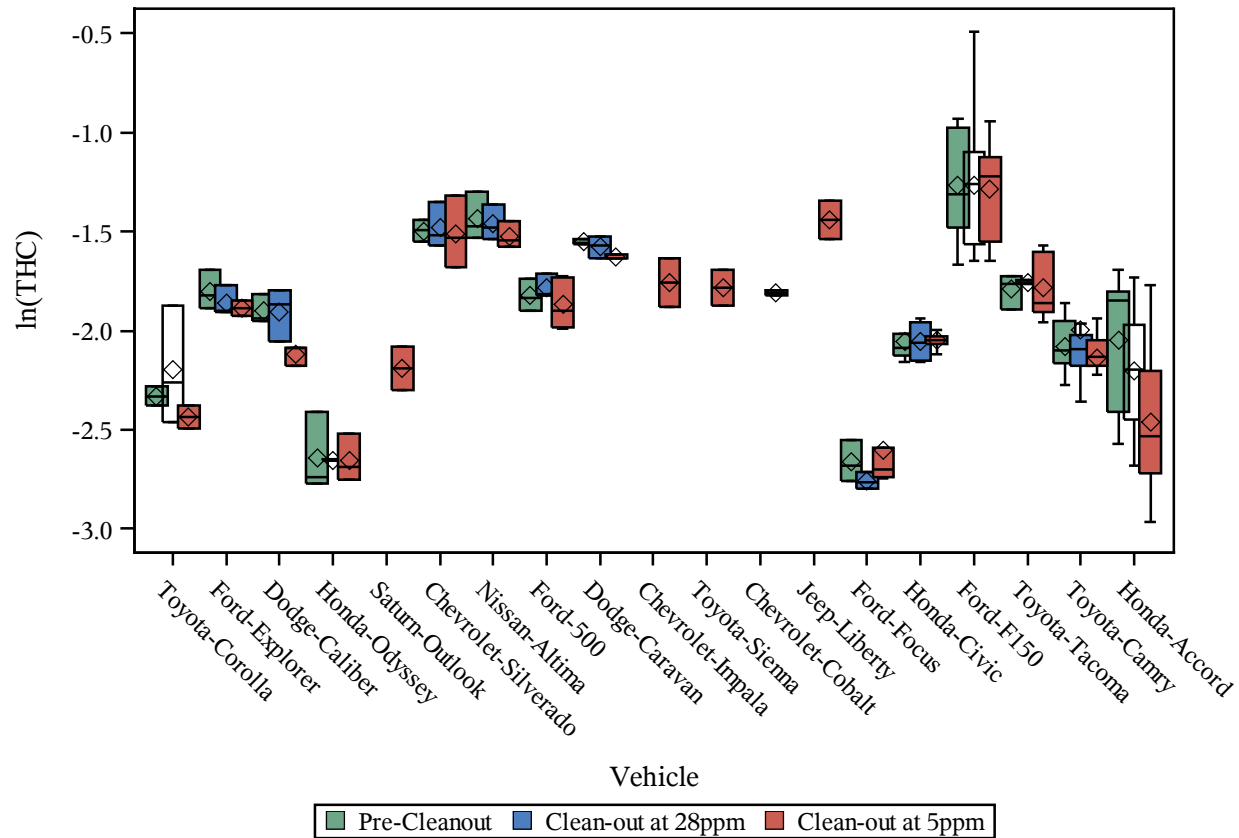
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (Wtd NO_x)



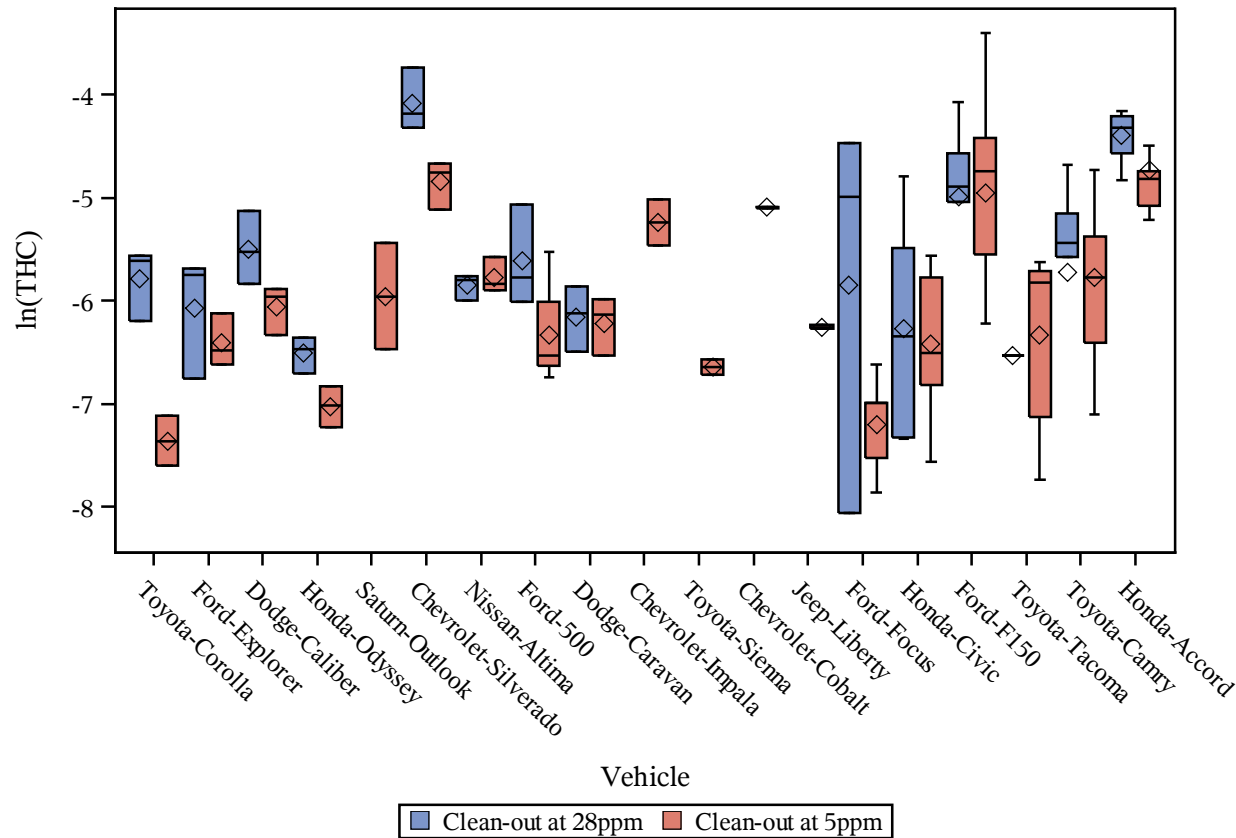
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(THC Bag 1)



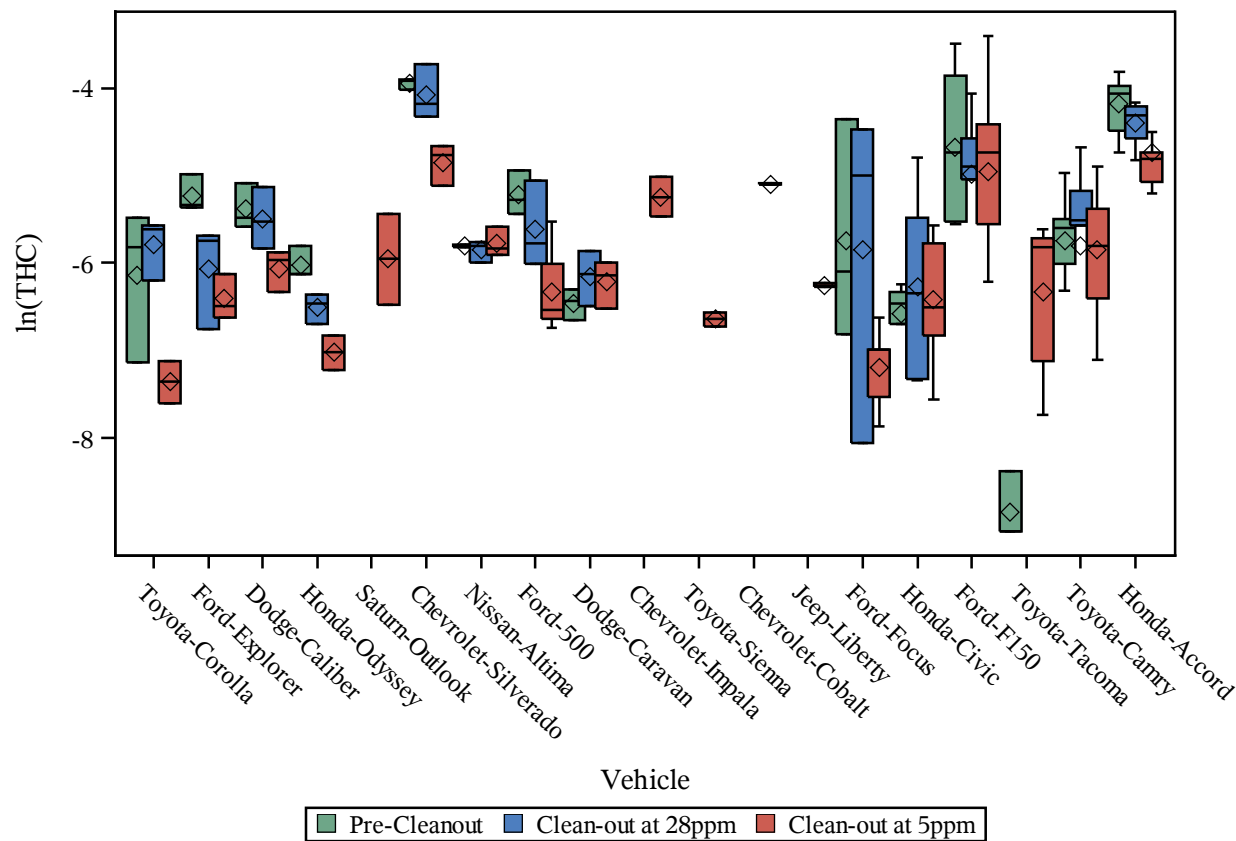
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (THC Bag 1)



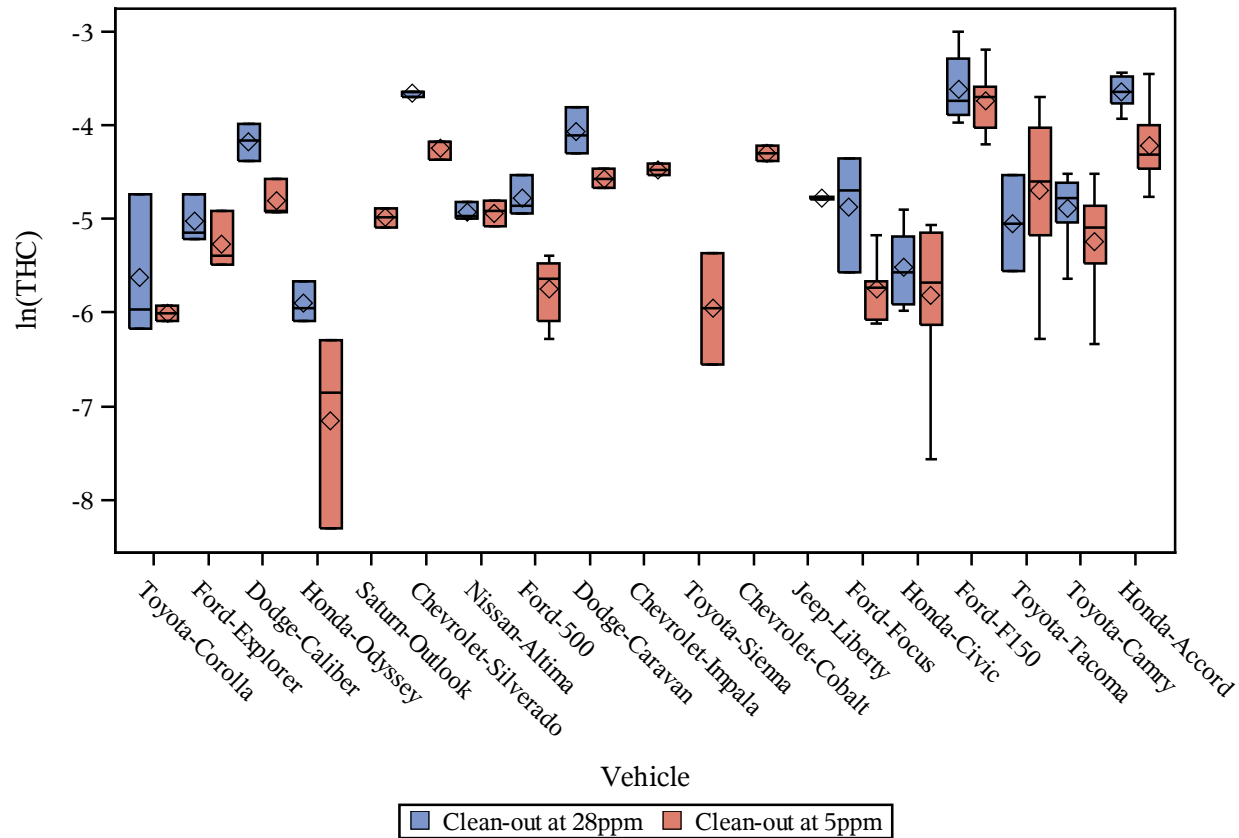
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(THC Bag 2)



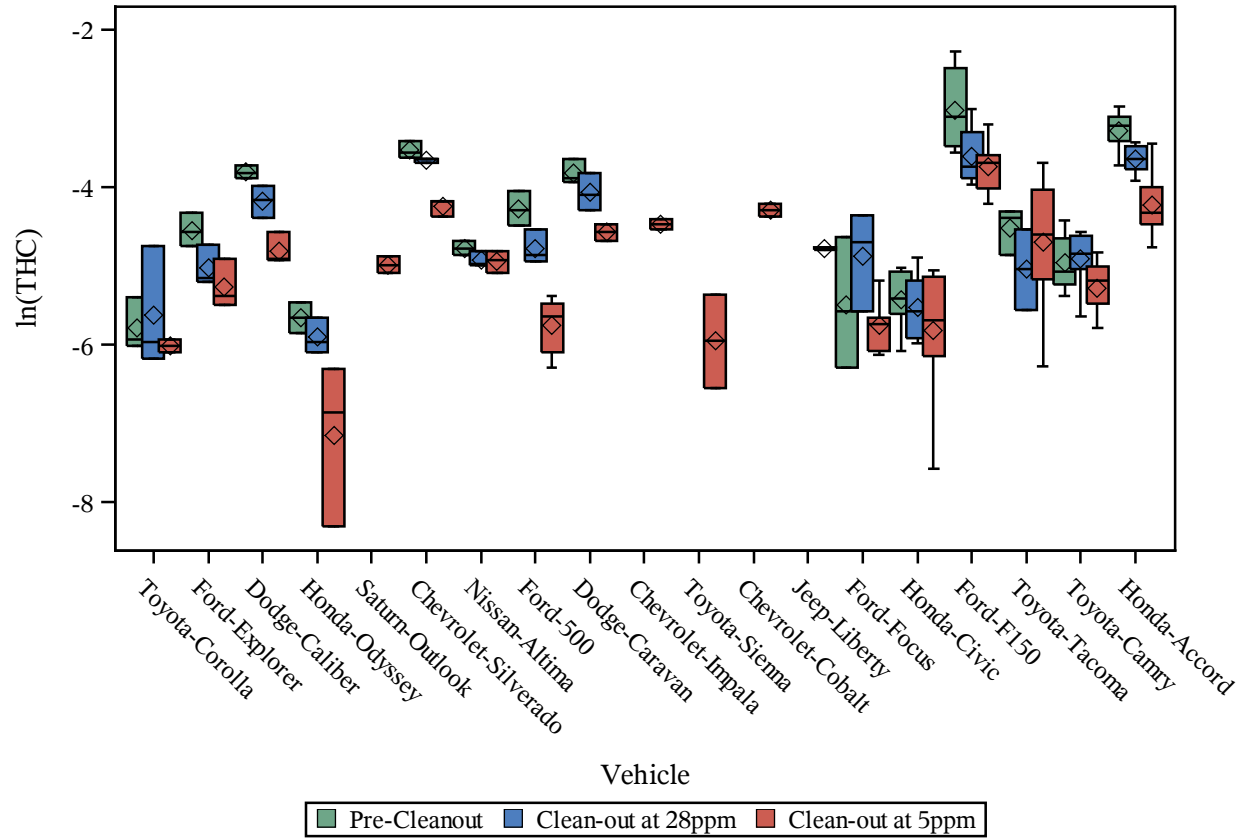
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (THC Bag 2)



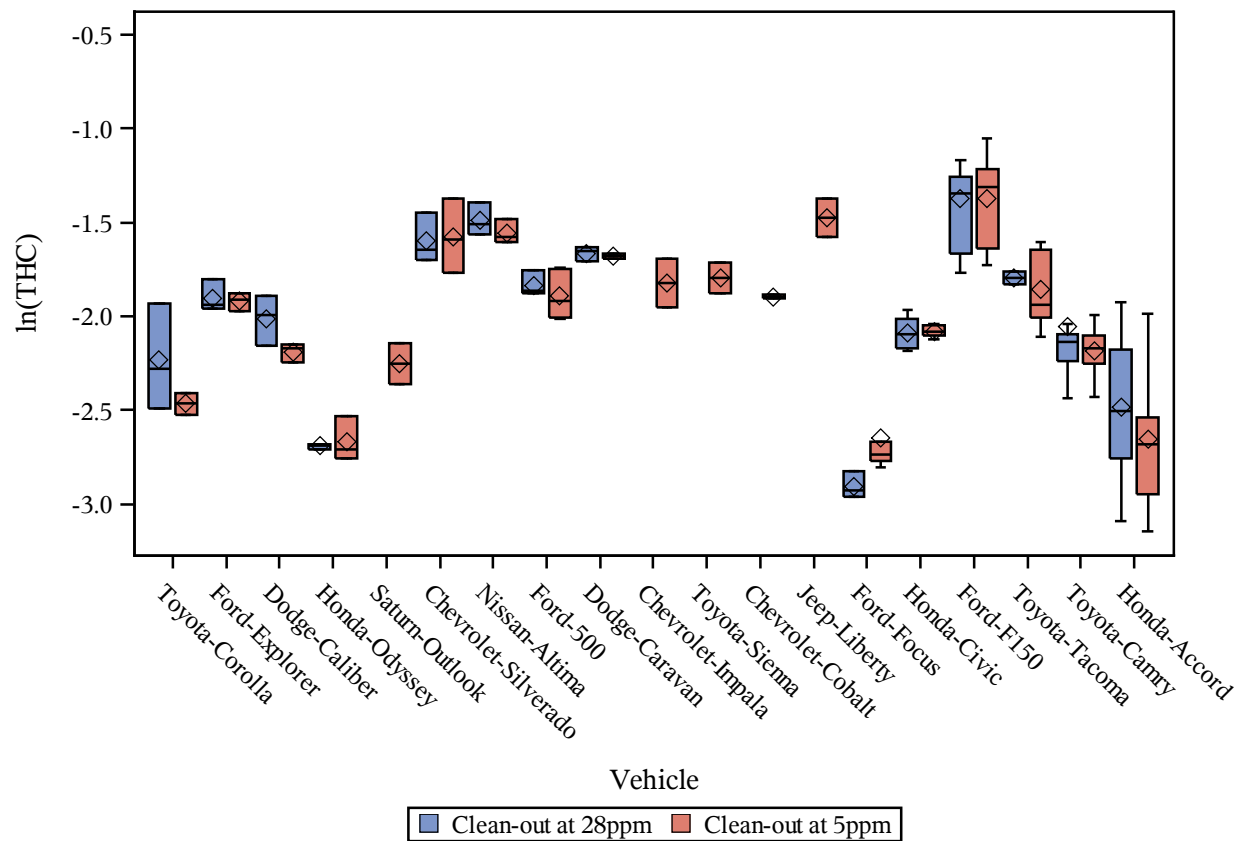
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(THC Bag 3)



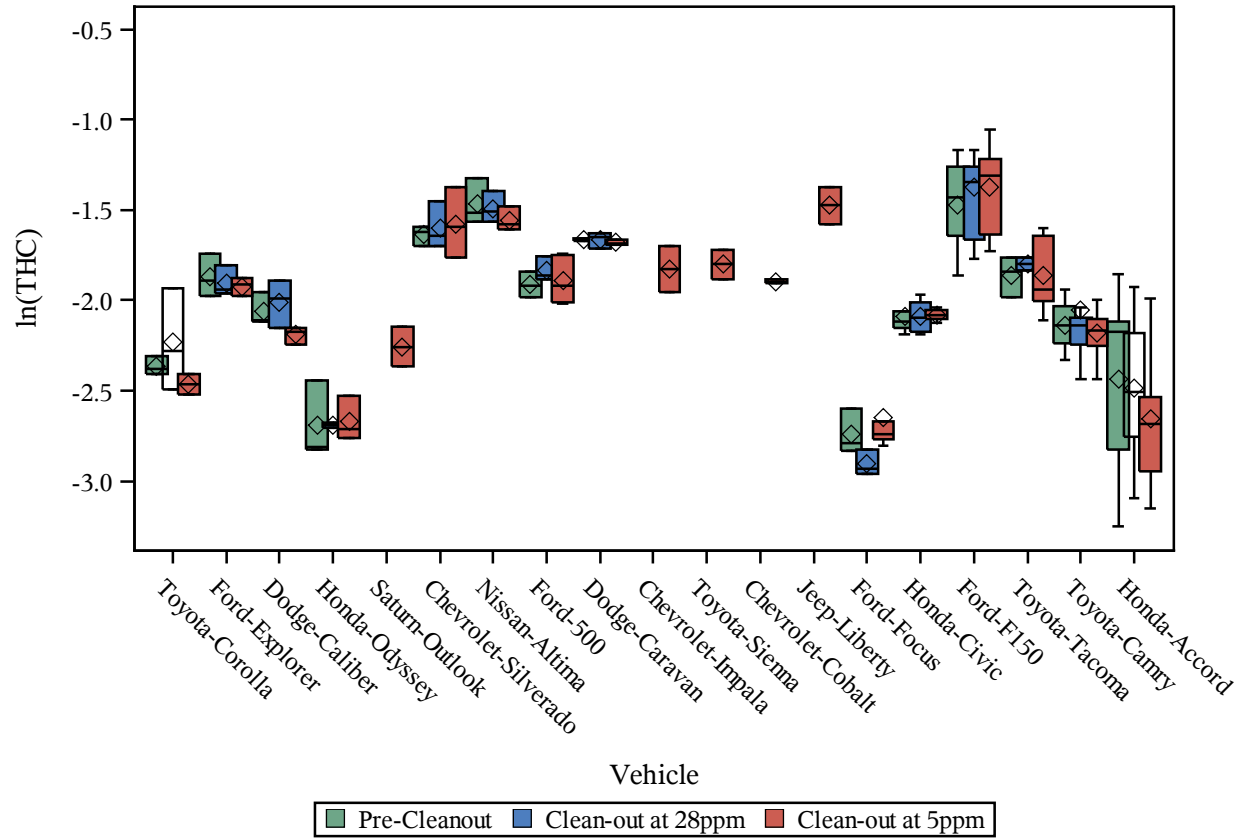
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (THC Bag 3)



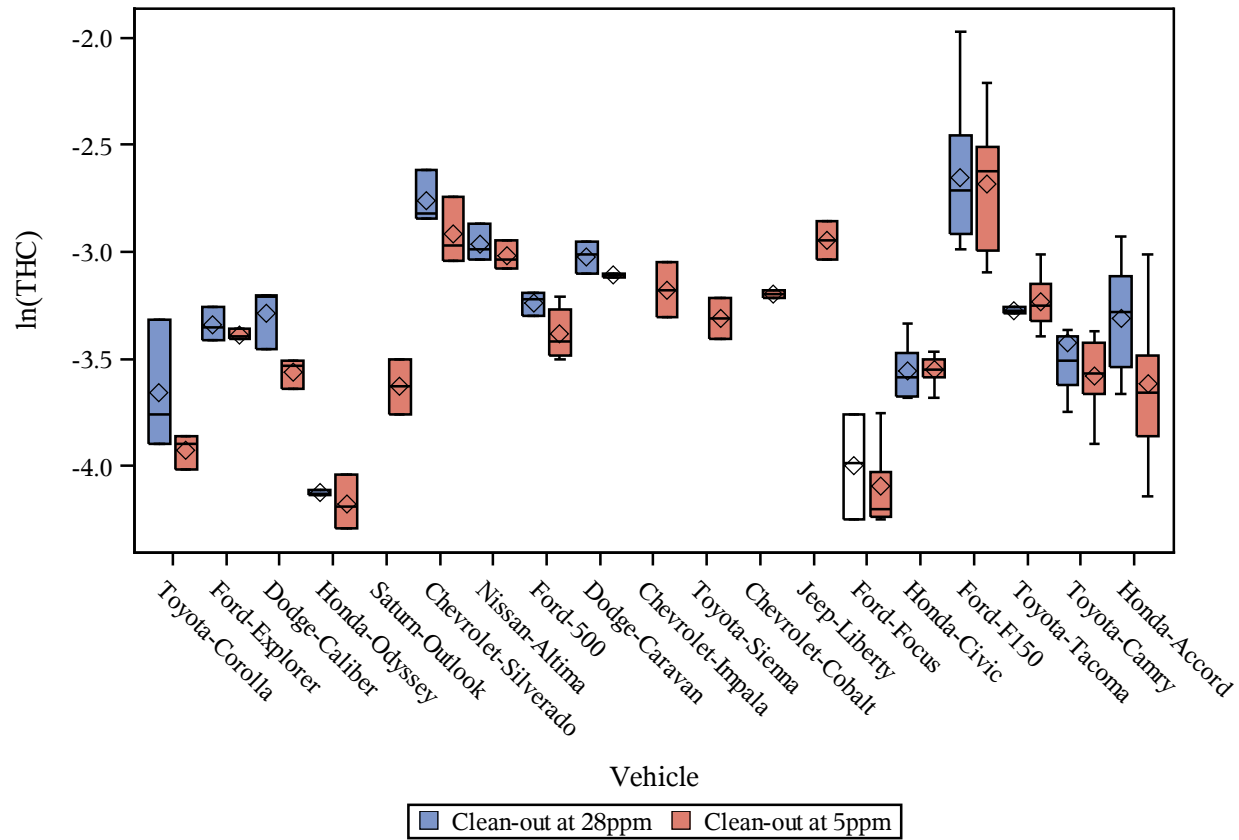
Box plot of vehicle family emissions by clean-out sulfur level at 28ppm and 5ppm
(THC Bag1-Bag3)



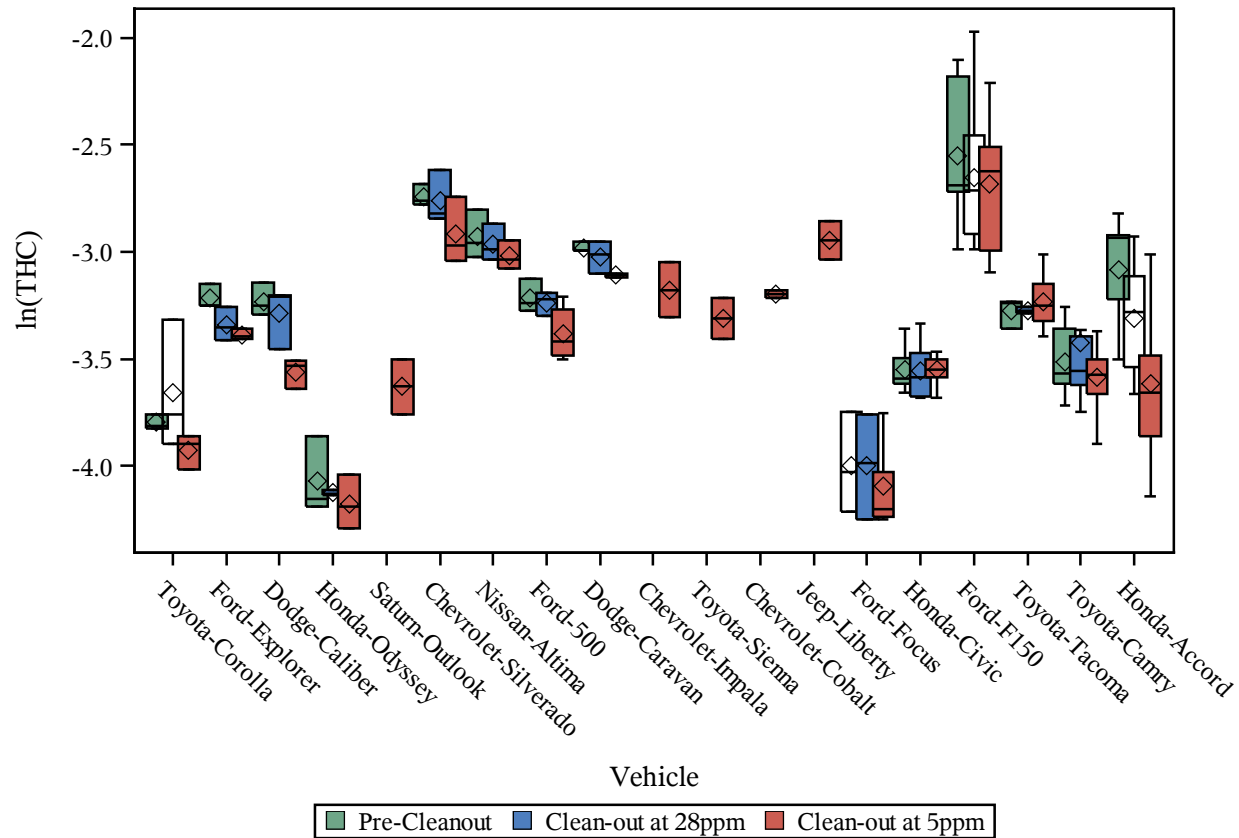
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (THC Bag1-Bag3)



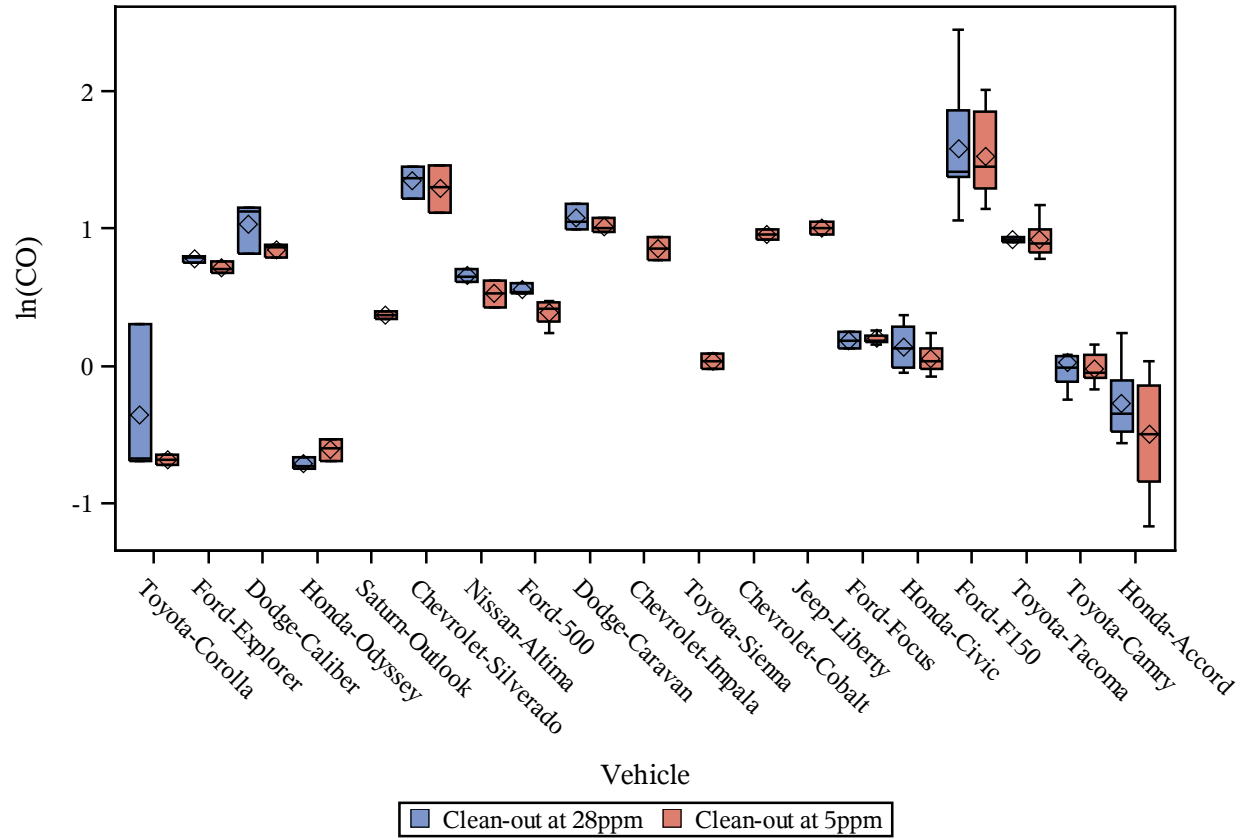
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(Wtd THC)



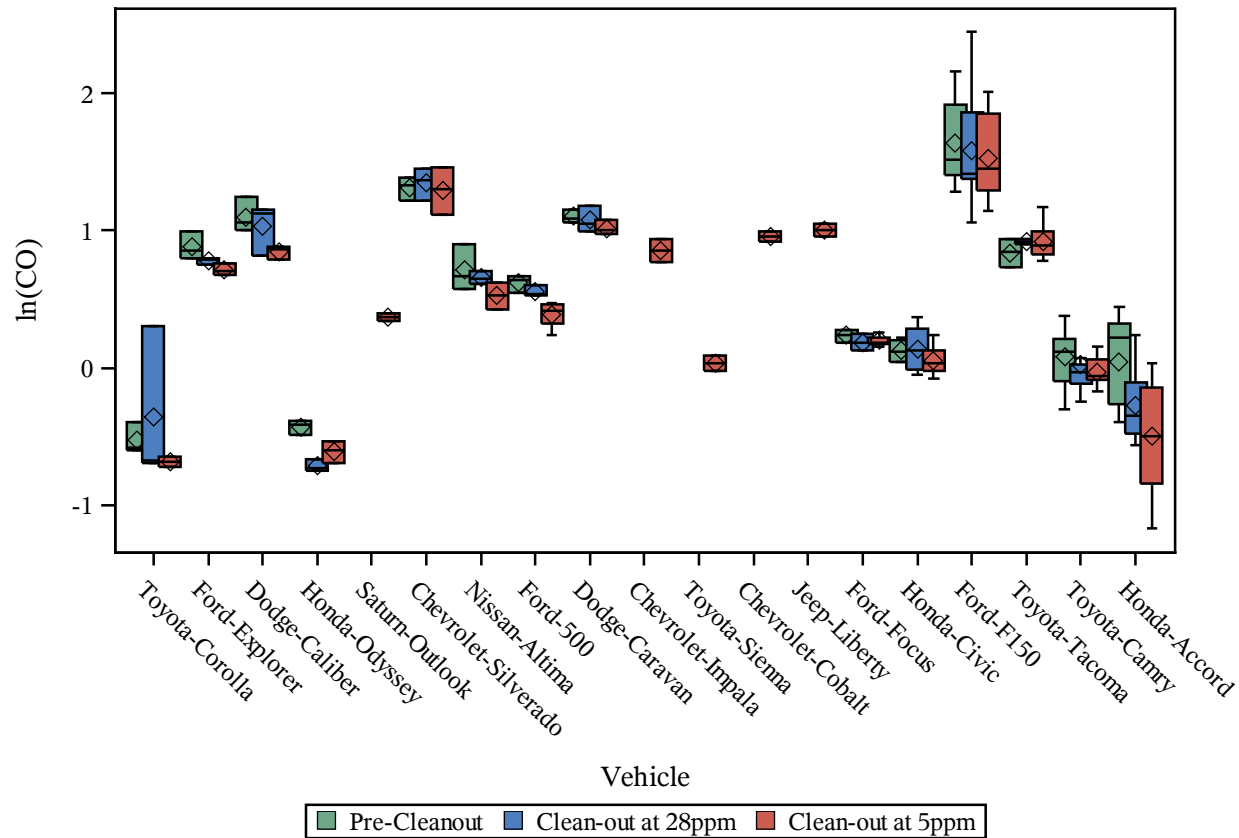
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (Wtd THC)



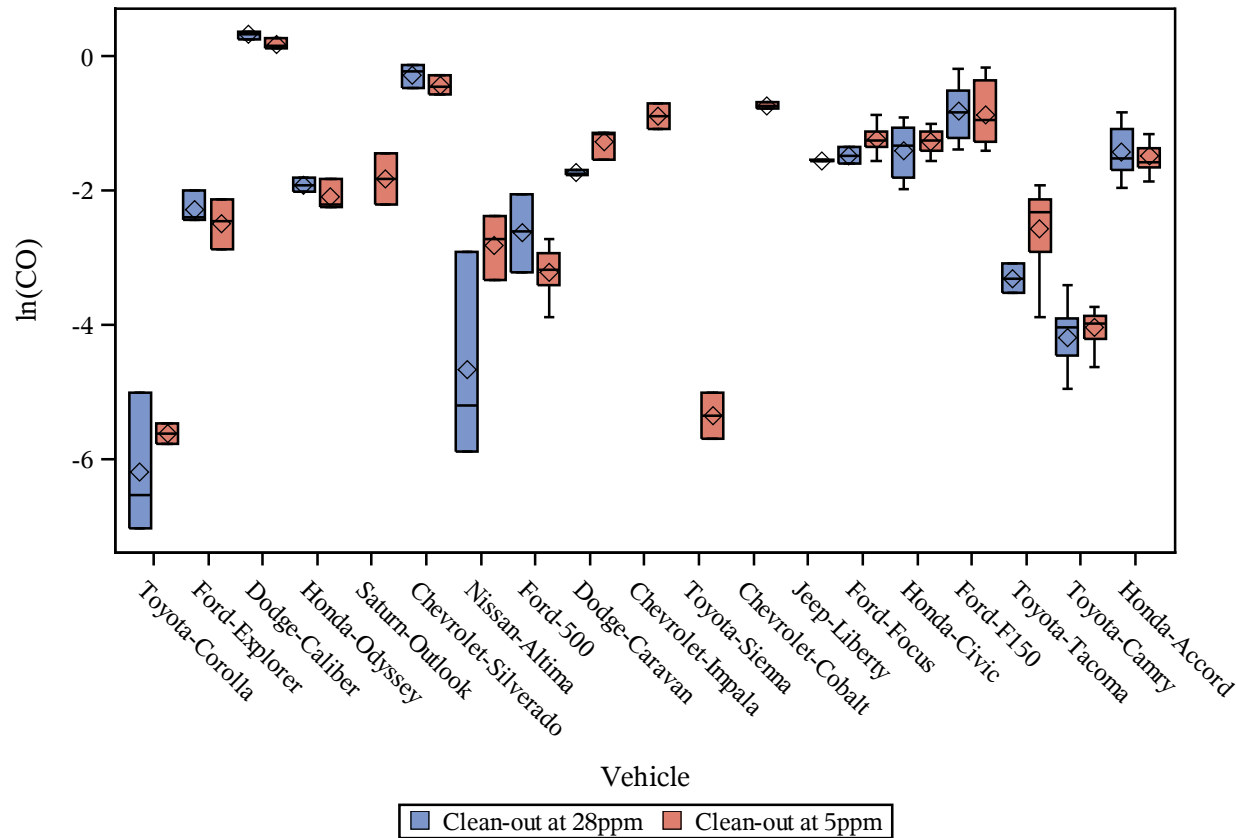
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(CO Bag 1)



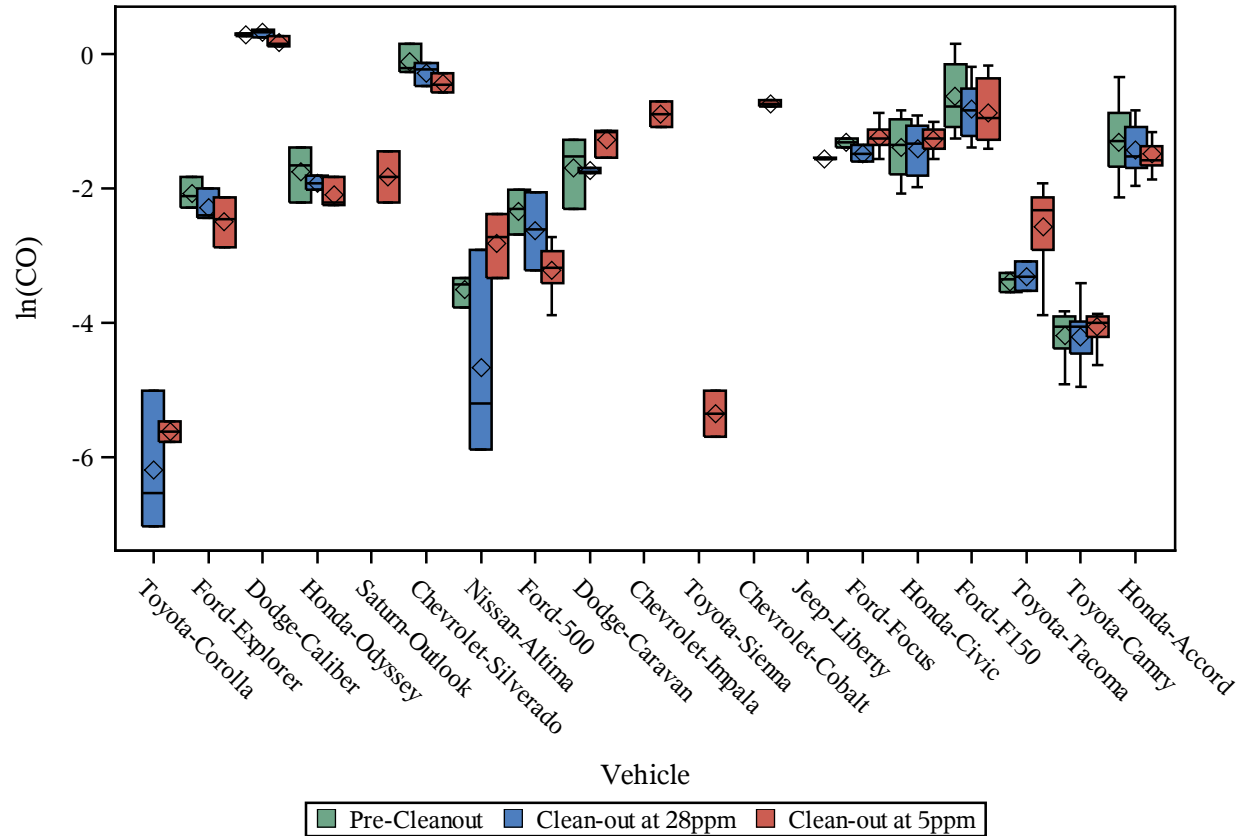
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CO Bag 1)



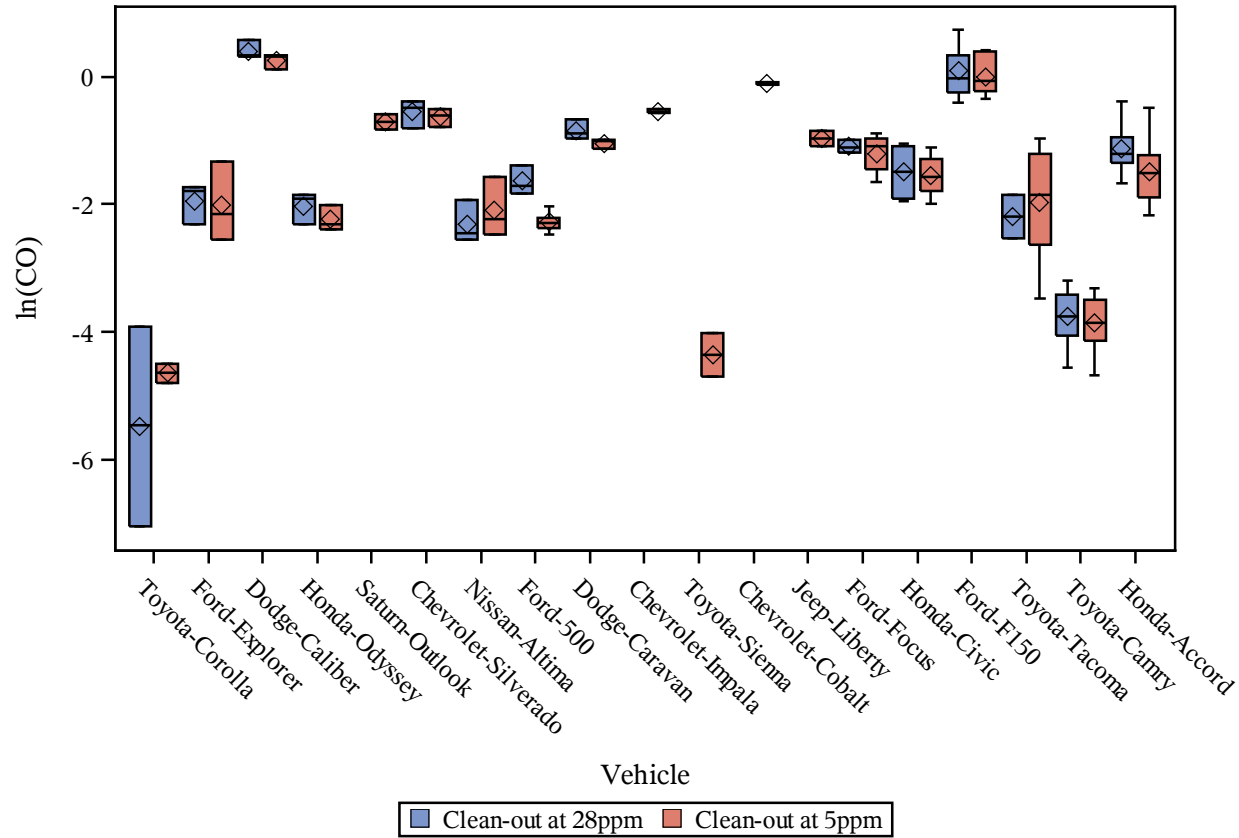
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(CO Bag 2)



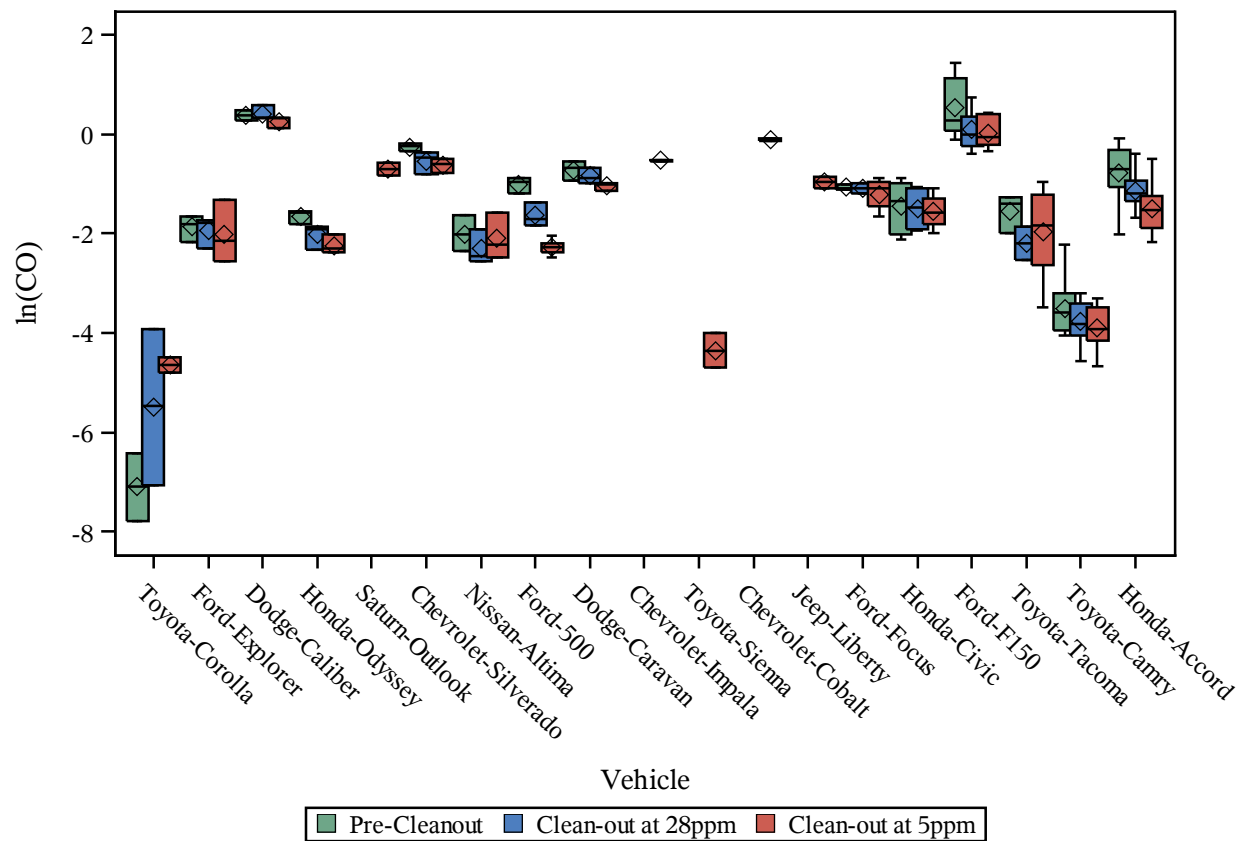
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CO Bag 2)



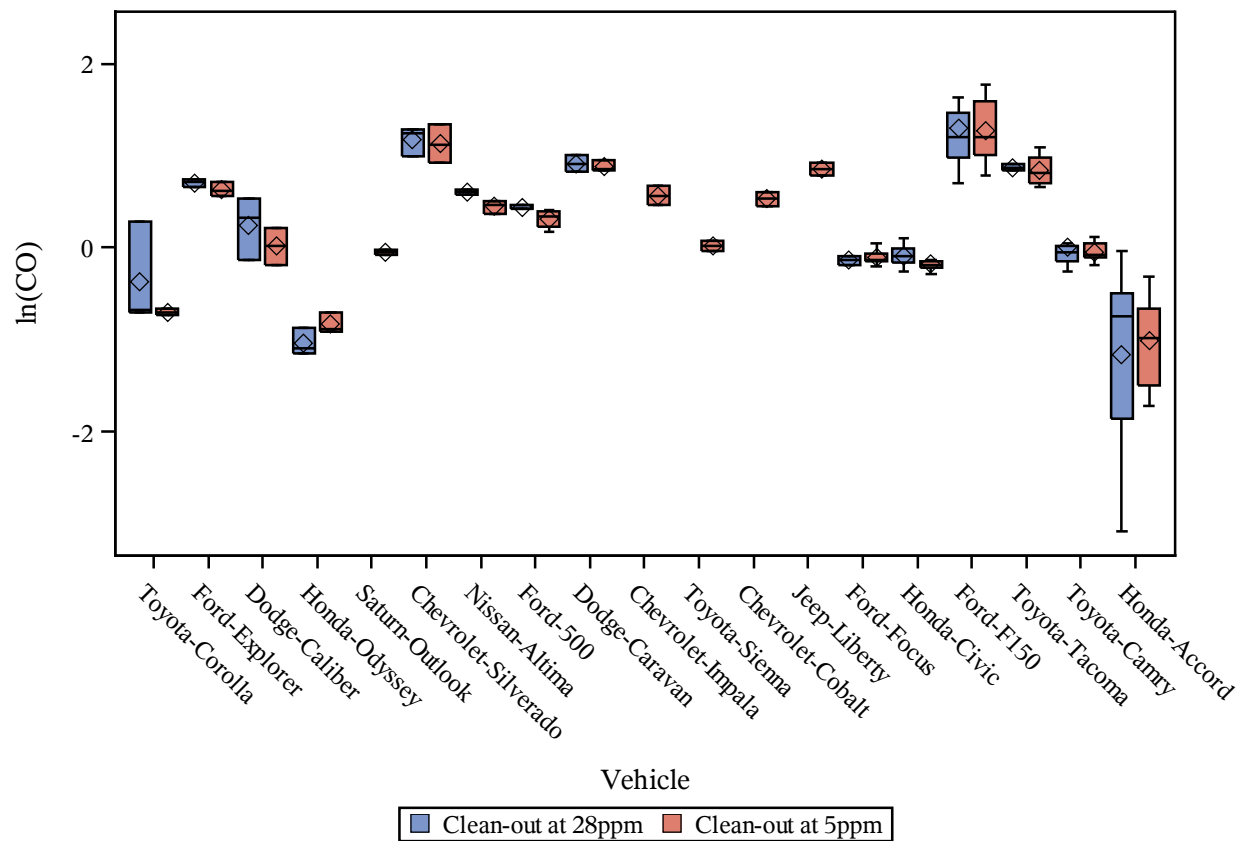
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(CO Bag 3)



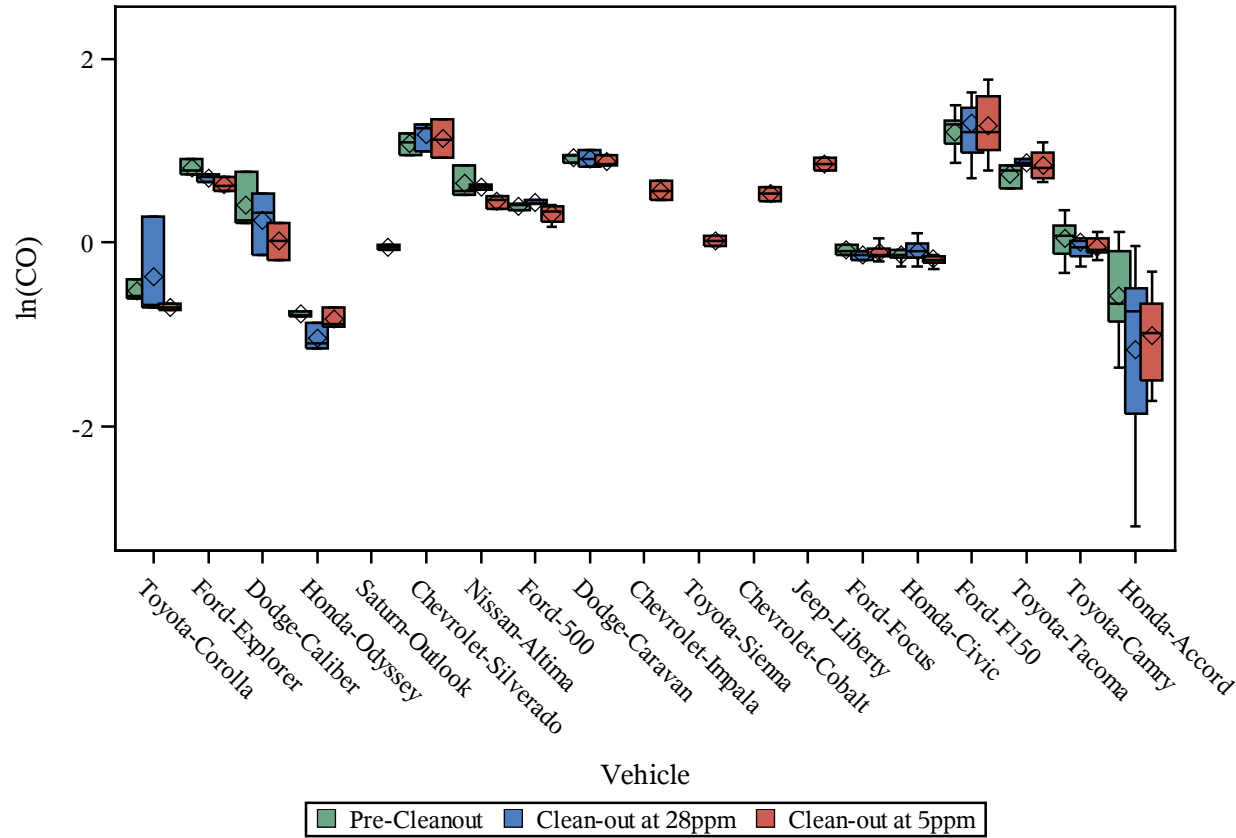
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CO Bag 3)



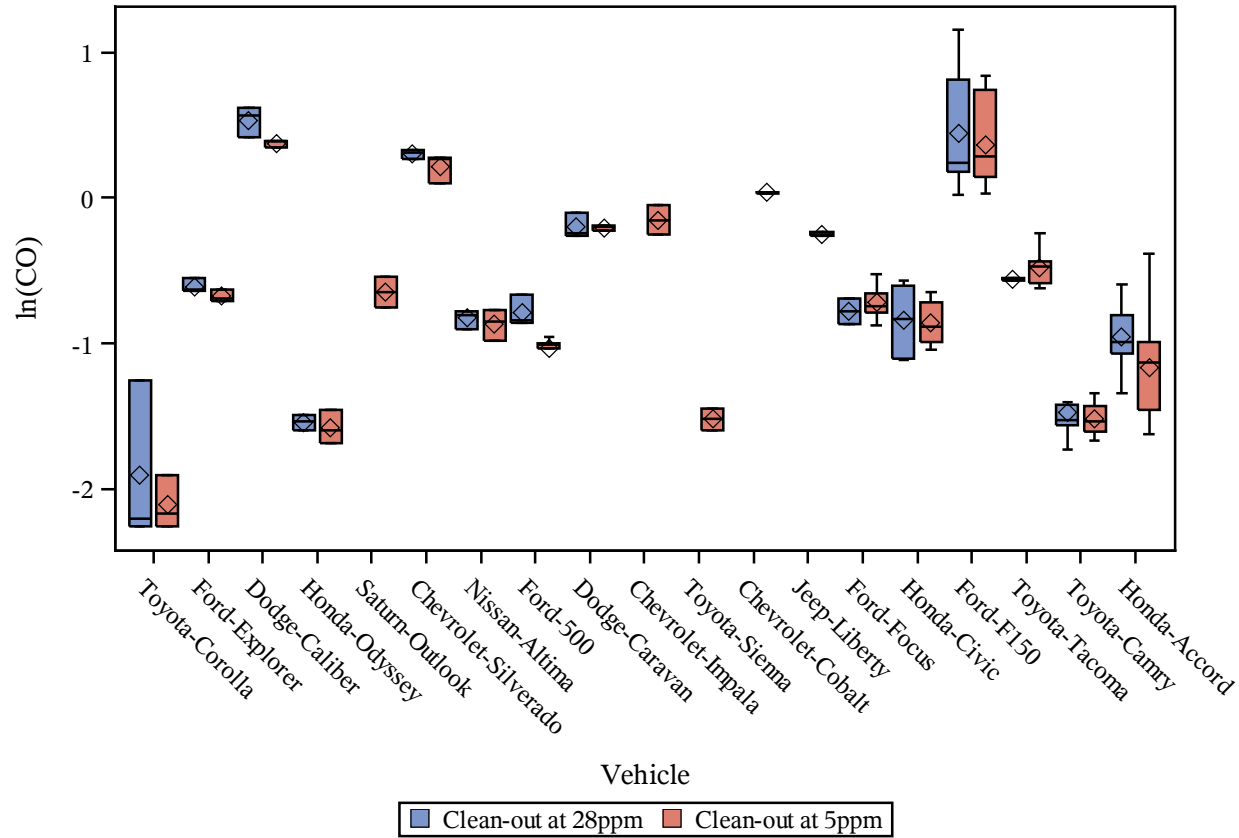
Box plot of vehicle family emissions by clean-out sulfur level at 28ppm and 5ppm
(CO Bag1-Bag3)



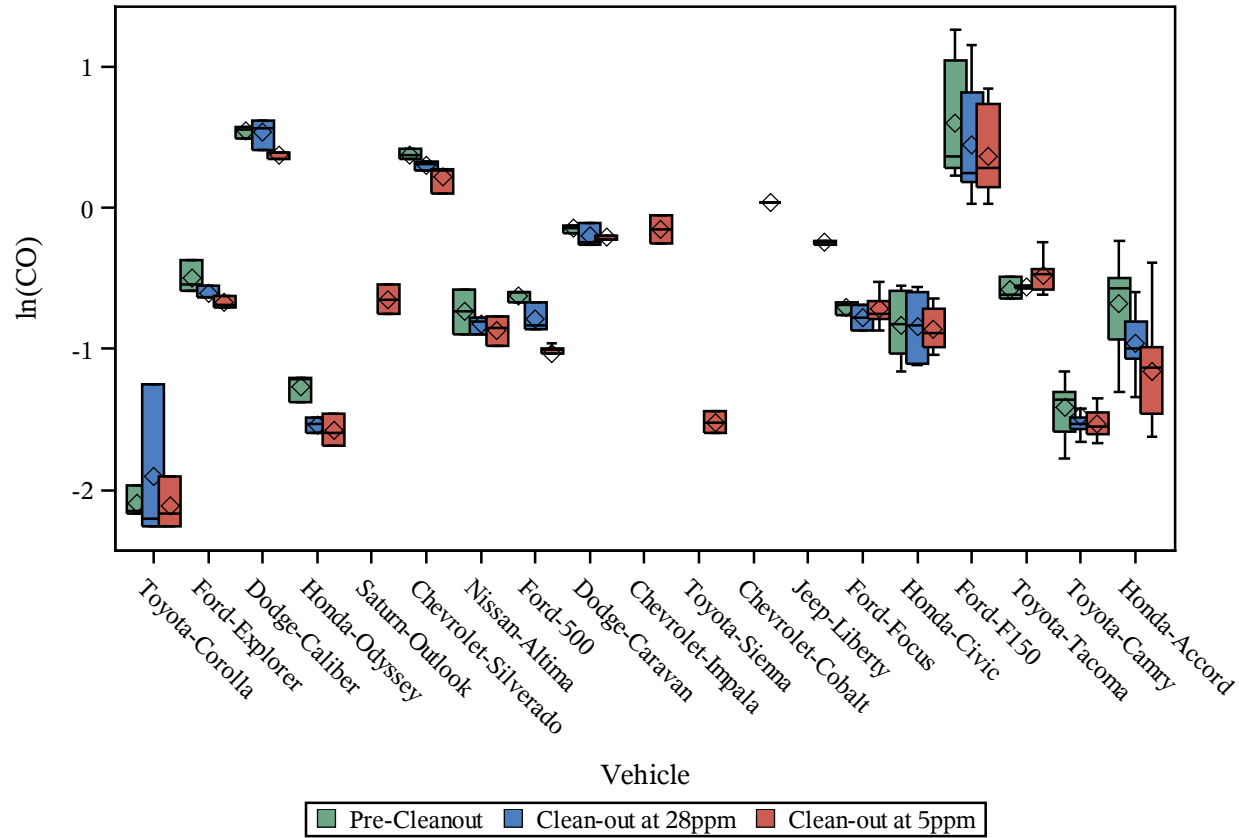
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CO Bag1-Bag3)



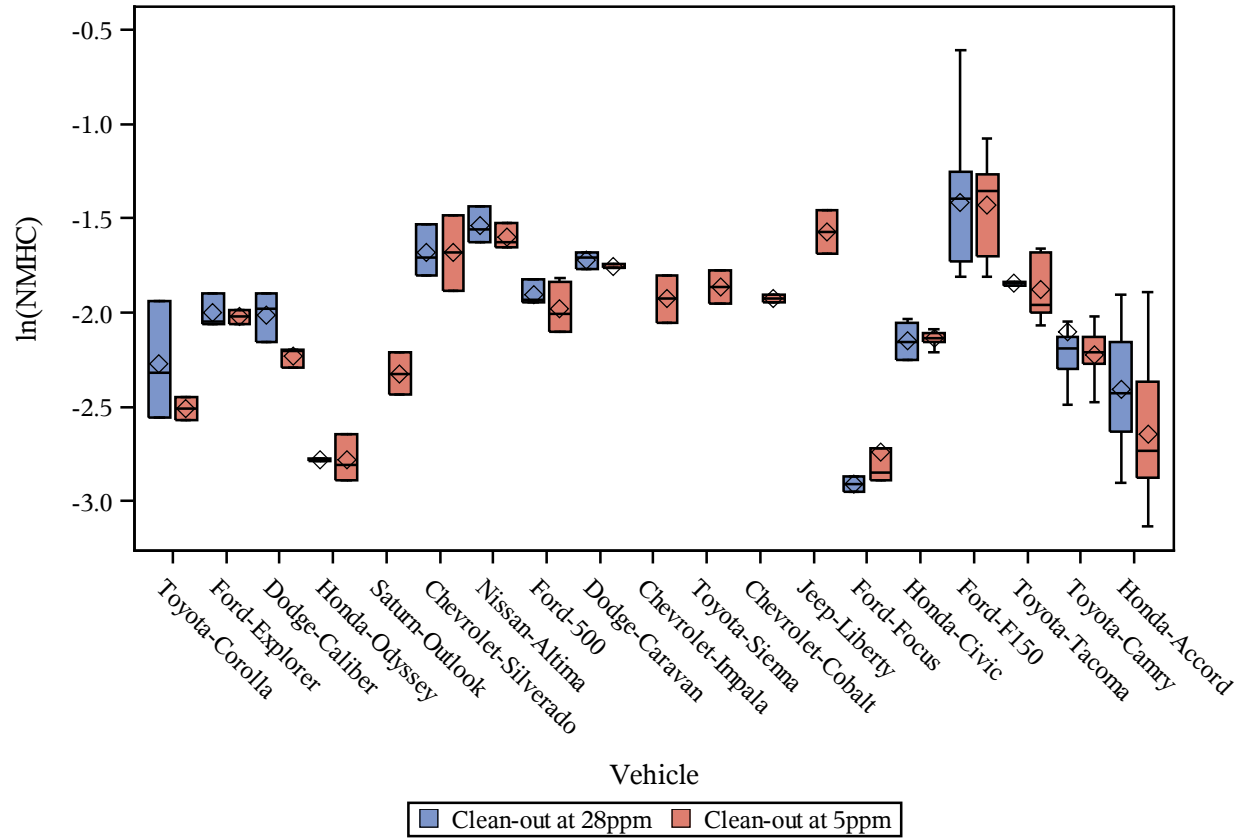
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(Wtd CO)



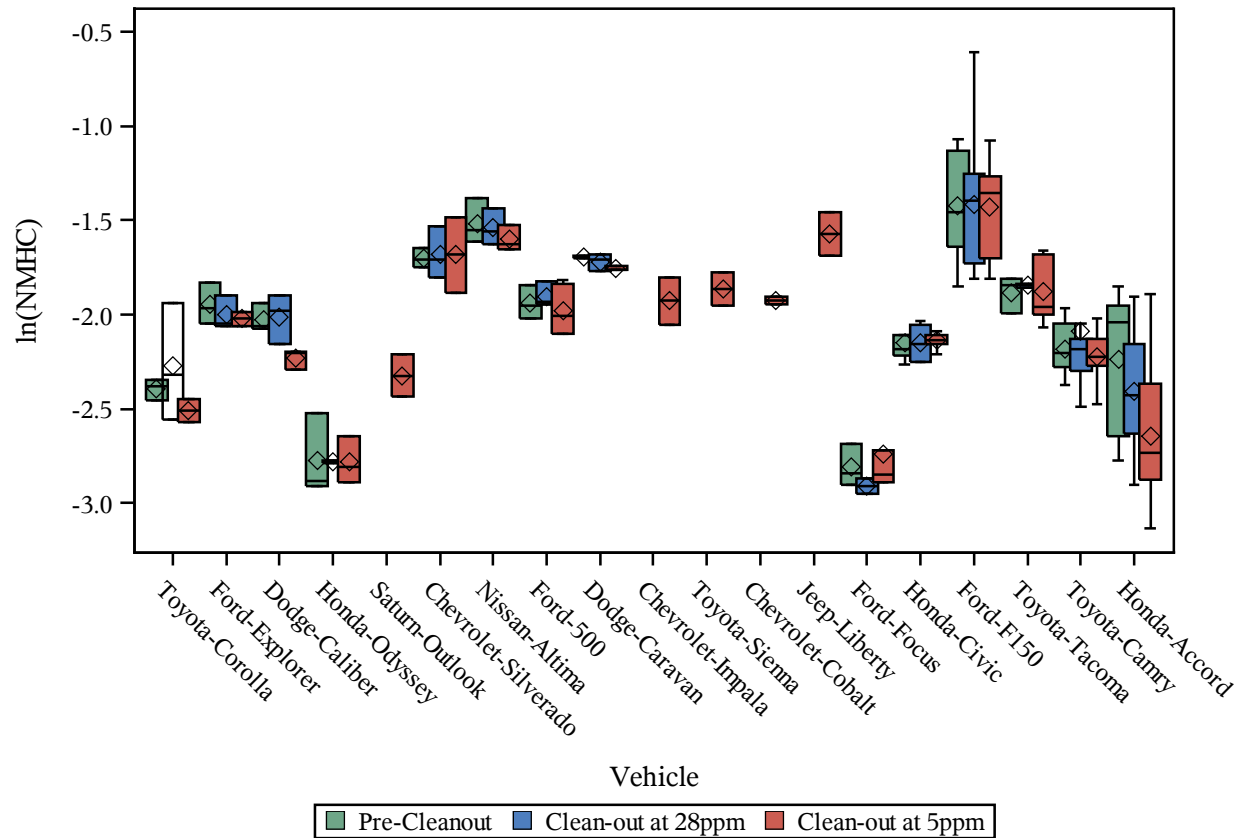
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (Wtd CO)



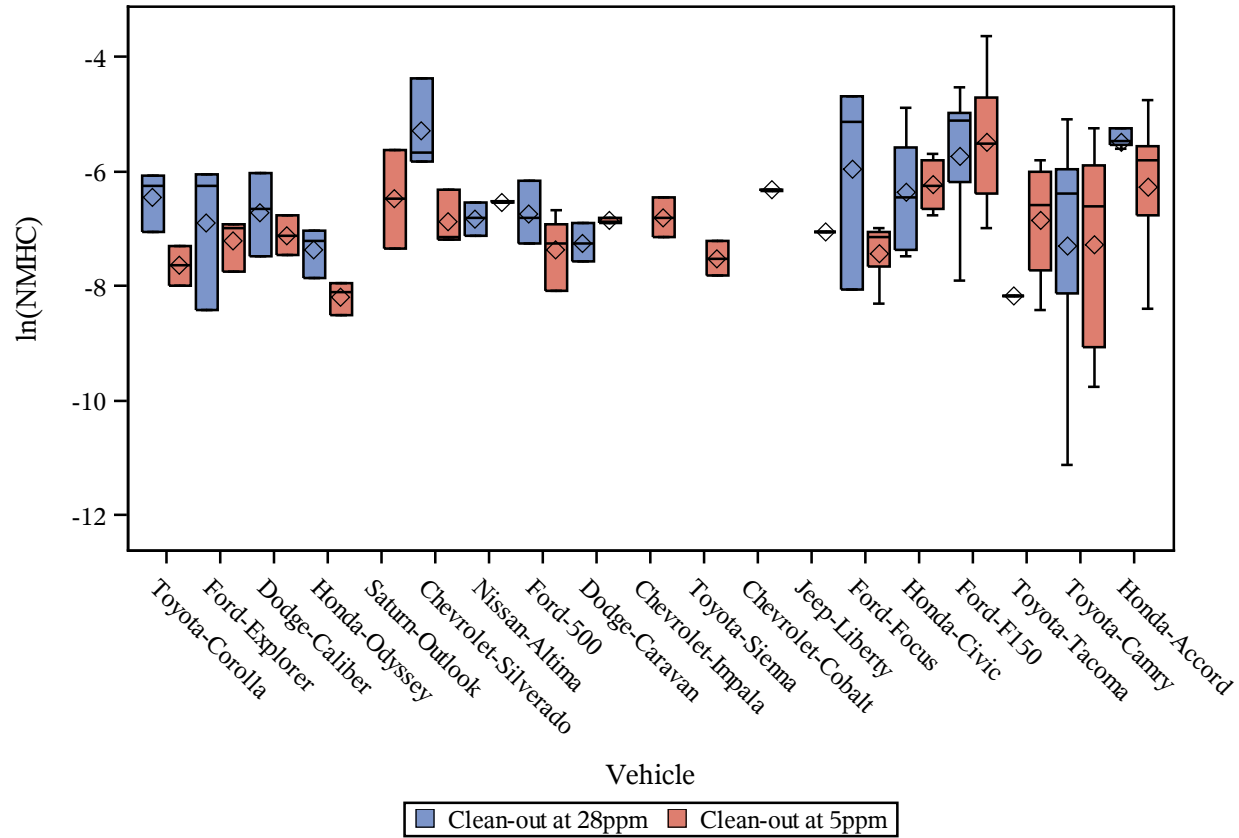
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(NMHC Bag 1)



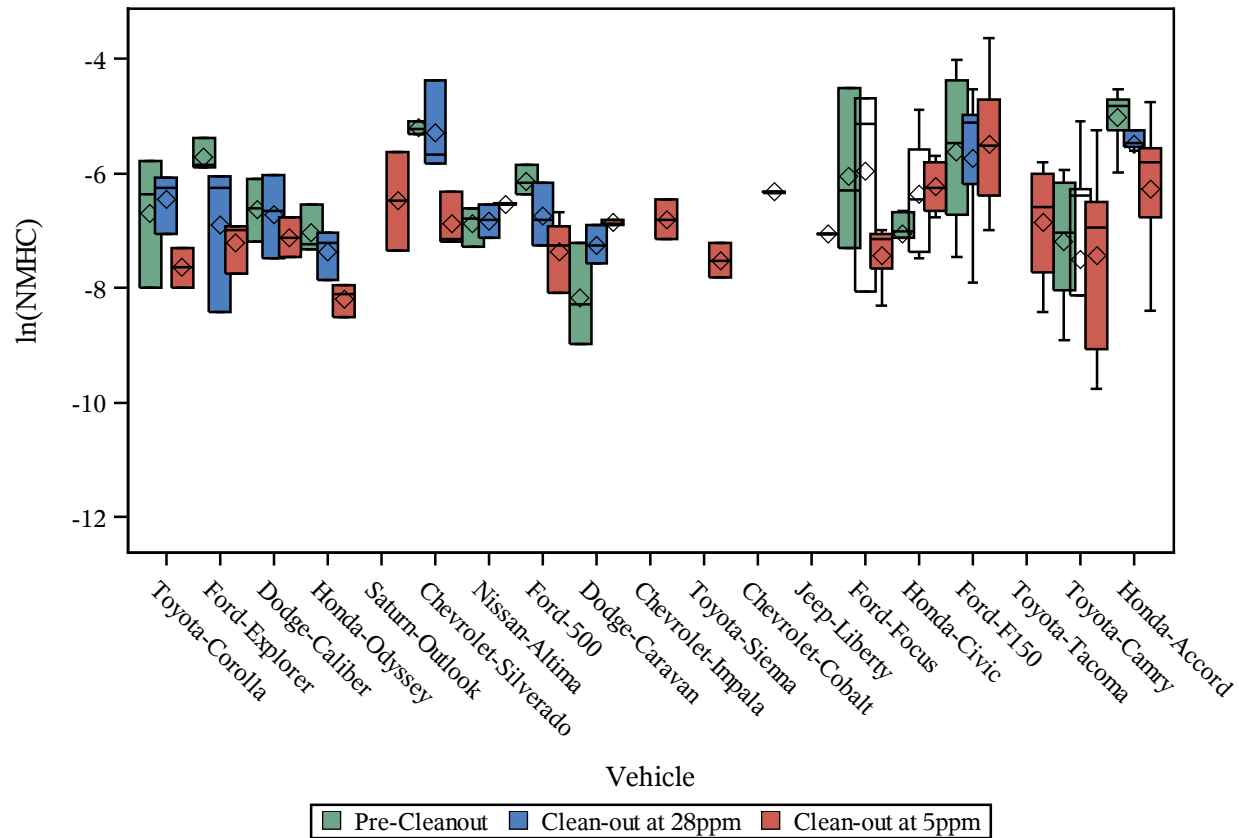
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NMHC Bag 1)



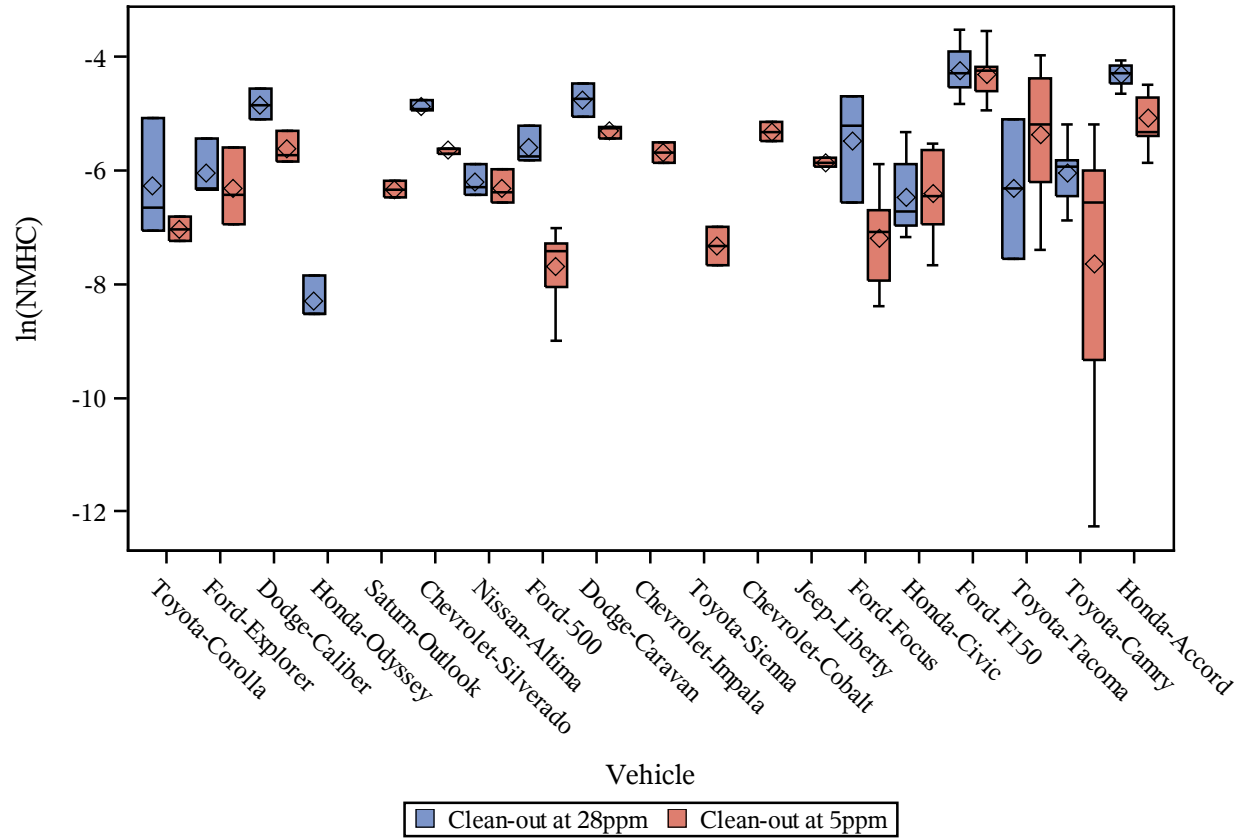
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(NMHC Bag 2)



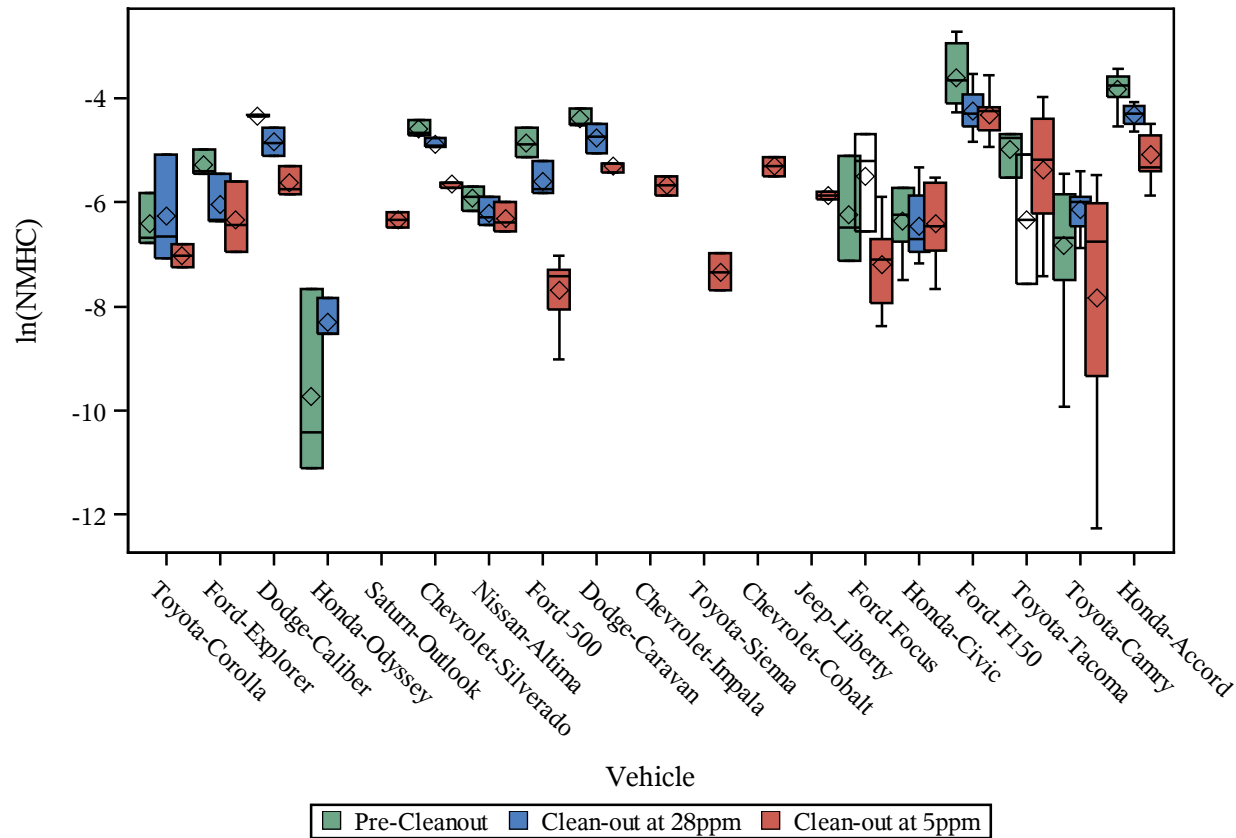
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NMHC Bag 2)



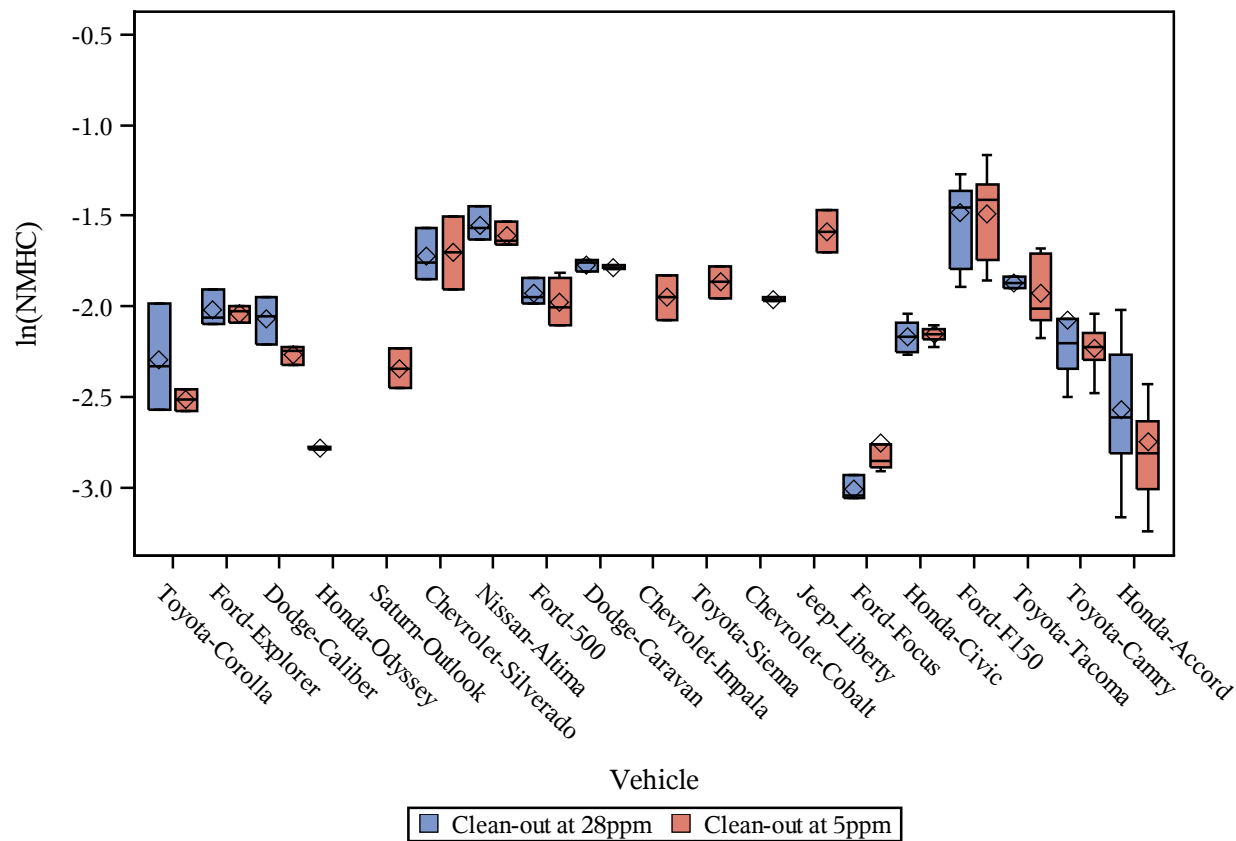
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(NMHC Bag 3)



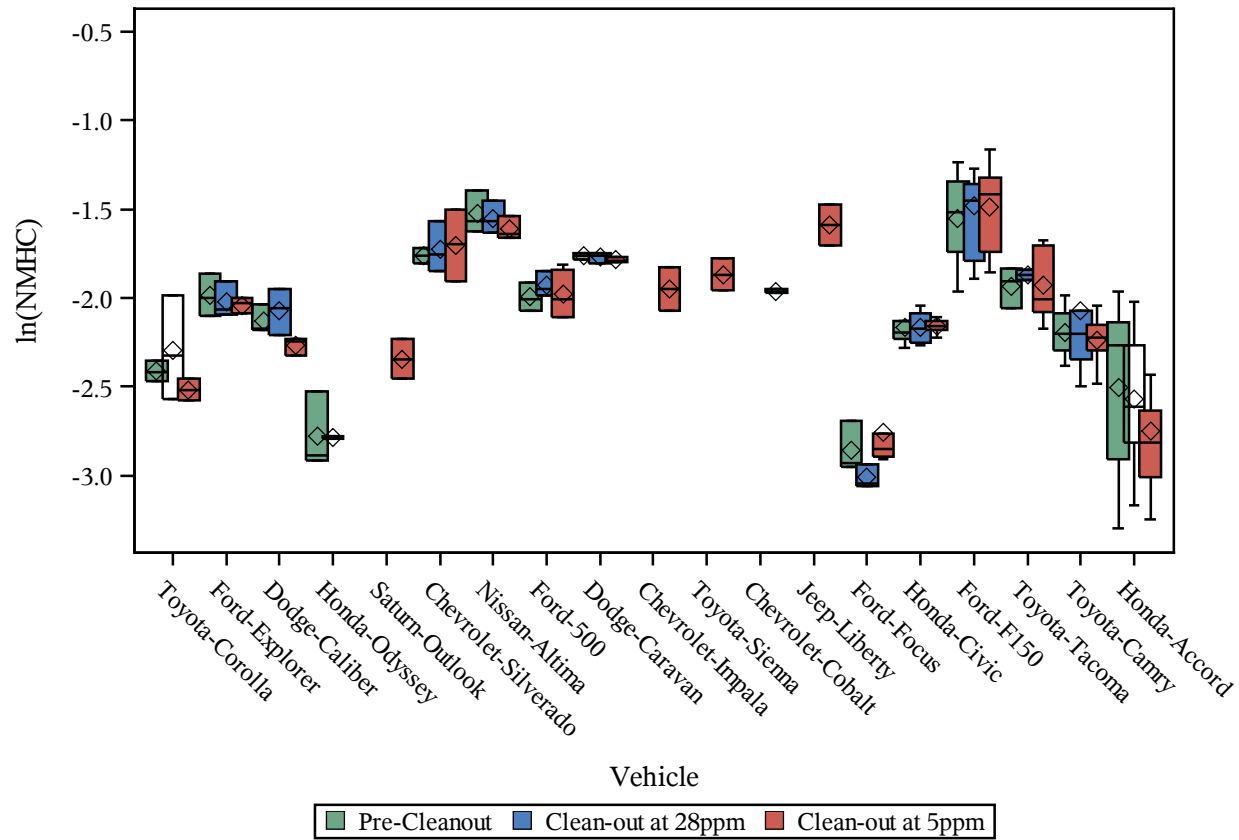
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NMHC Bag 3)



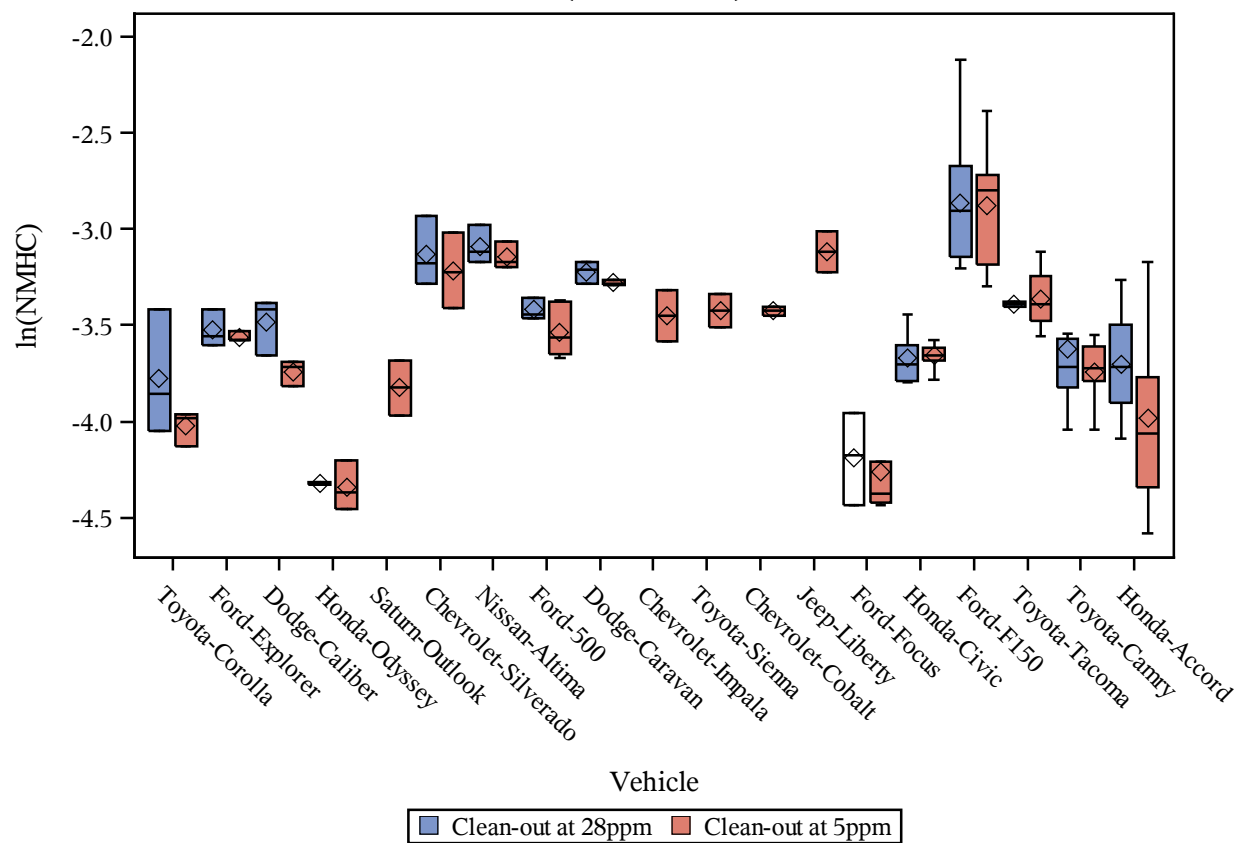
Box plot of vehicle family emissions by clean-out sulfur level at 28ppm and 5ppm
(NMHC Bag1-Bag3)



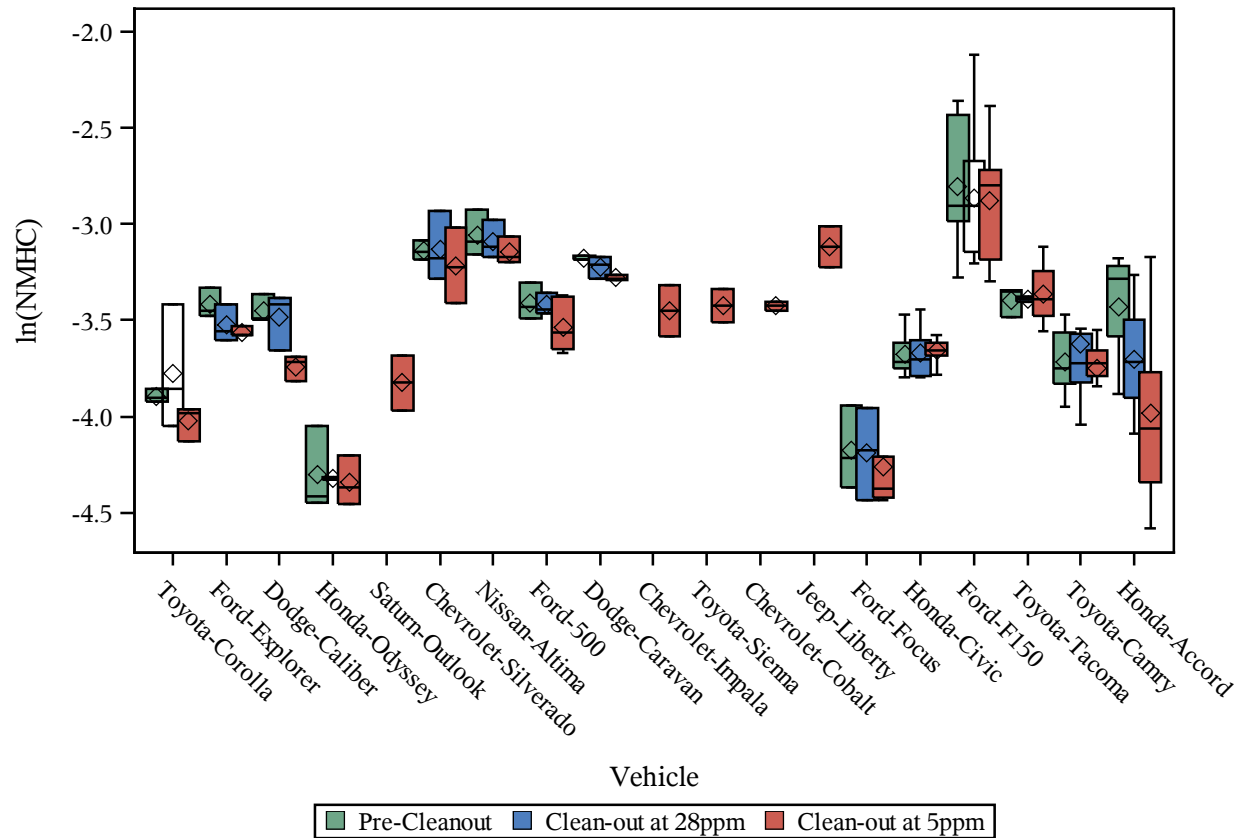
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (NMHC Bag1-Bag3)



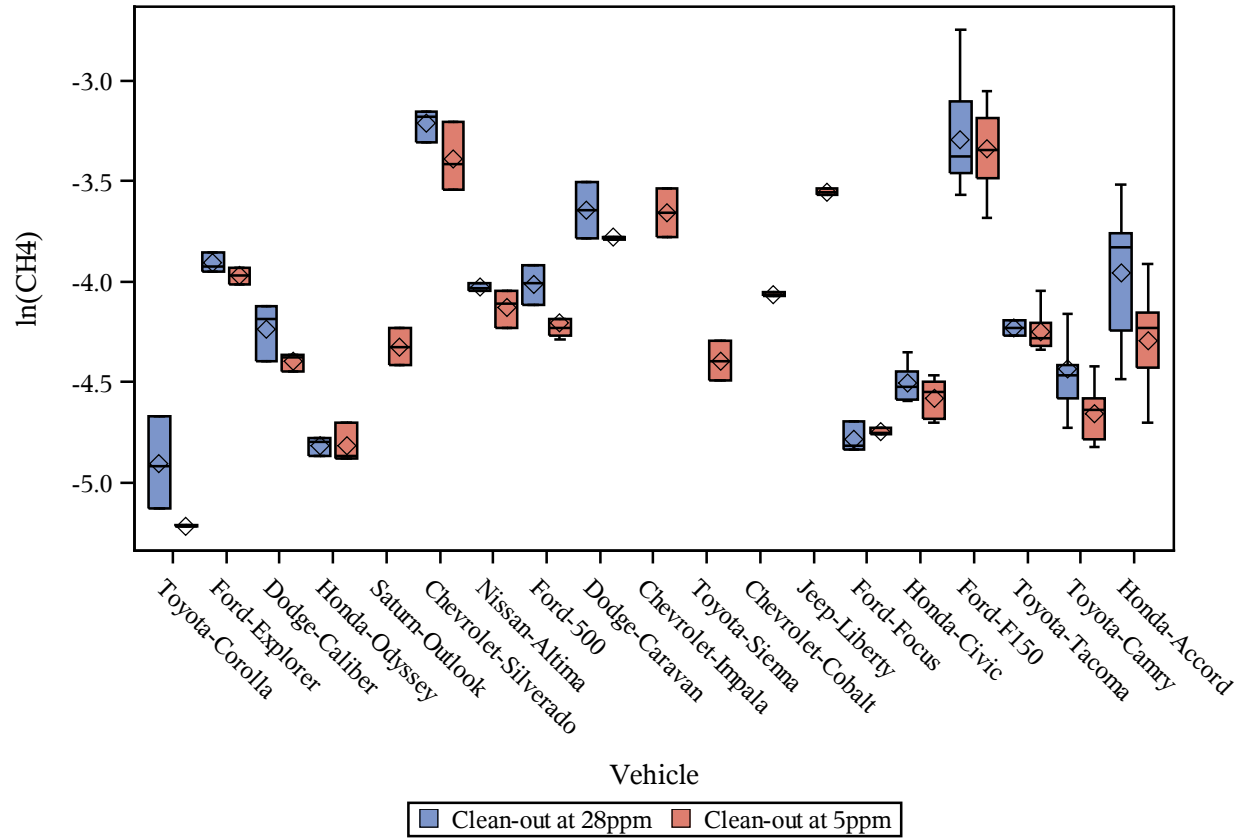
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(Wtd NMHC)



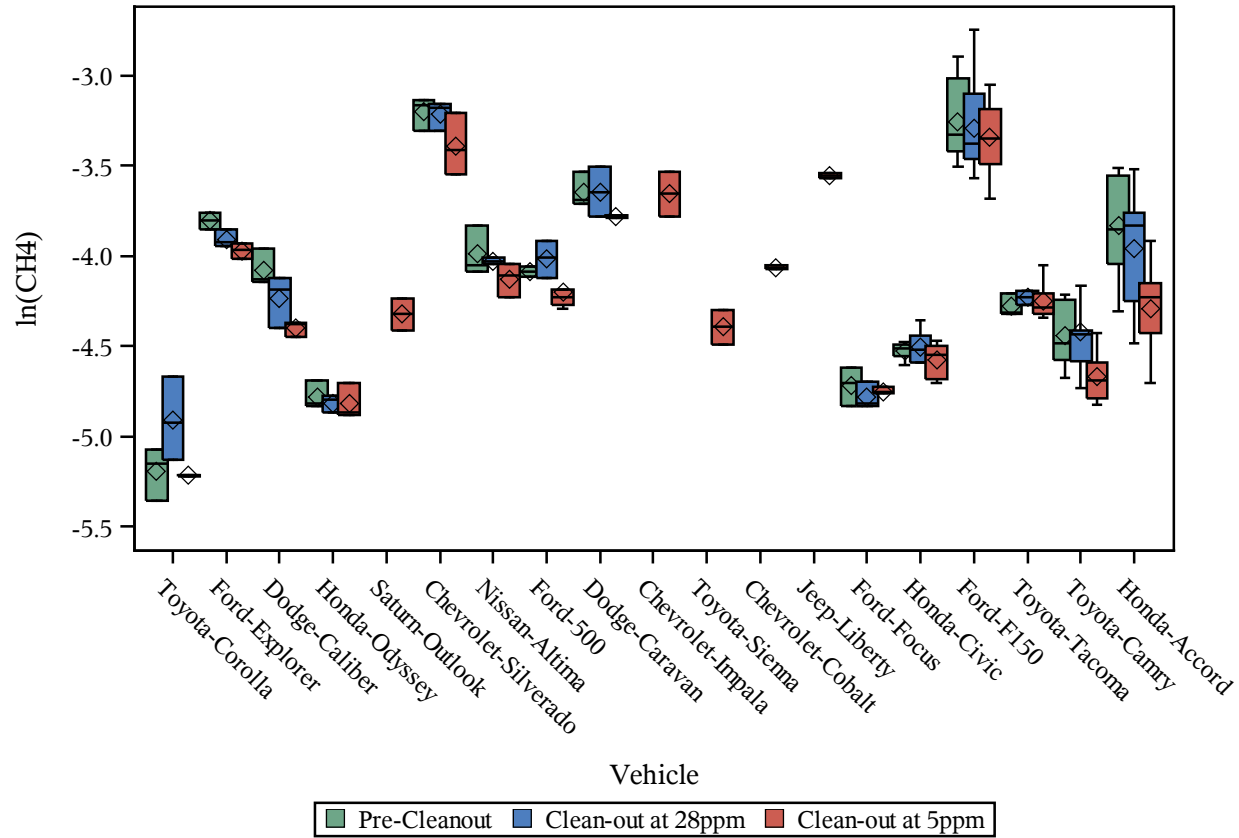
Box plot of vehicle families by pre-cleanout and post-cleanout
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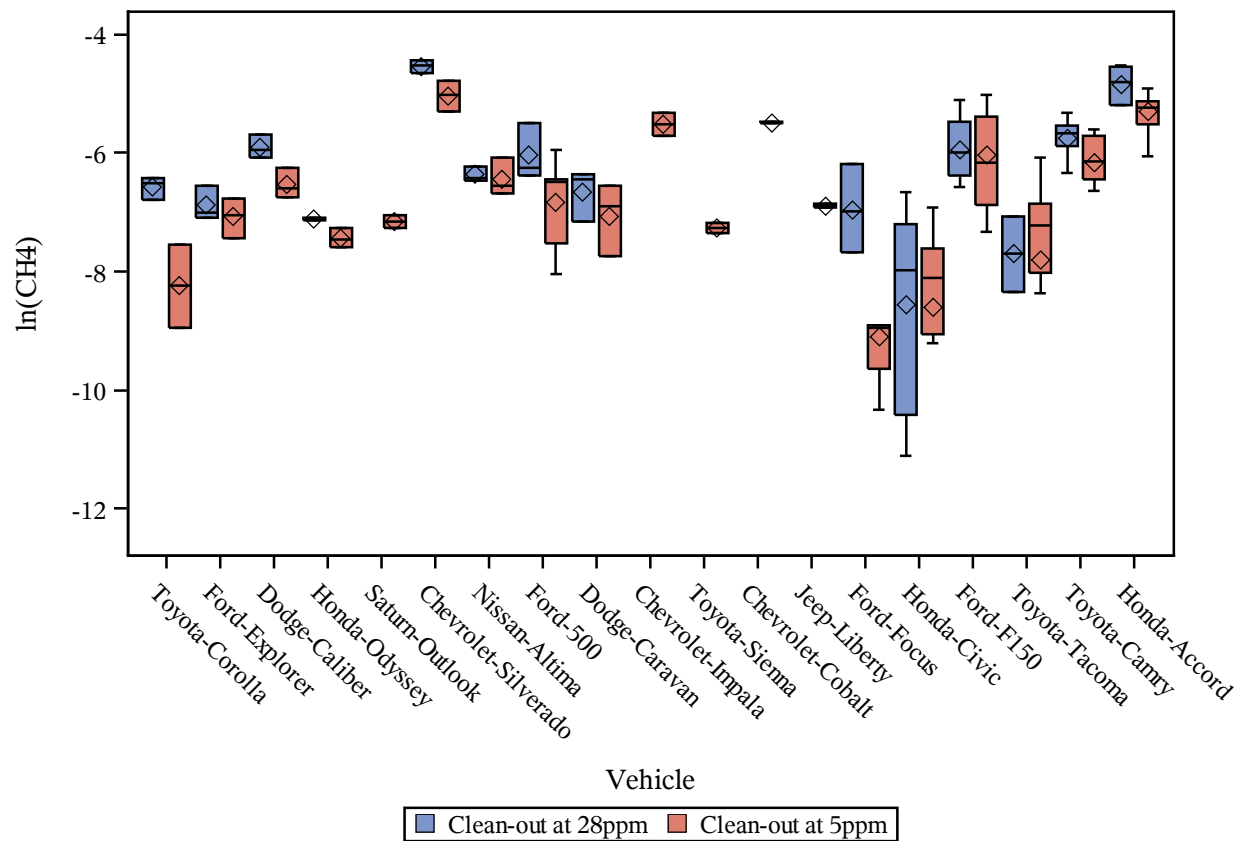
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(CH4 Bag 1)



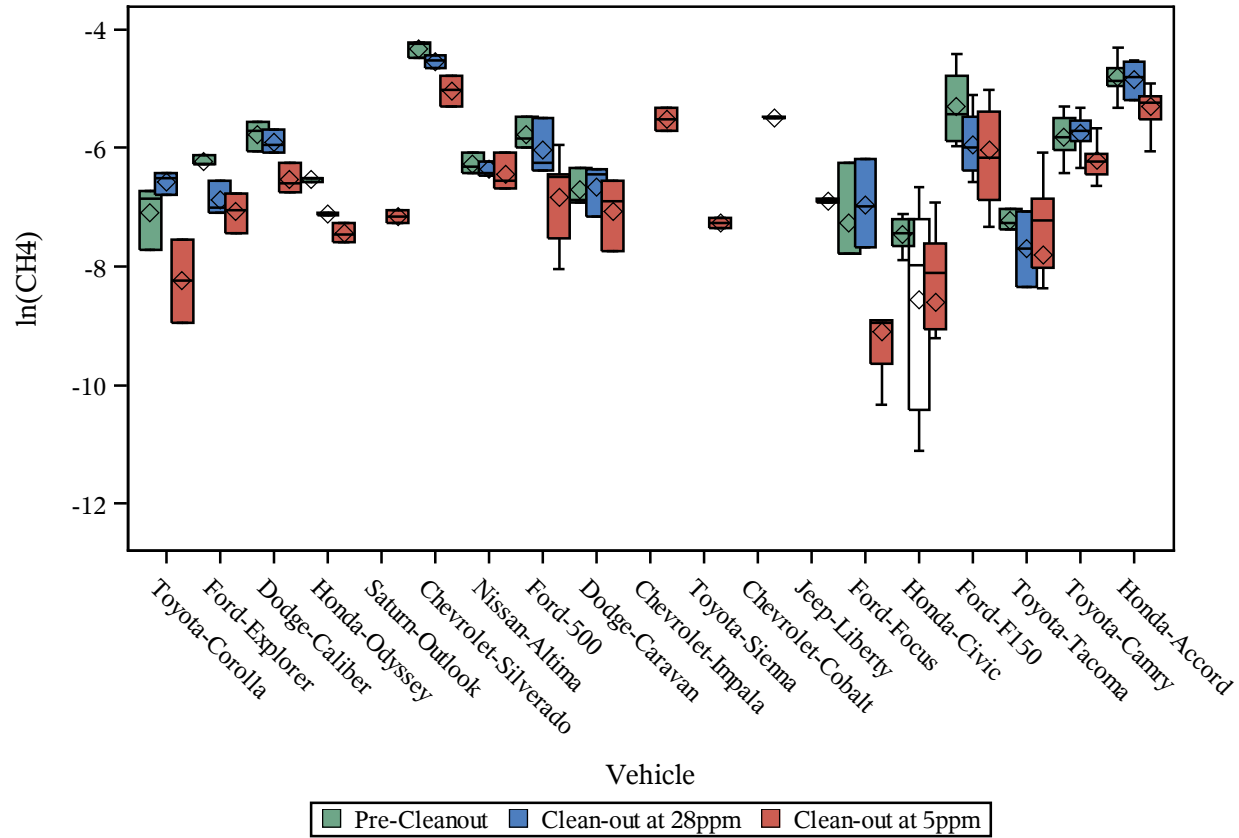
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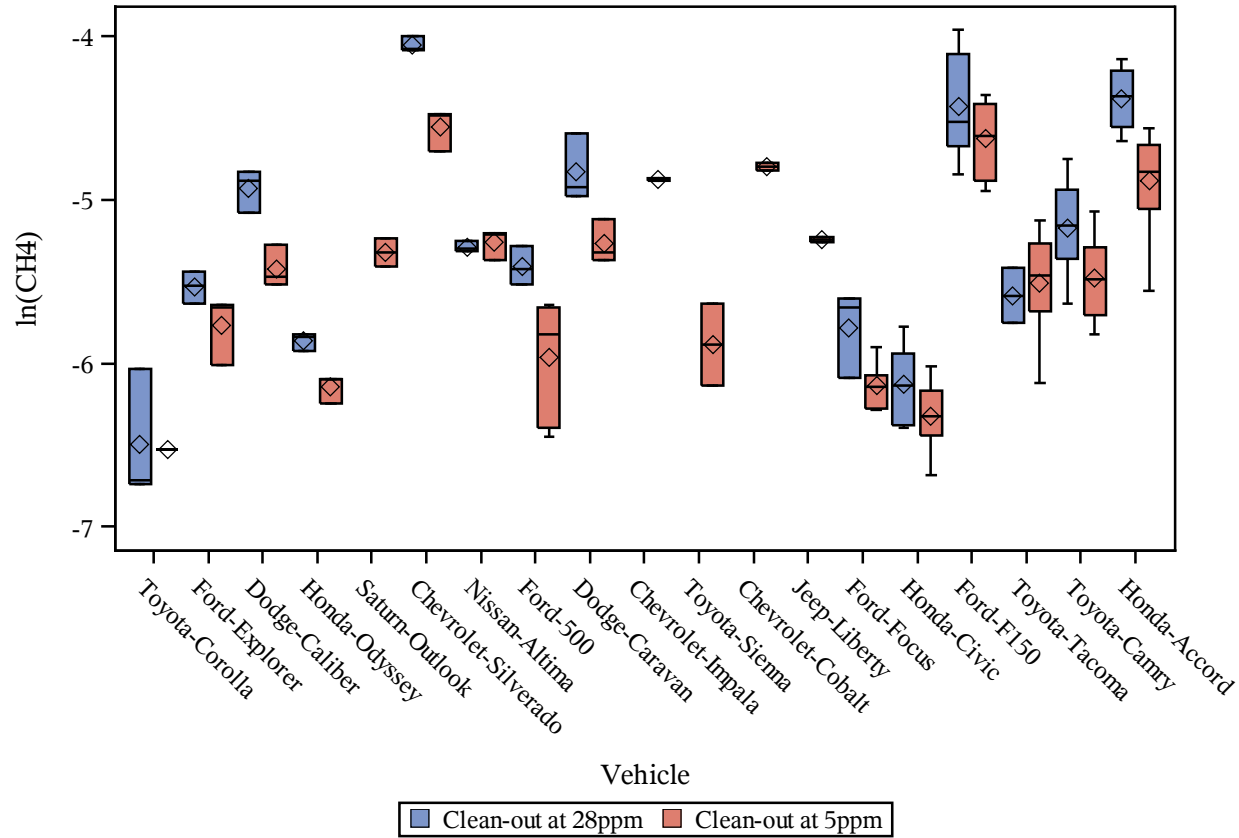
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(CH4 Bag 2)



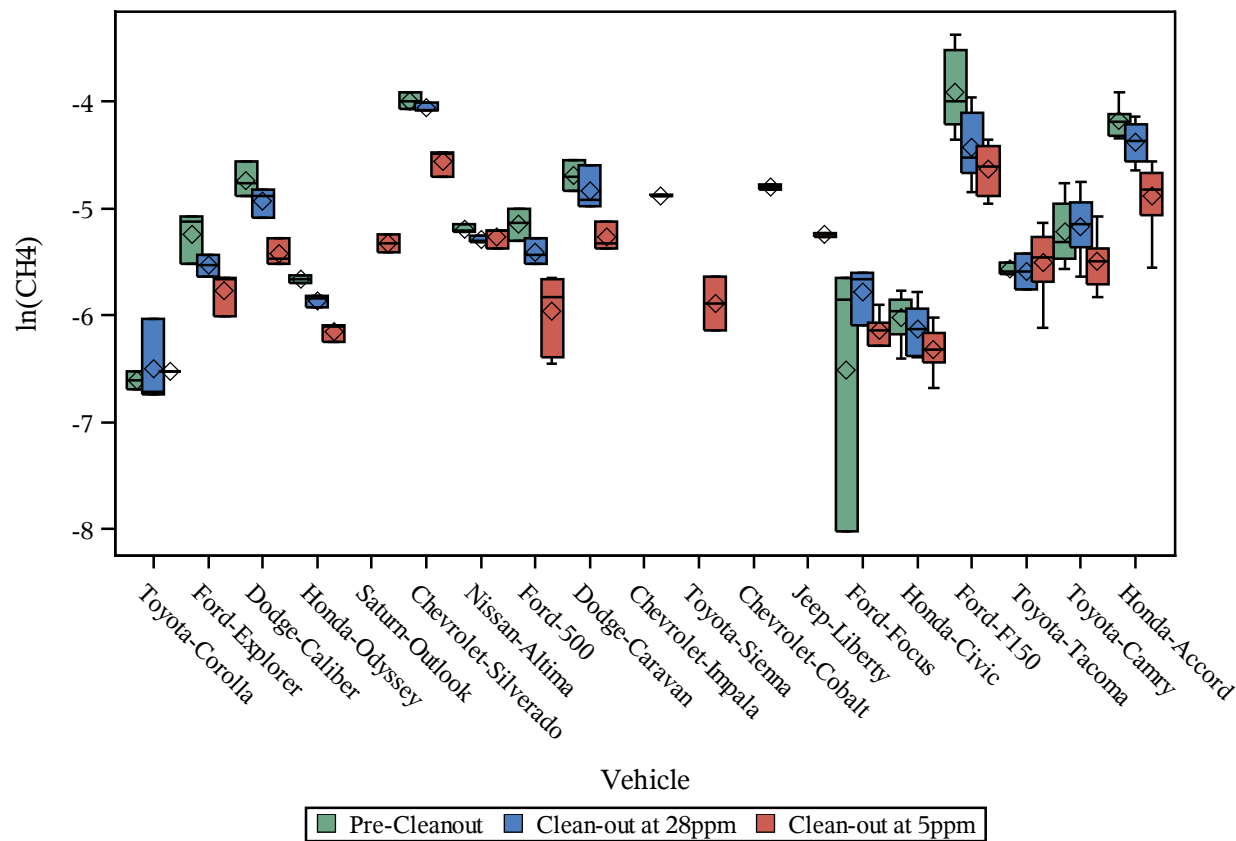
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CH4 Bag 2)



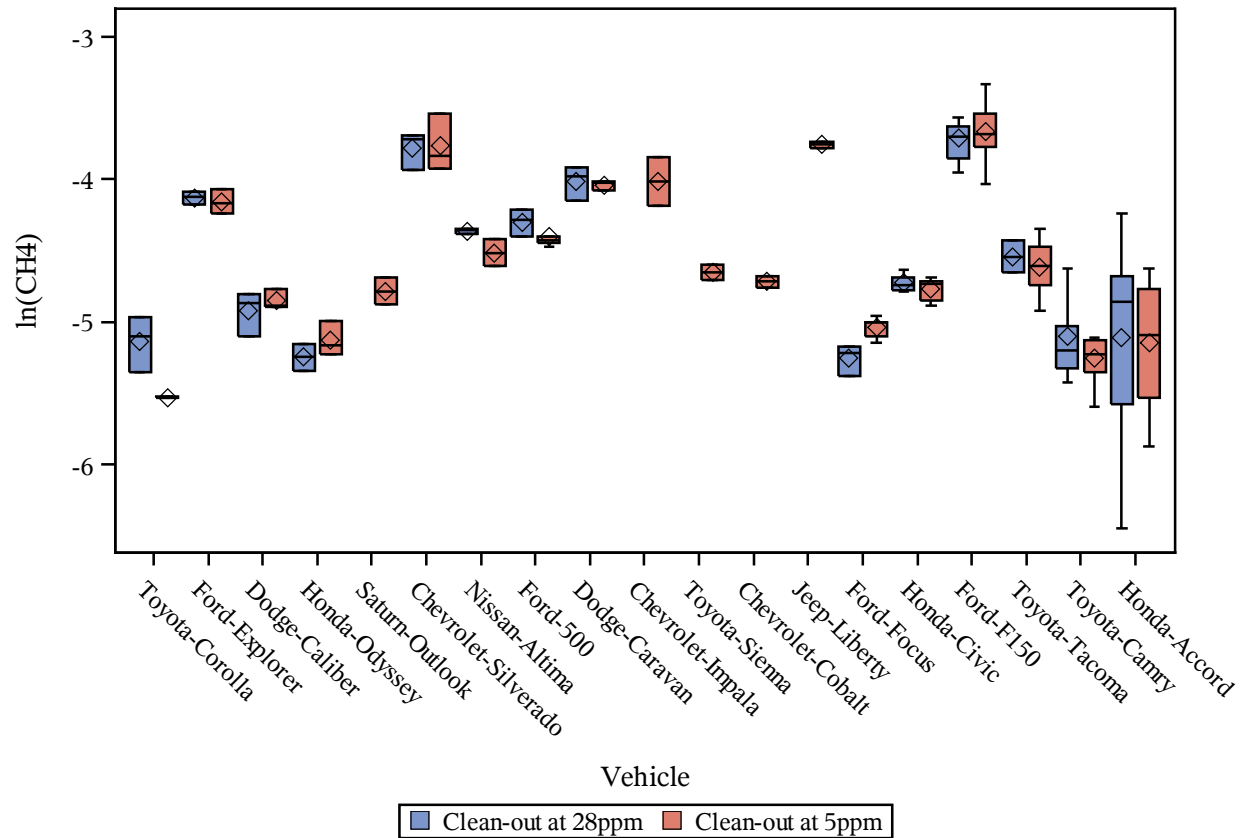
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(CH₄ Bag 3)



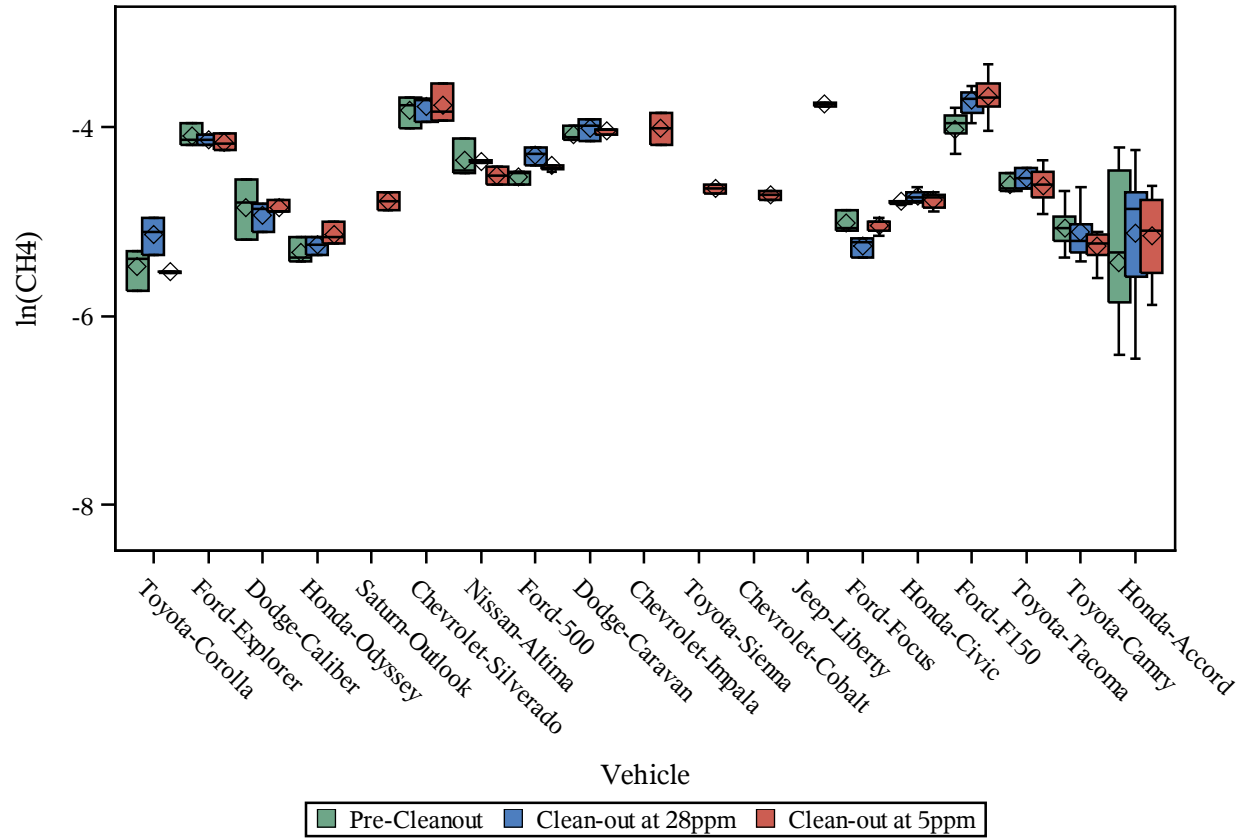
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CH4 Bag 3)



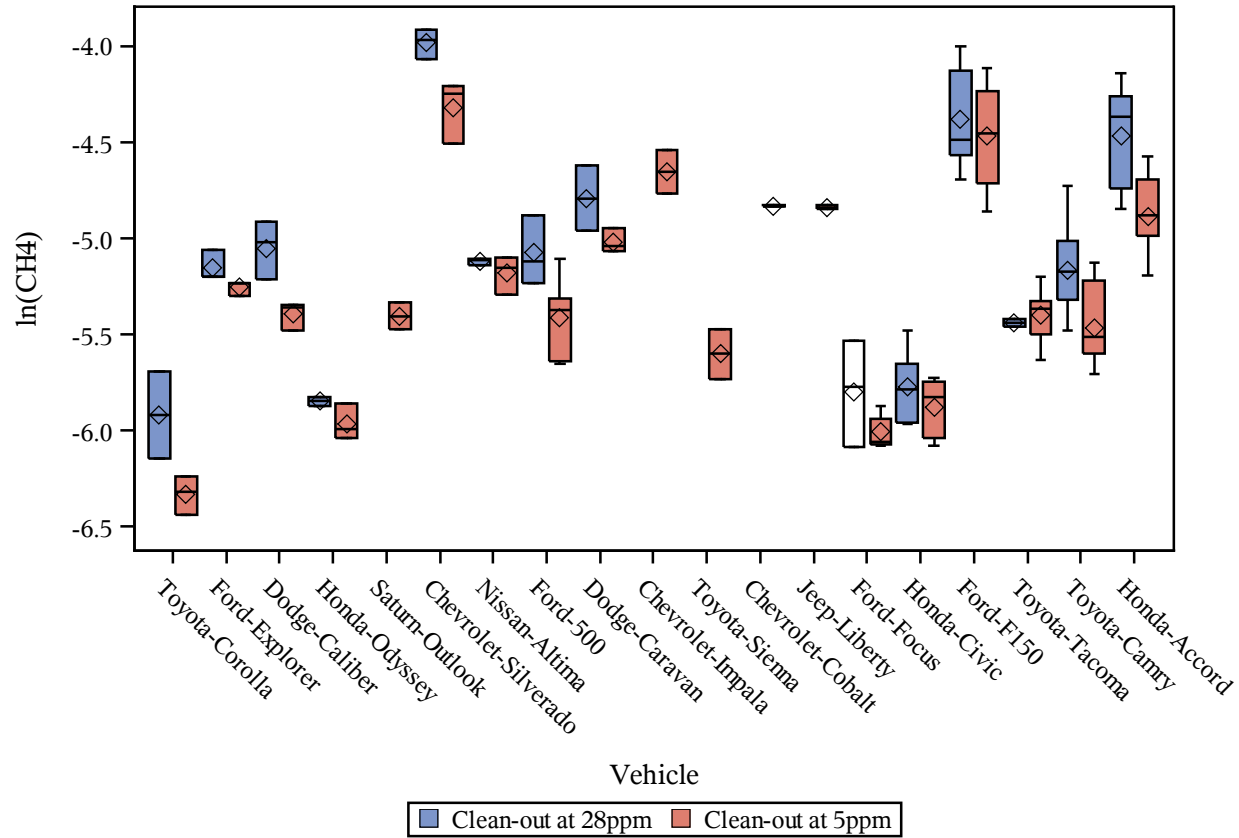
Box plot of vehicle family emissions by clean-out sulfur level at 28ppm and 5ppm
(CH4 Bag1-Bag3)



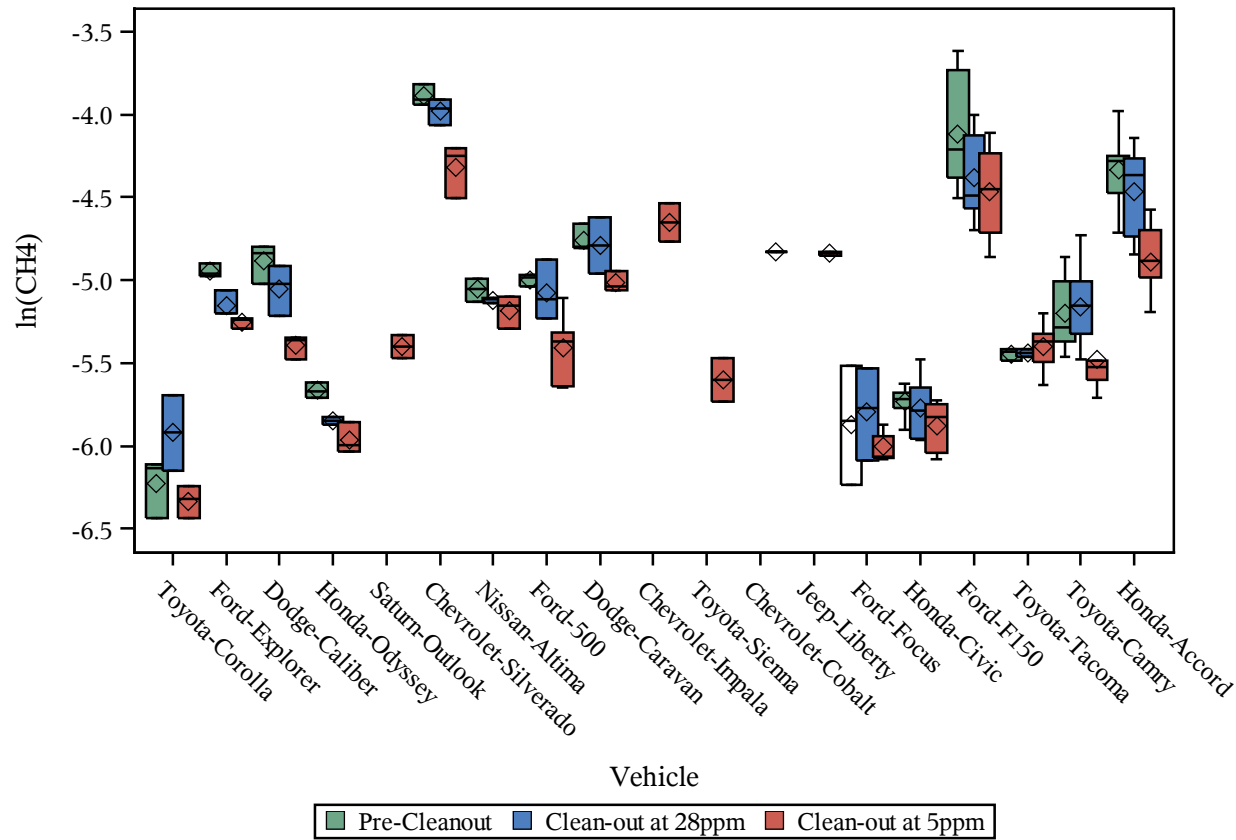
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (CH4 Bag1-Bag3)



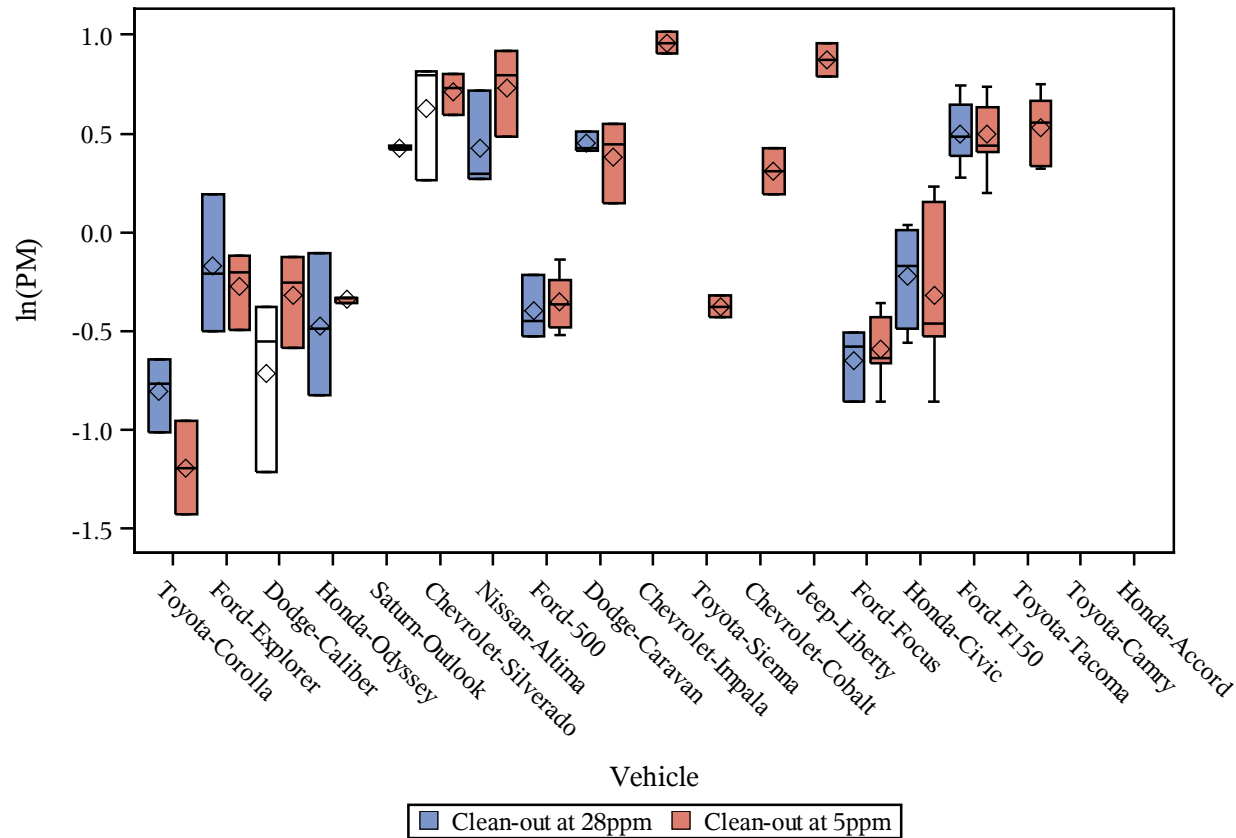
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(Wtd CH₄)



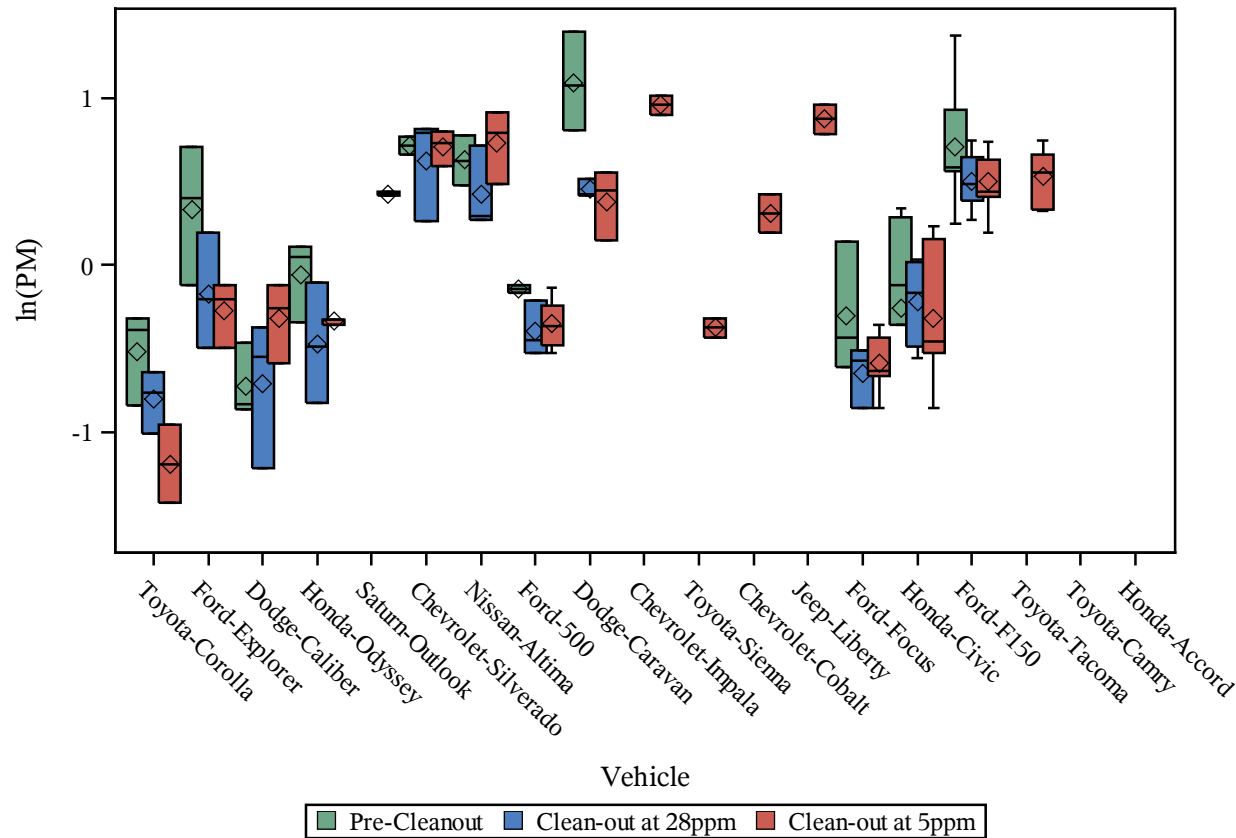
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (Wtd CH4)



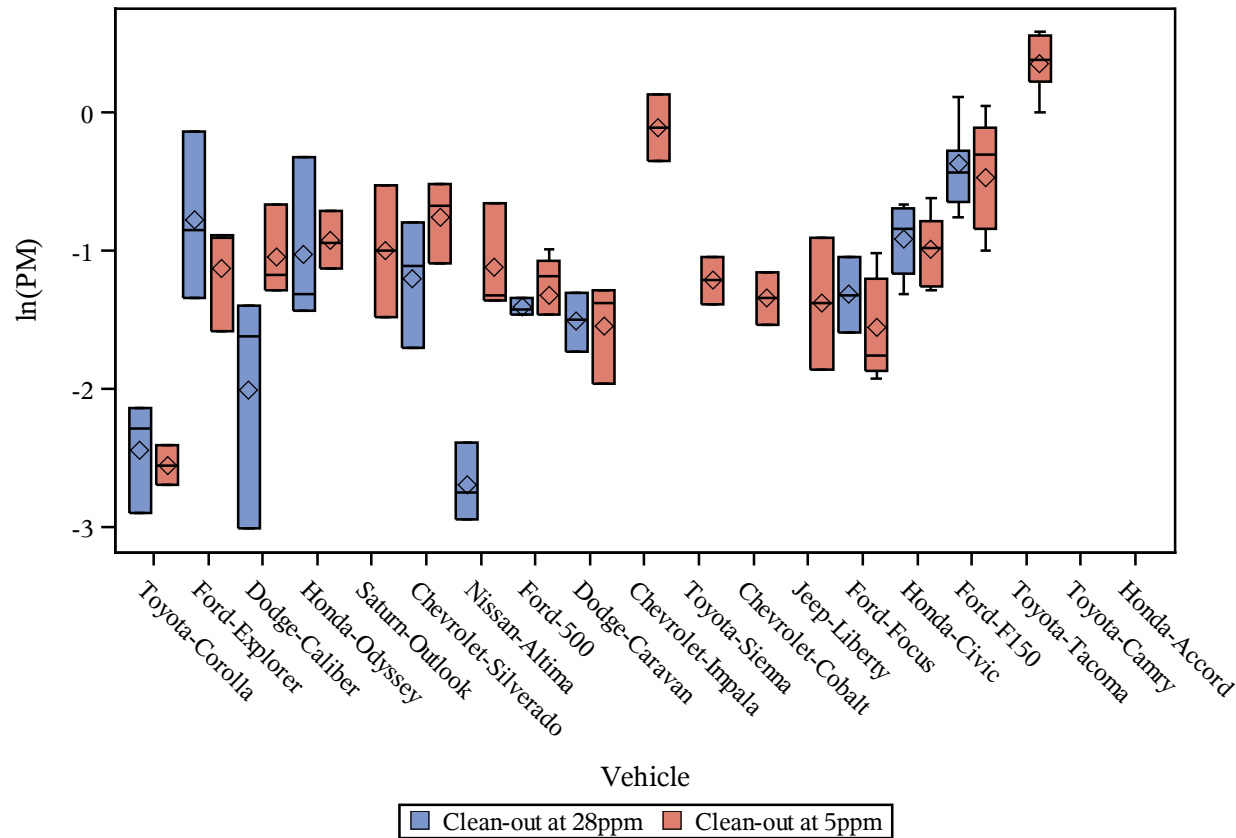
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(PM Bag 1)



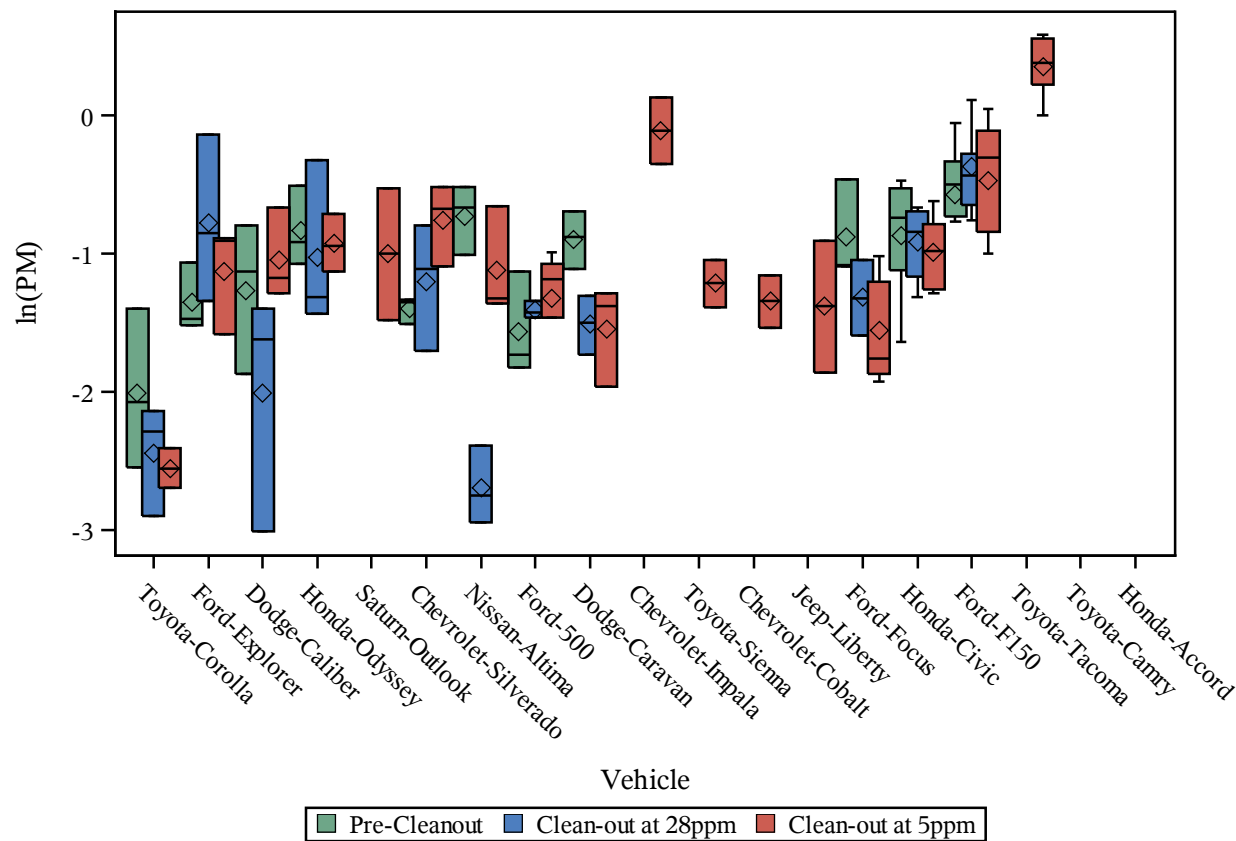
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (PM Bag 1)



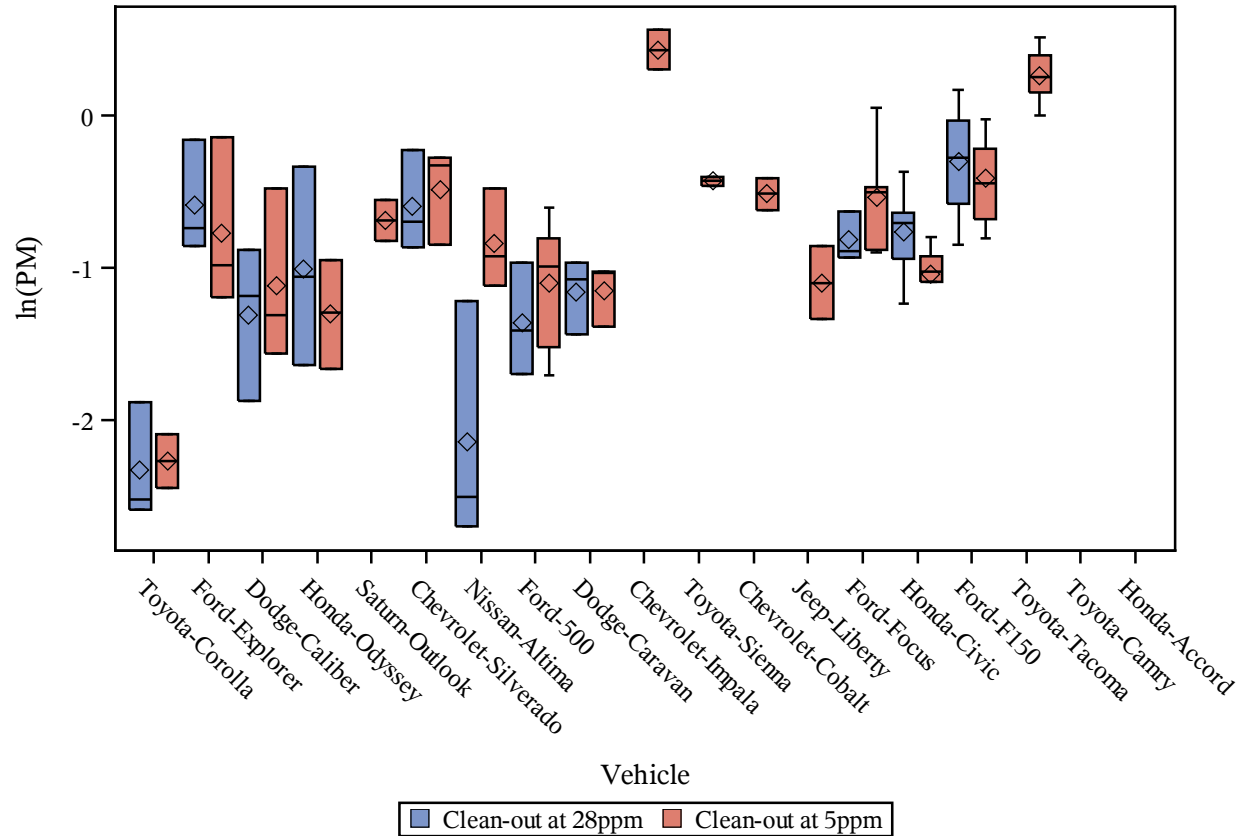
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(PM Bag 2)



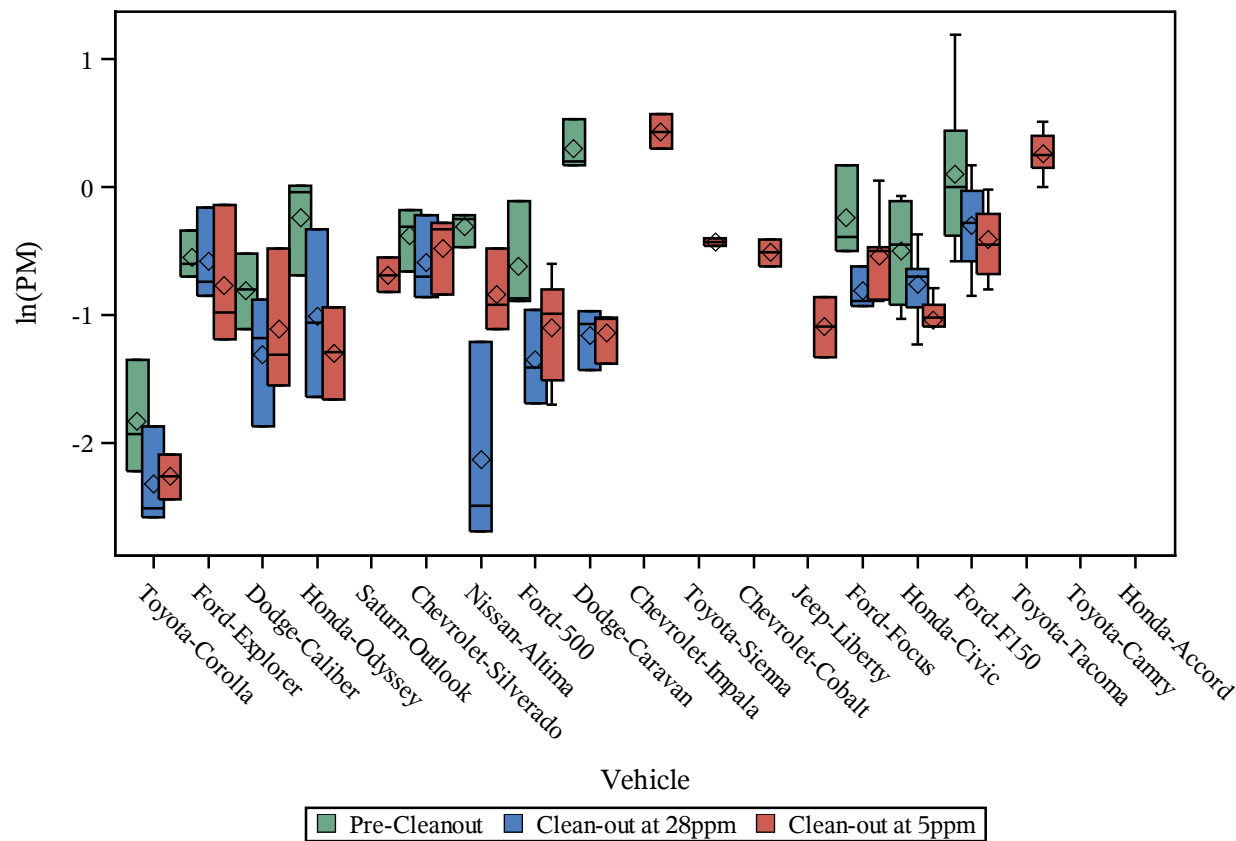
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (PM Bag 2)



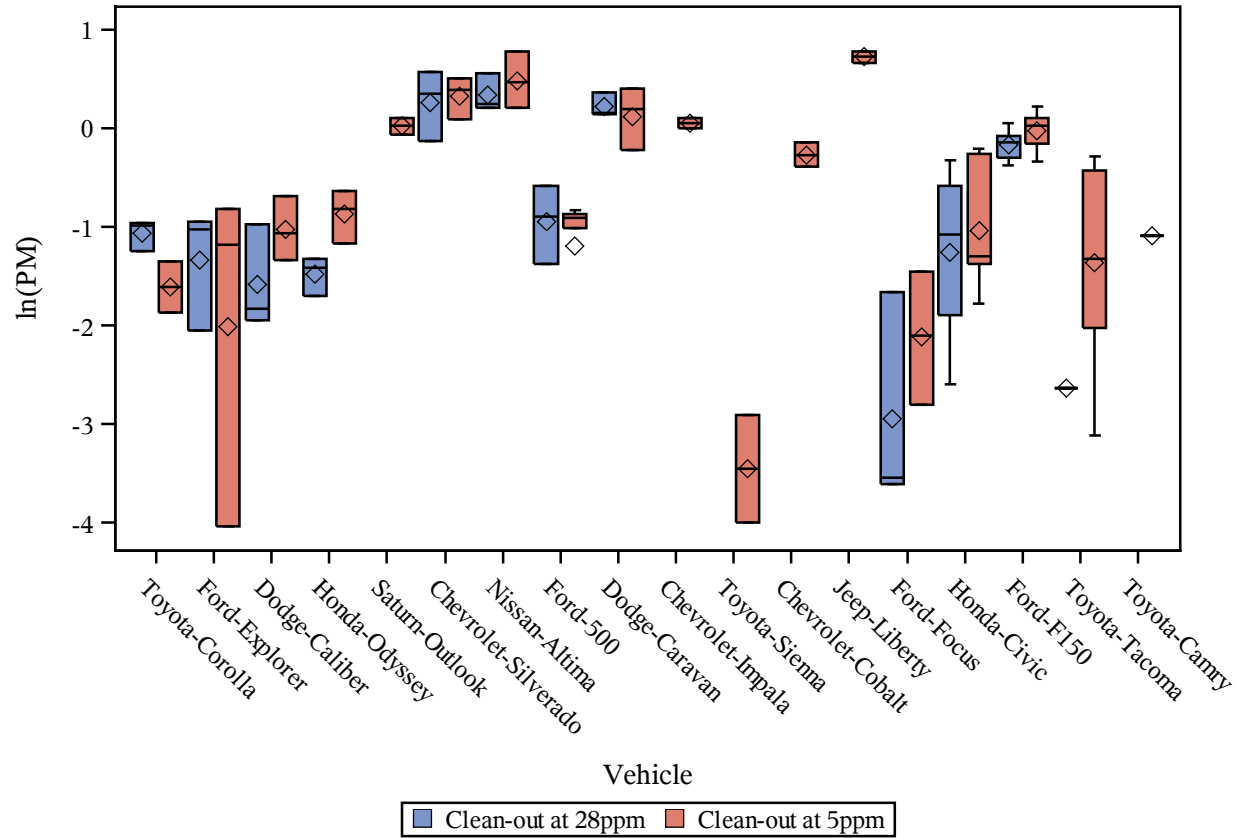
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(PM Bag 3)



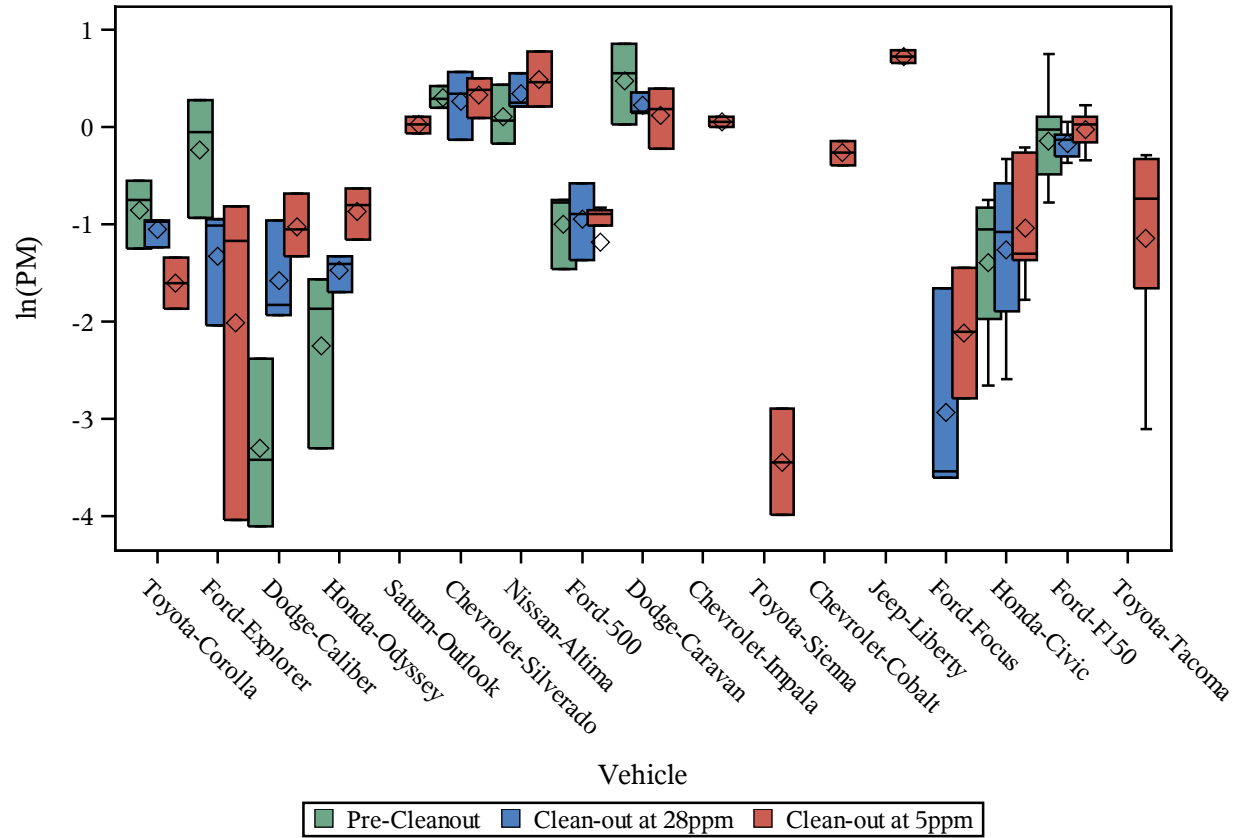
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (PM Bag 3)



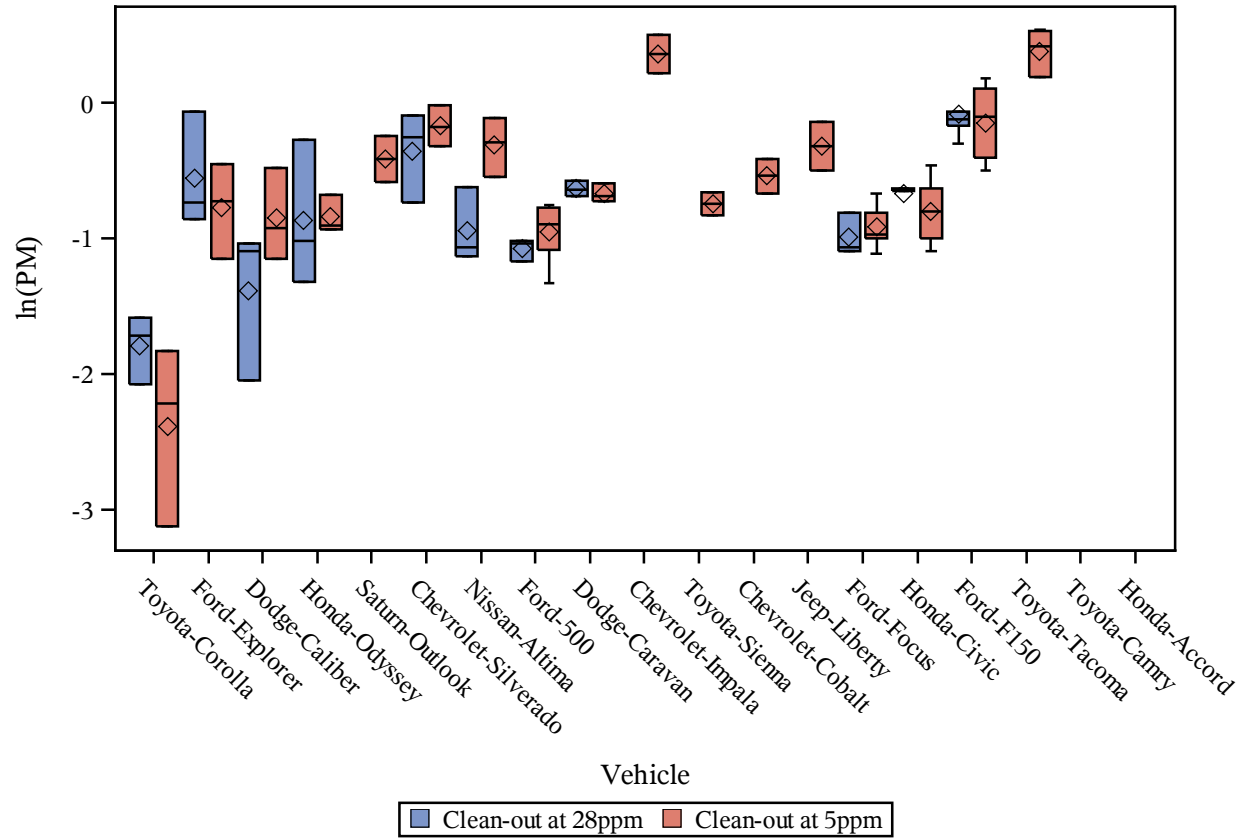
Box plot of vehicle family emissions by clean-out sulfur level at 28ppm and 5ppm
(PM Bag1-Bag3)



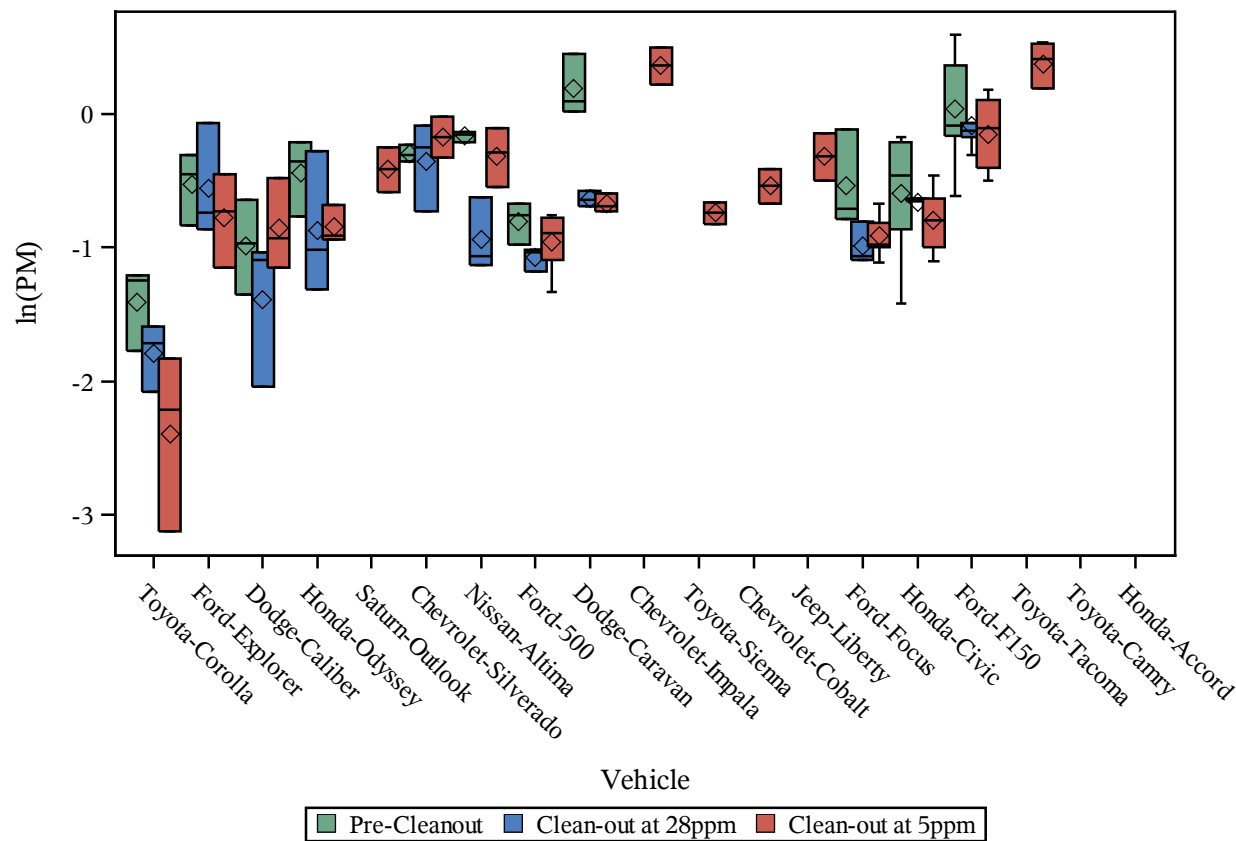
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (PM Bag1-Bag3)



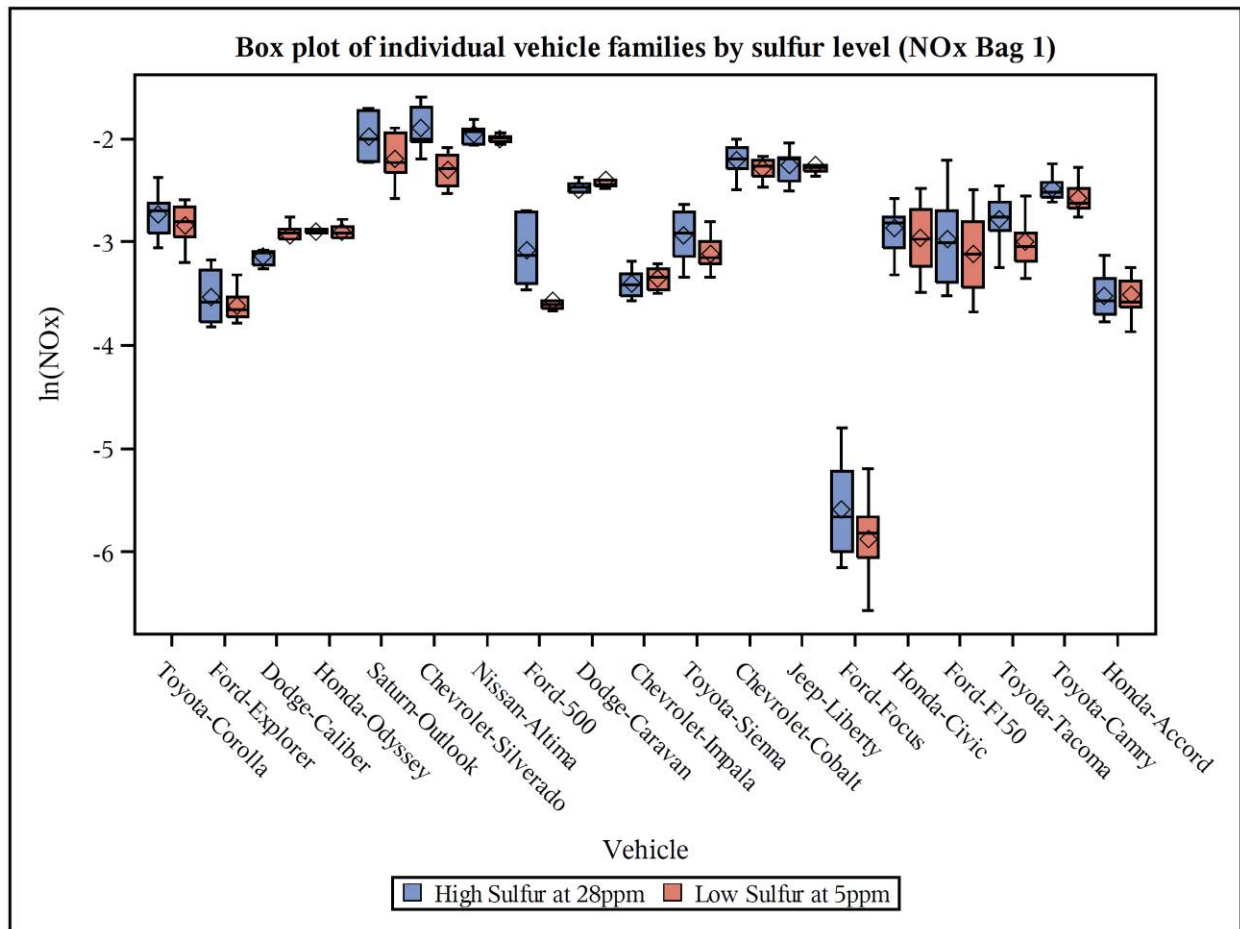
Box plot of vehicle families by clean-out sulfur level at 28ppm and 5ppm
(Wtd PM)



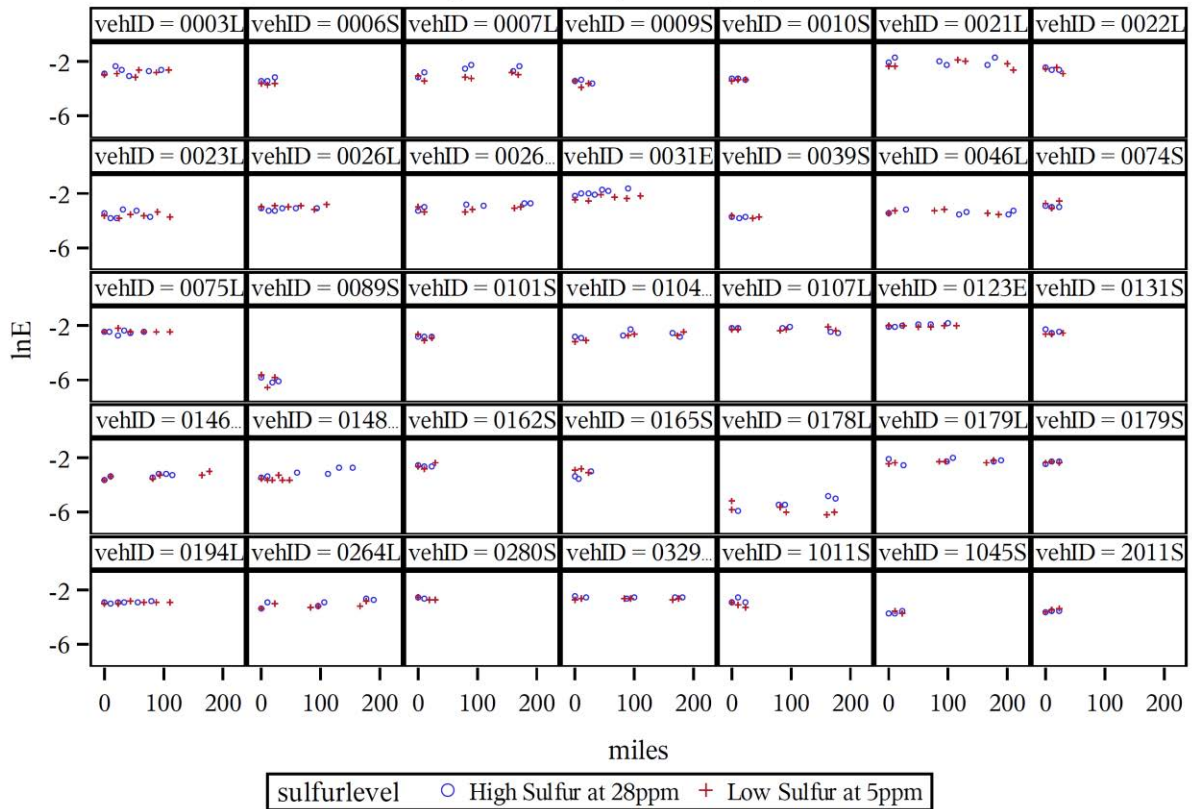
Box plot of vehicle families by pre-cleanout and post-cleanout
at 28ppm and 5ppm (Wtd PM)



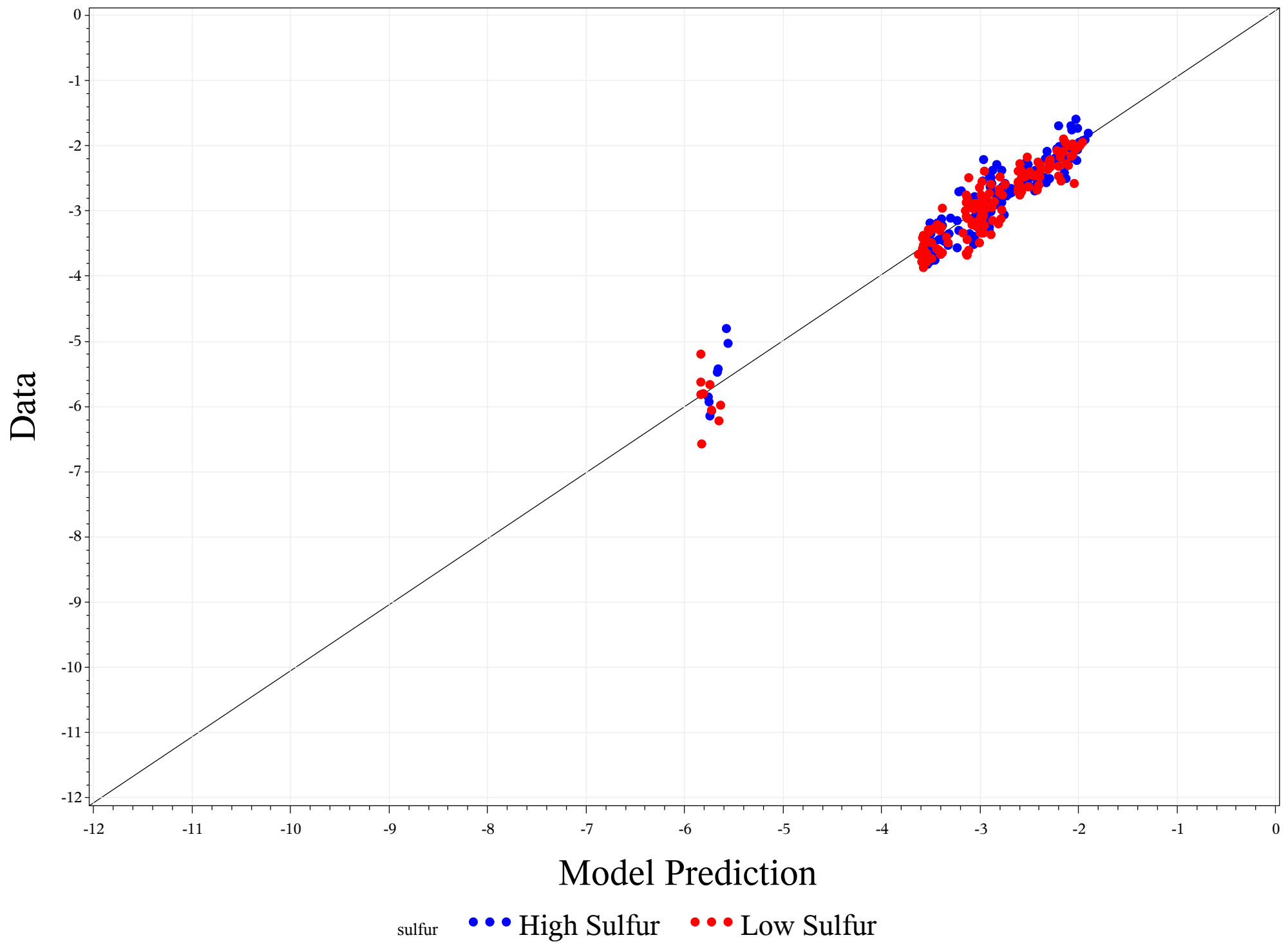
E.3. Effect of sulfur level



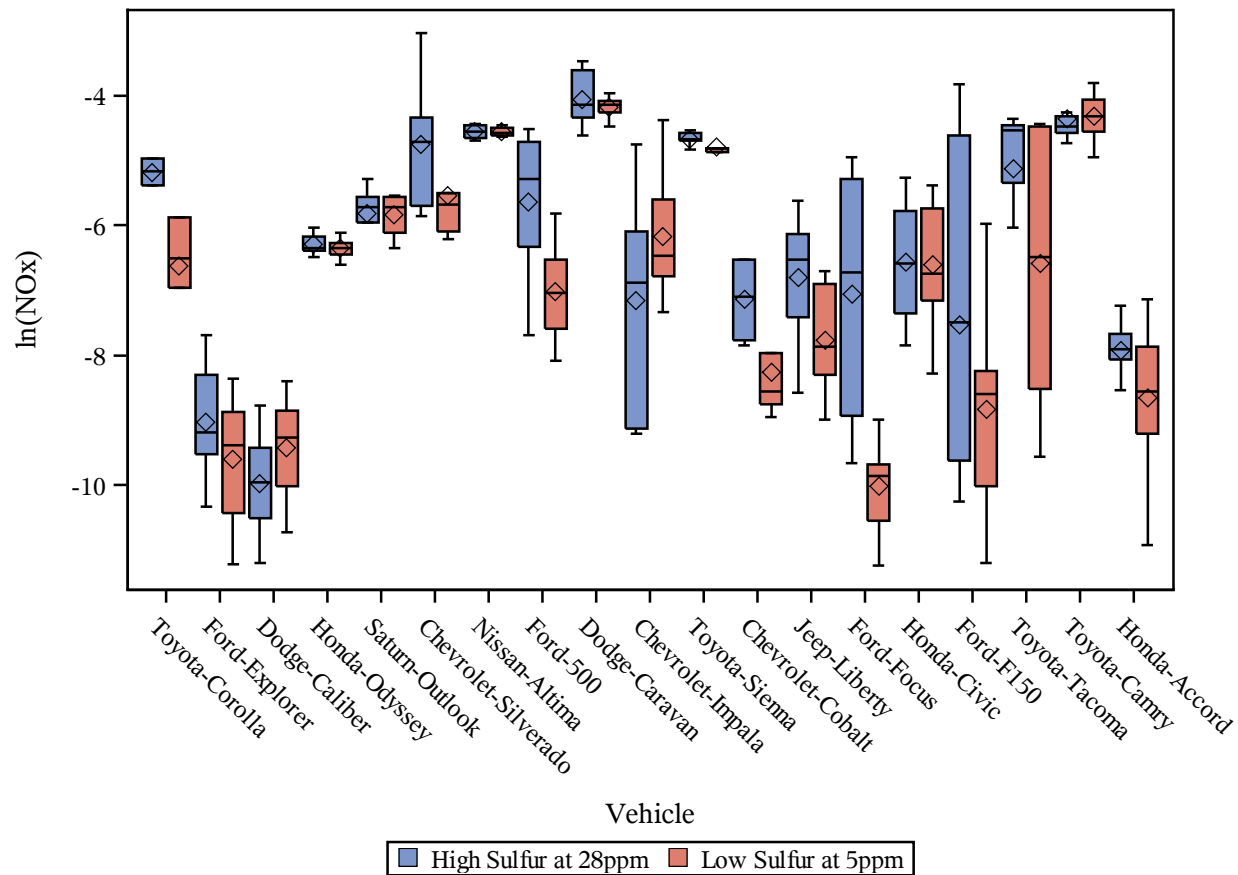
Log-transformed emissions from individual vehicles by sulfur level (NOx Bag 1)



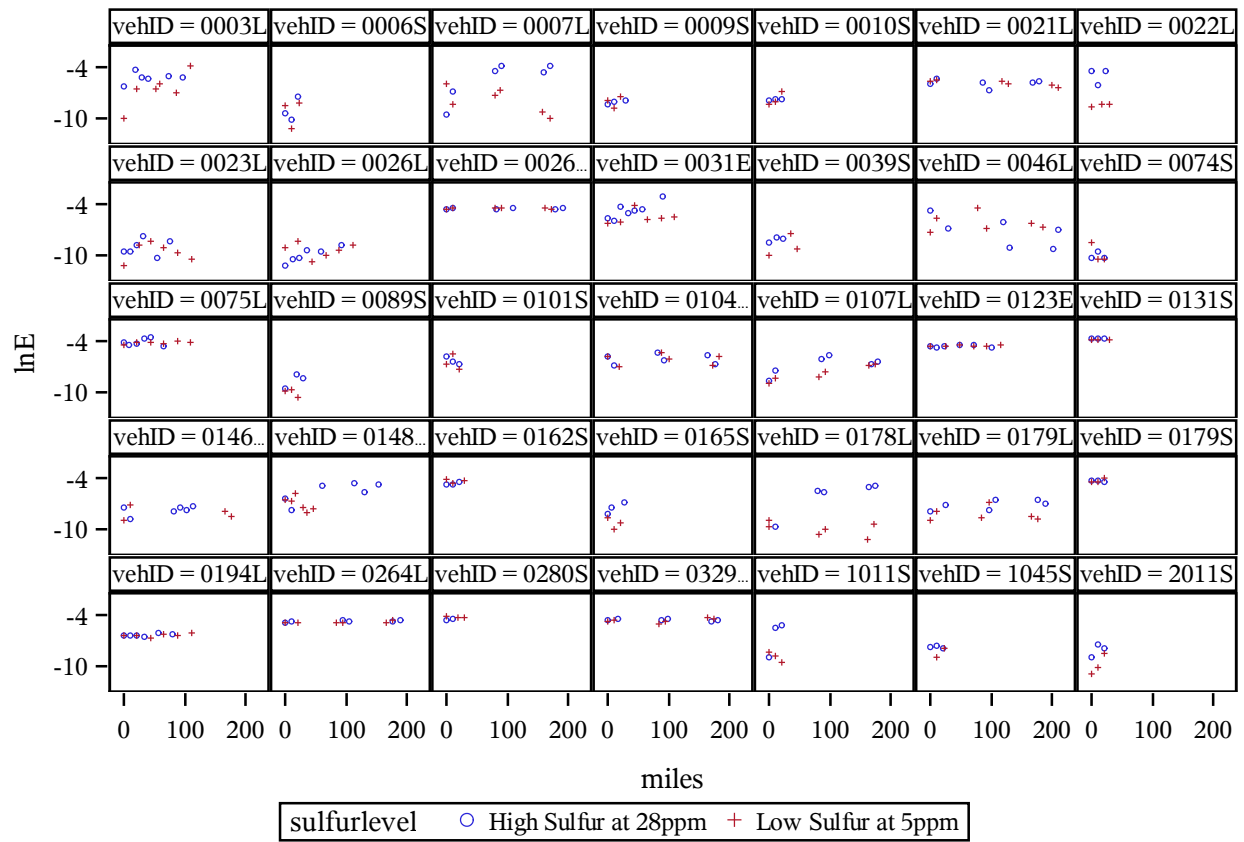
NOx Bag 1: Data vs Predicted



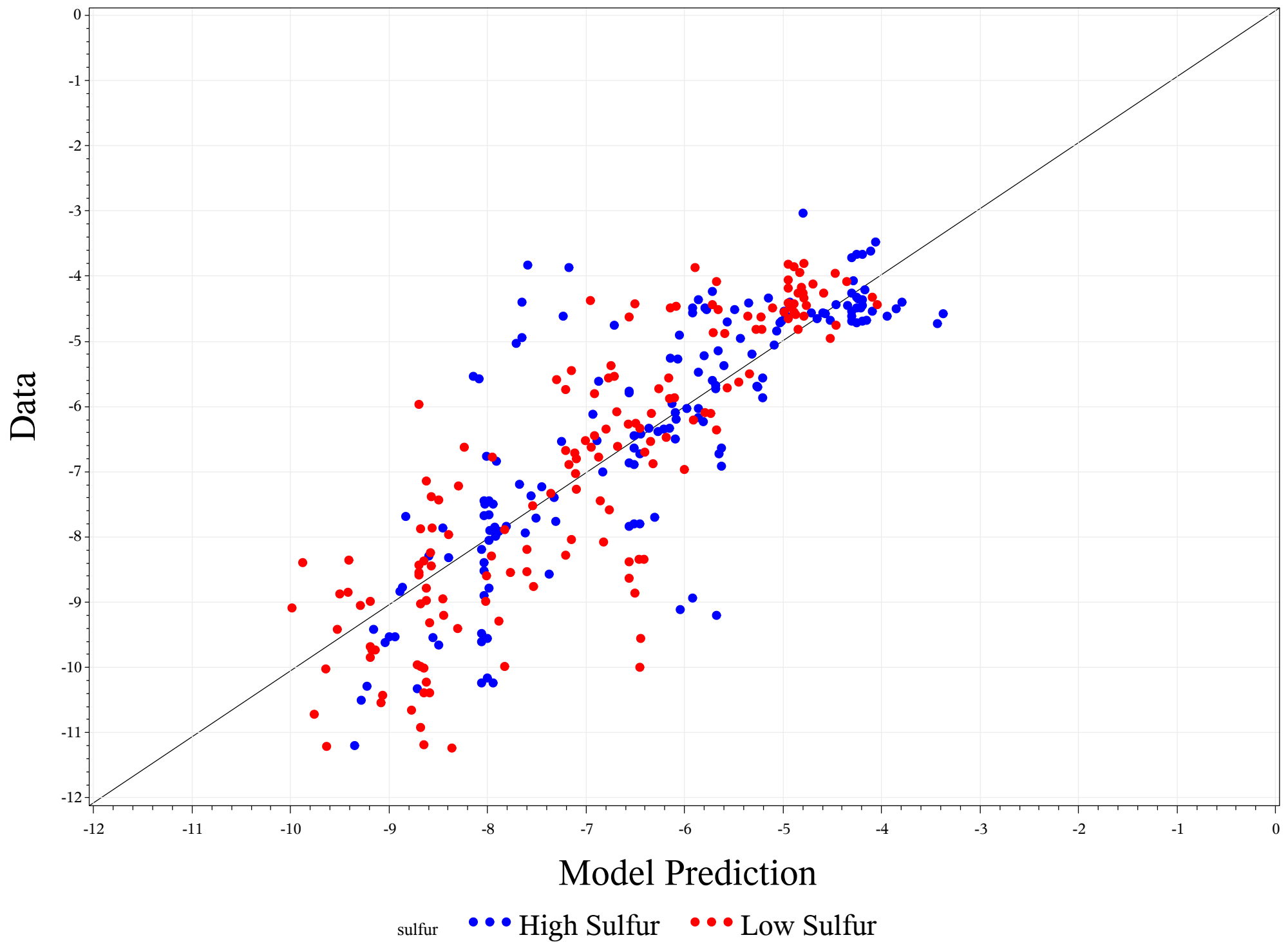
Box plot of individual vehicle families by sulfur level (NOx Bag 2)



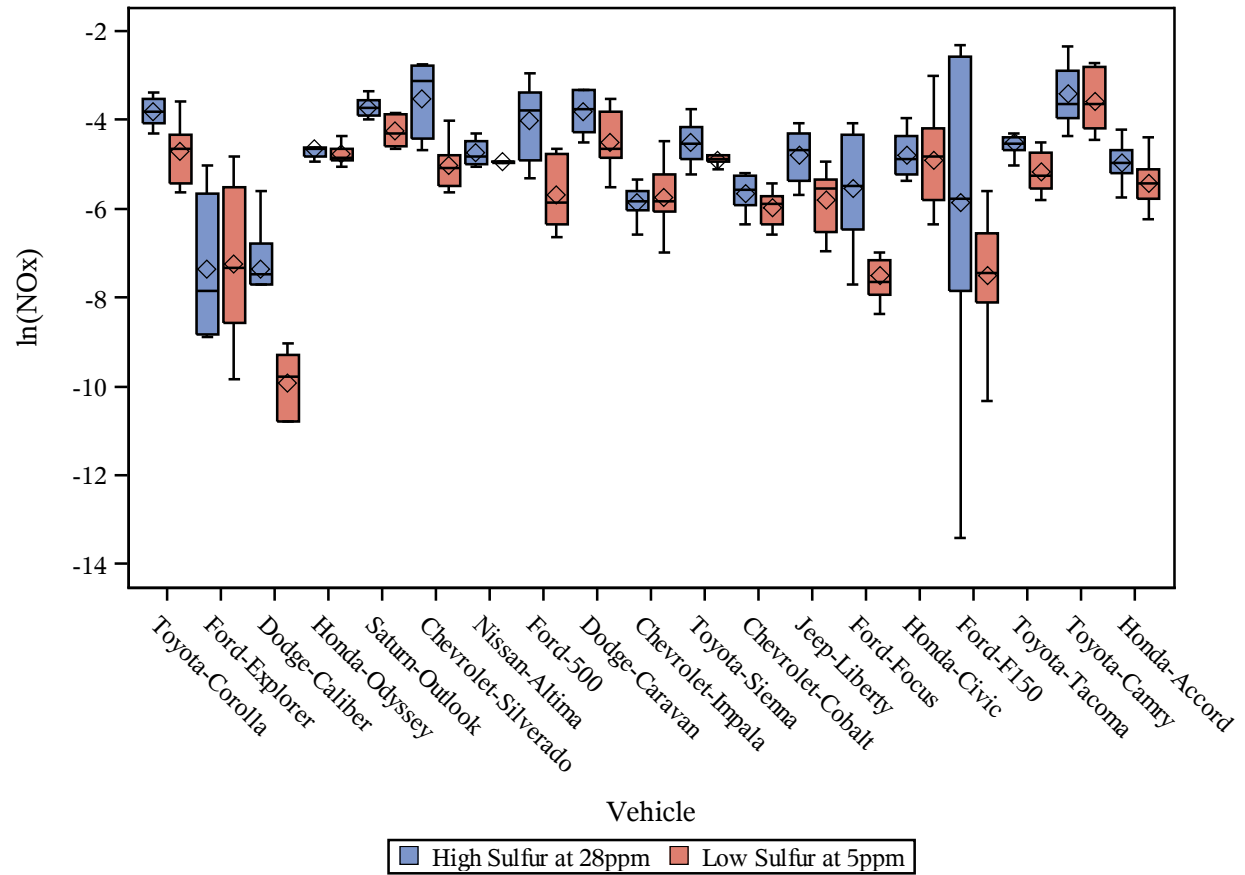
Log-transformed emissions from individual vehicles by sulfur level (NOx Bag 2)



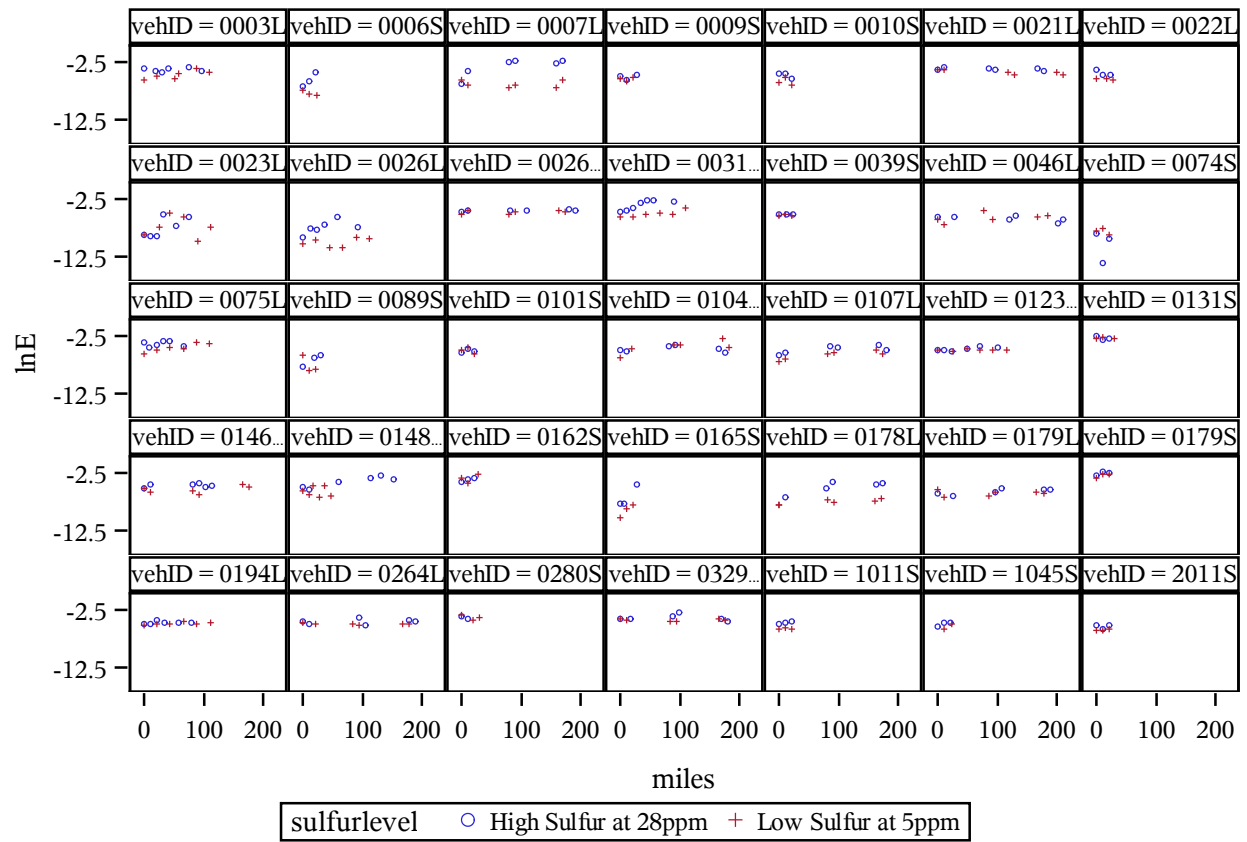
NOx Bag 2: Data vs Predicted



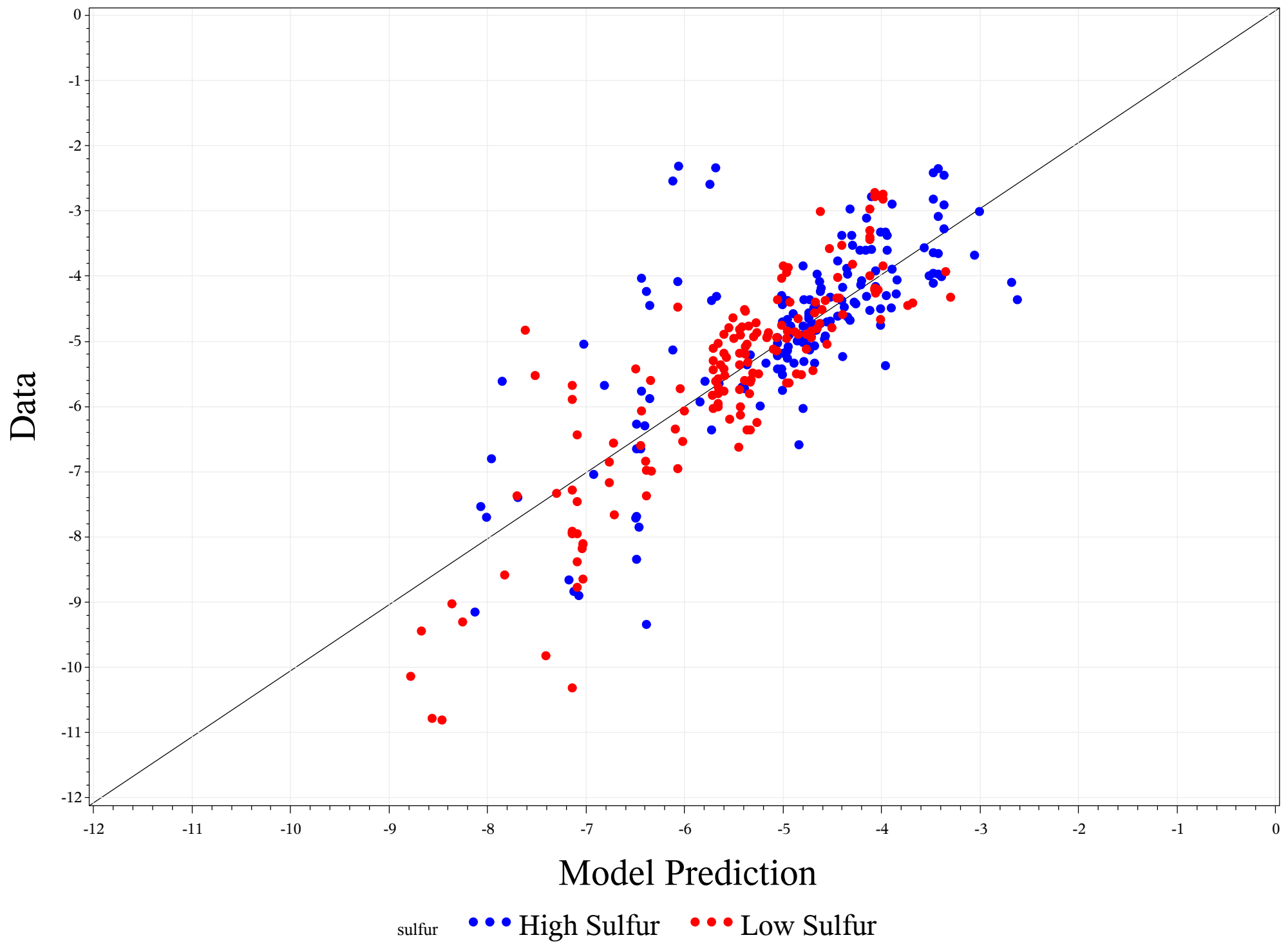
Box plot of individual vehicle families by sulfur level (NOx Bag 3)



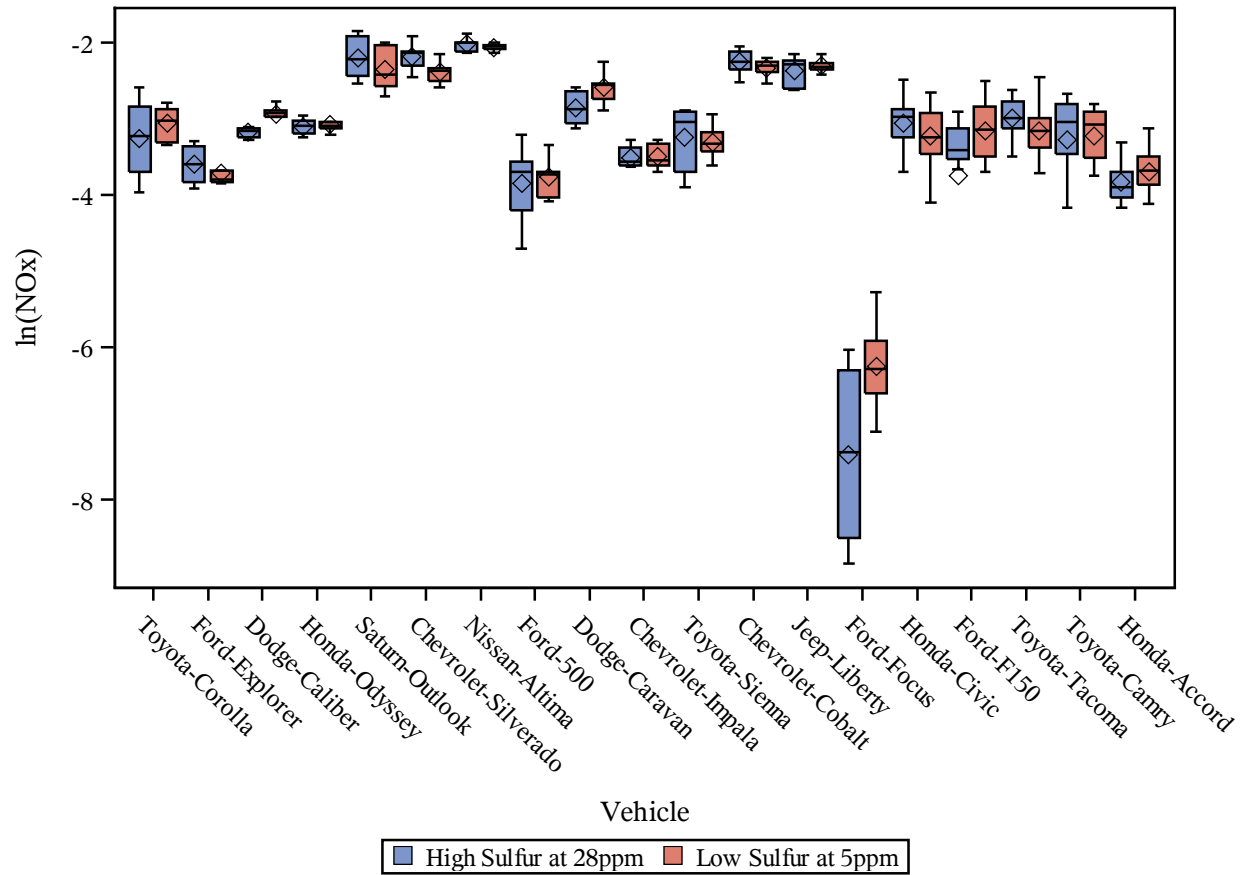
Log-transformed emissions from individual vehicles by sulfur level (NOx Bag 3)



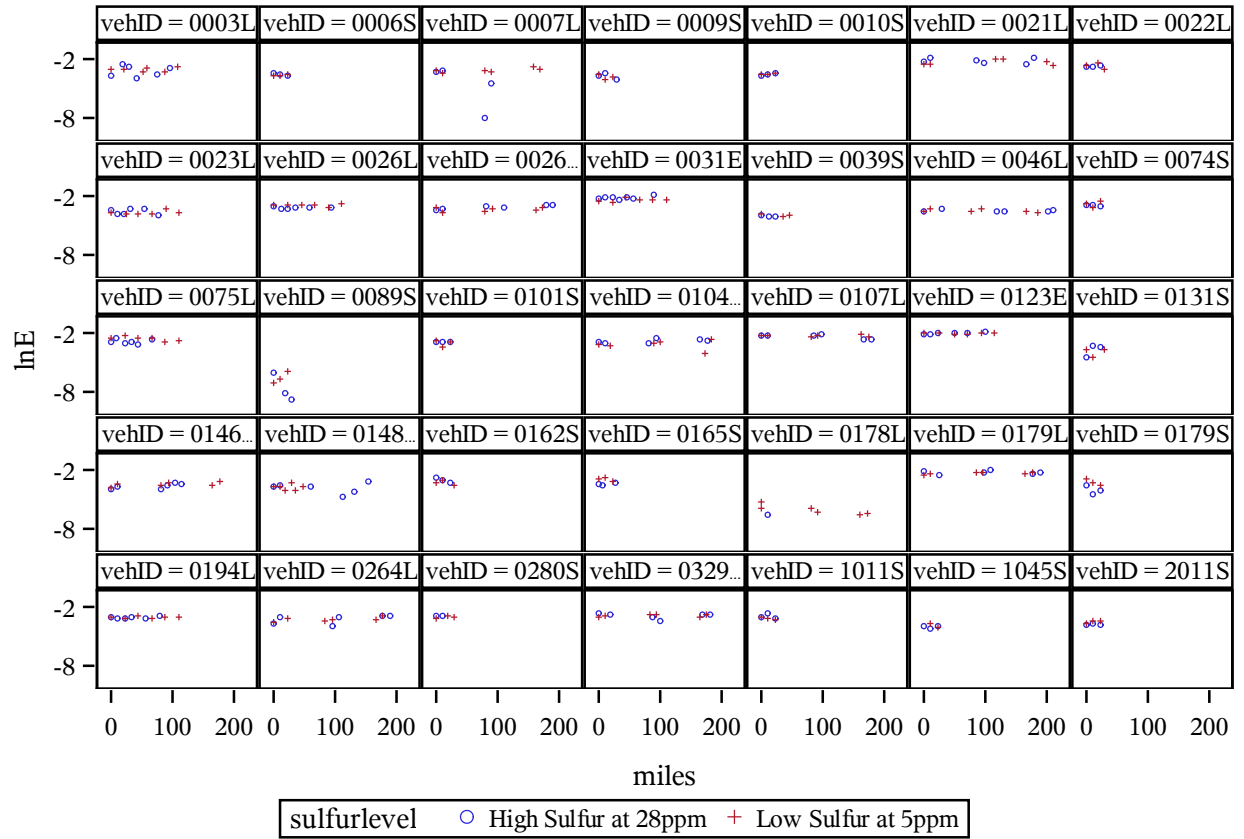
NOx Bag 3: Data vs Predicted



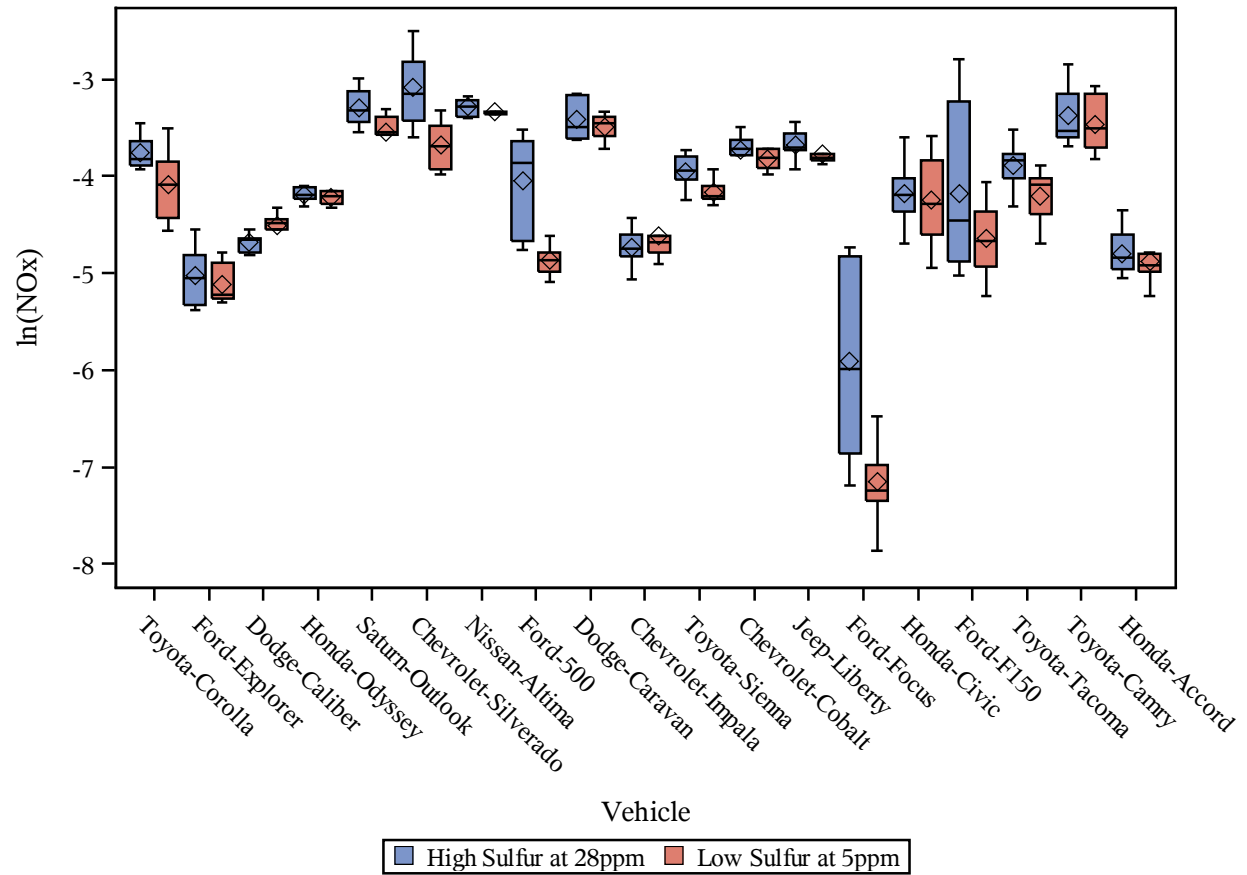
Box plot of individual vehicle families by sulfur level (NOx Bag1-Bag3)



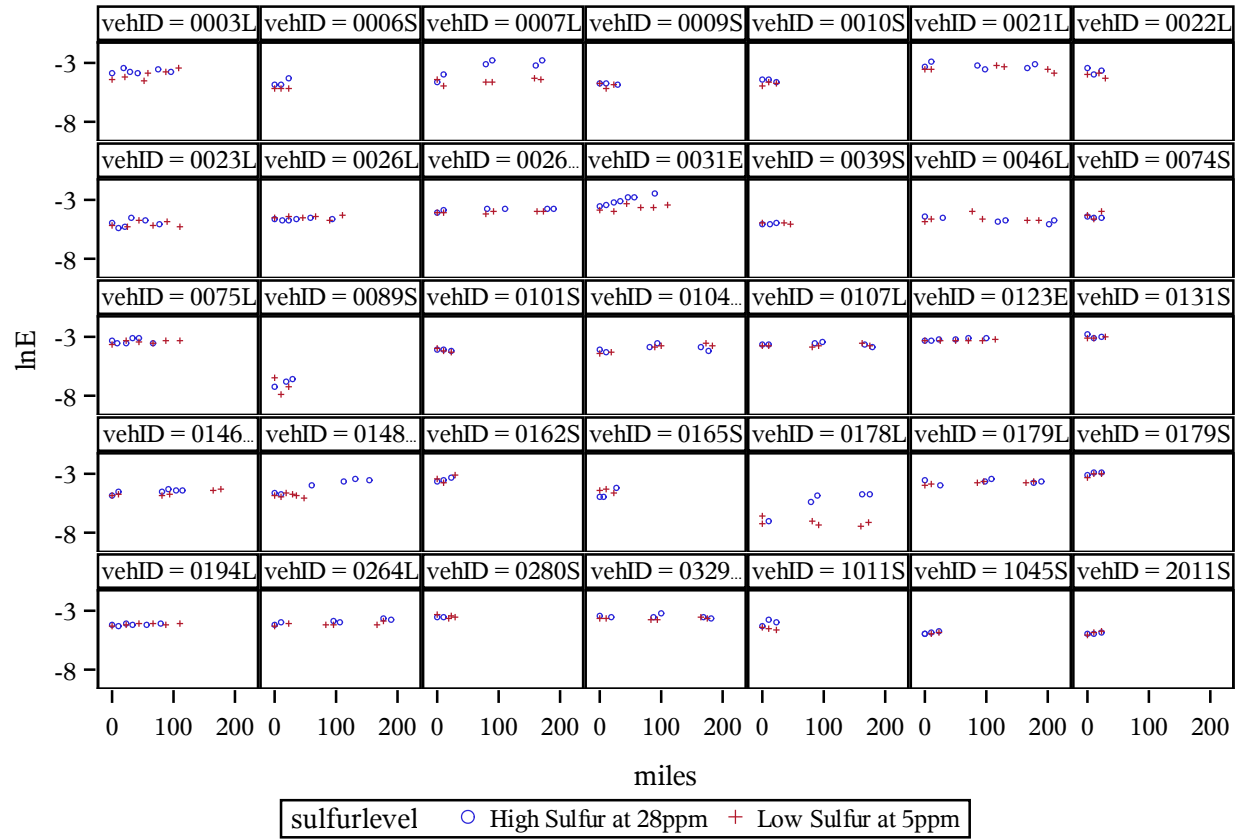
Log-transformed emissions from individual vehicles by sulfur level (NOx Bag1-Bag3)



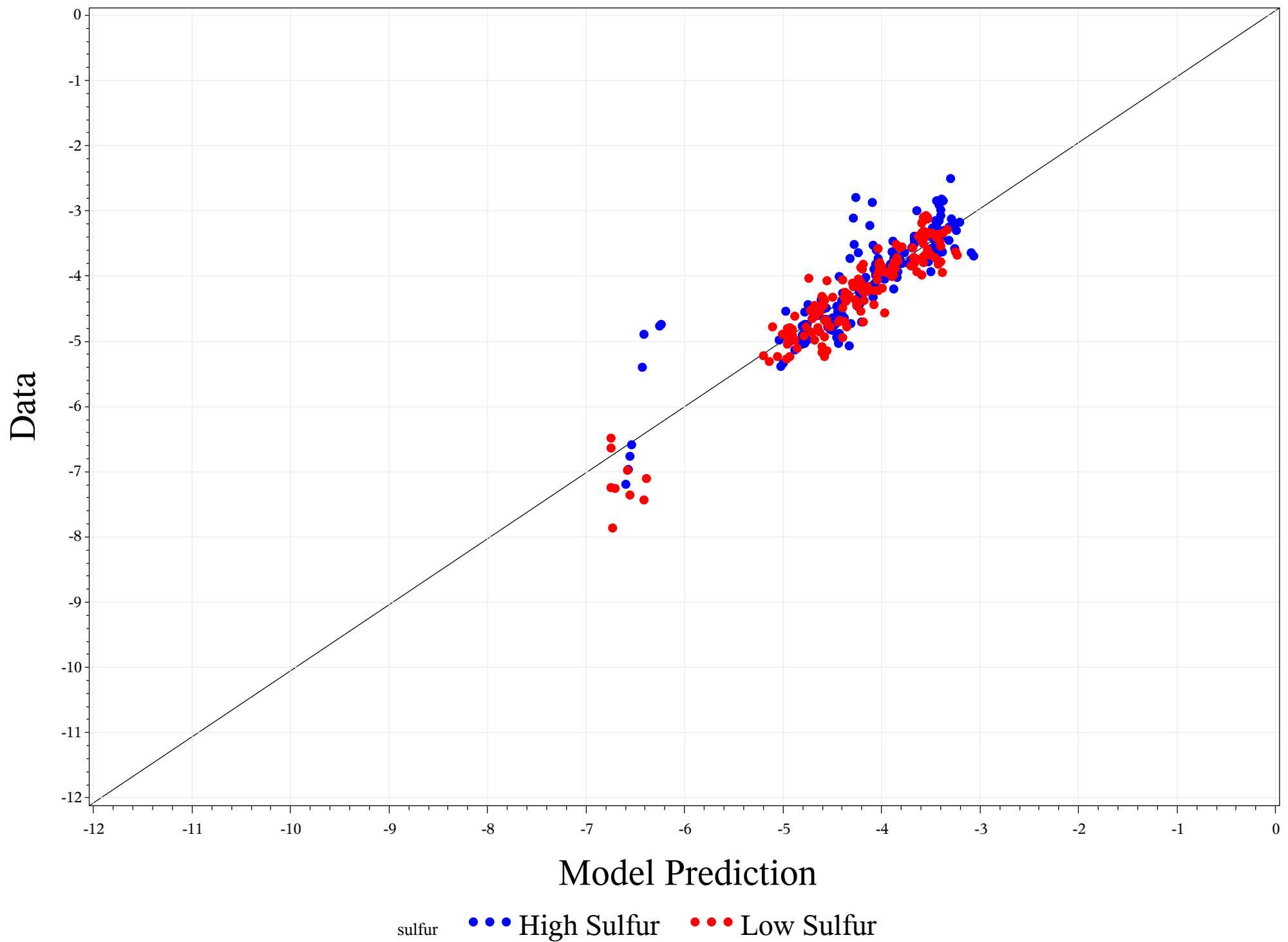
Box plot of individual vehicle families by sulfur level (Wtd NOx)



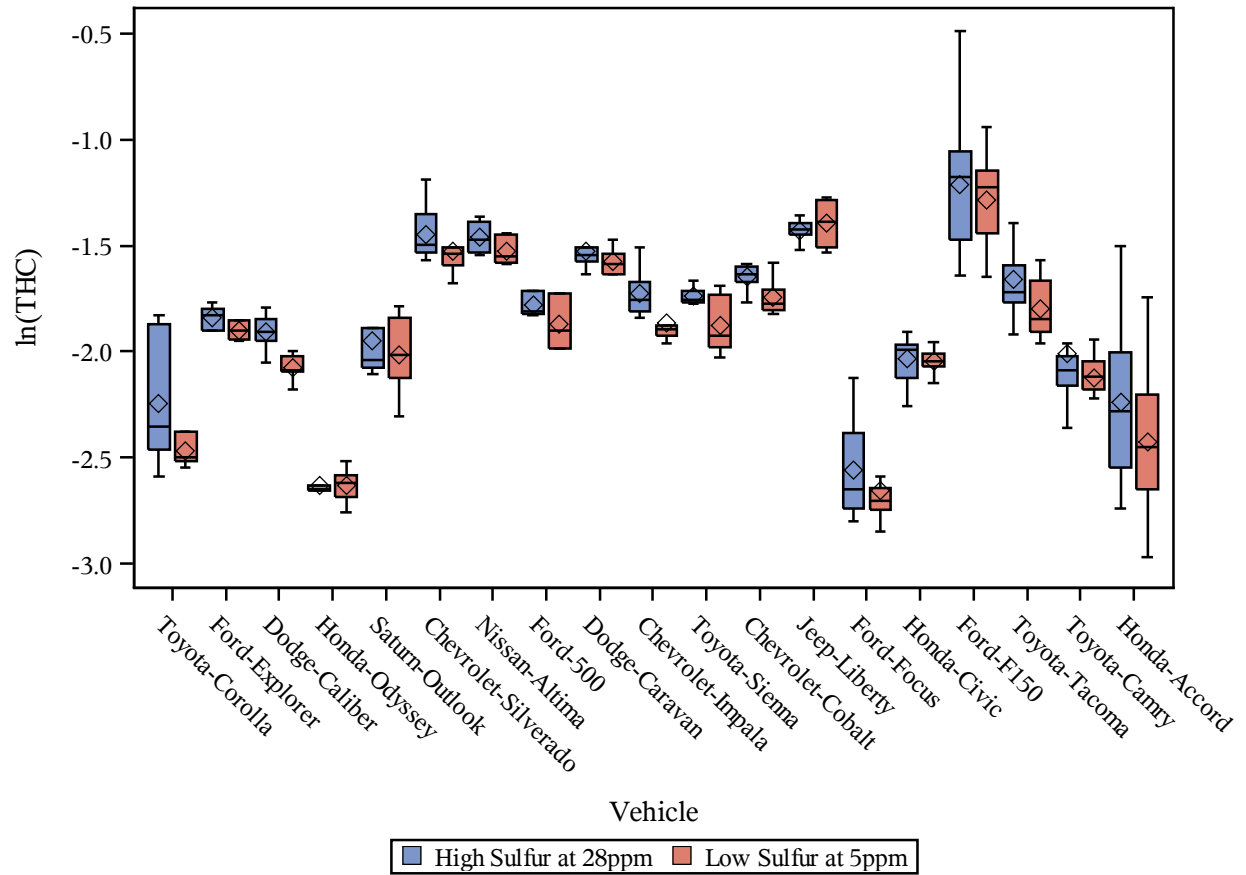
Log-transformed emissions from individual vehicles by sulfur level (Wtd NOx)



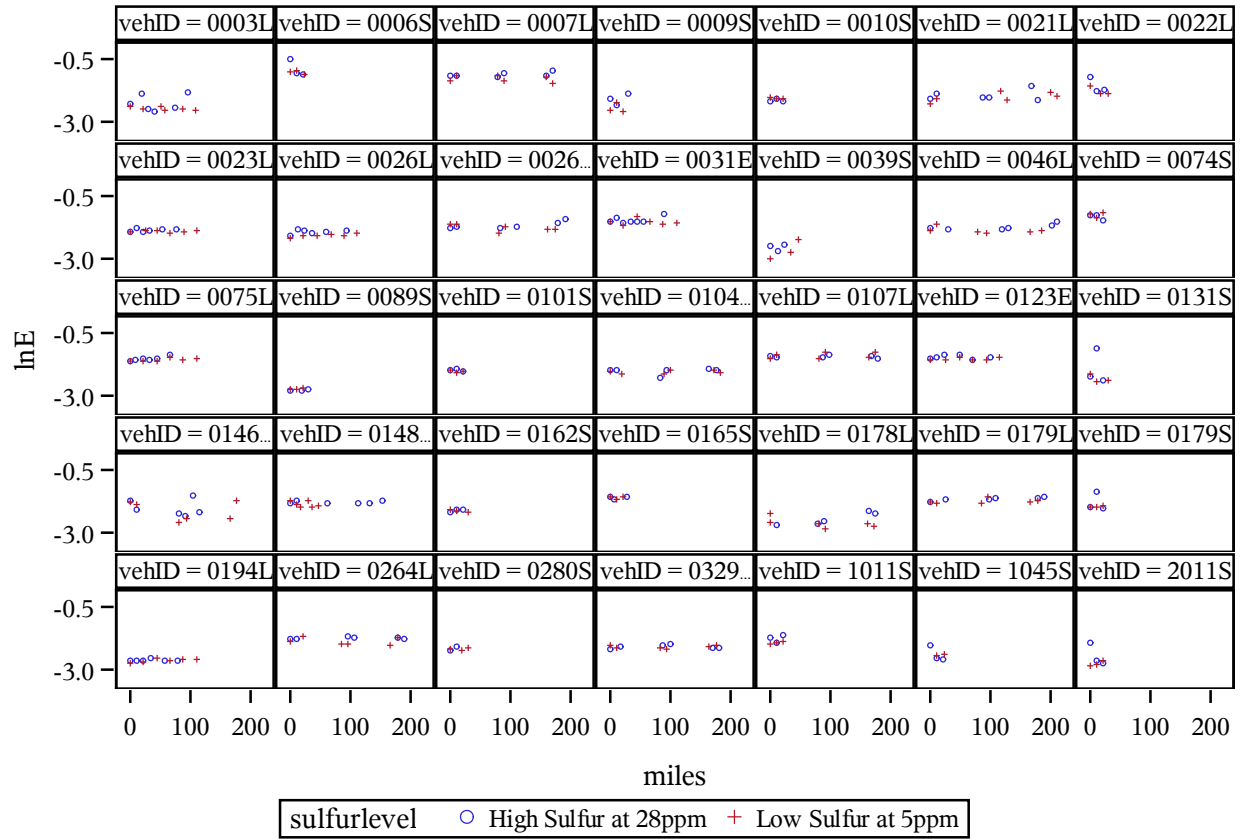
Wtd NOx: Data vs Predicted



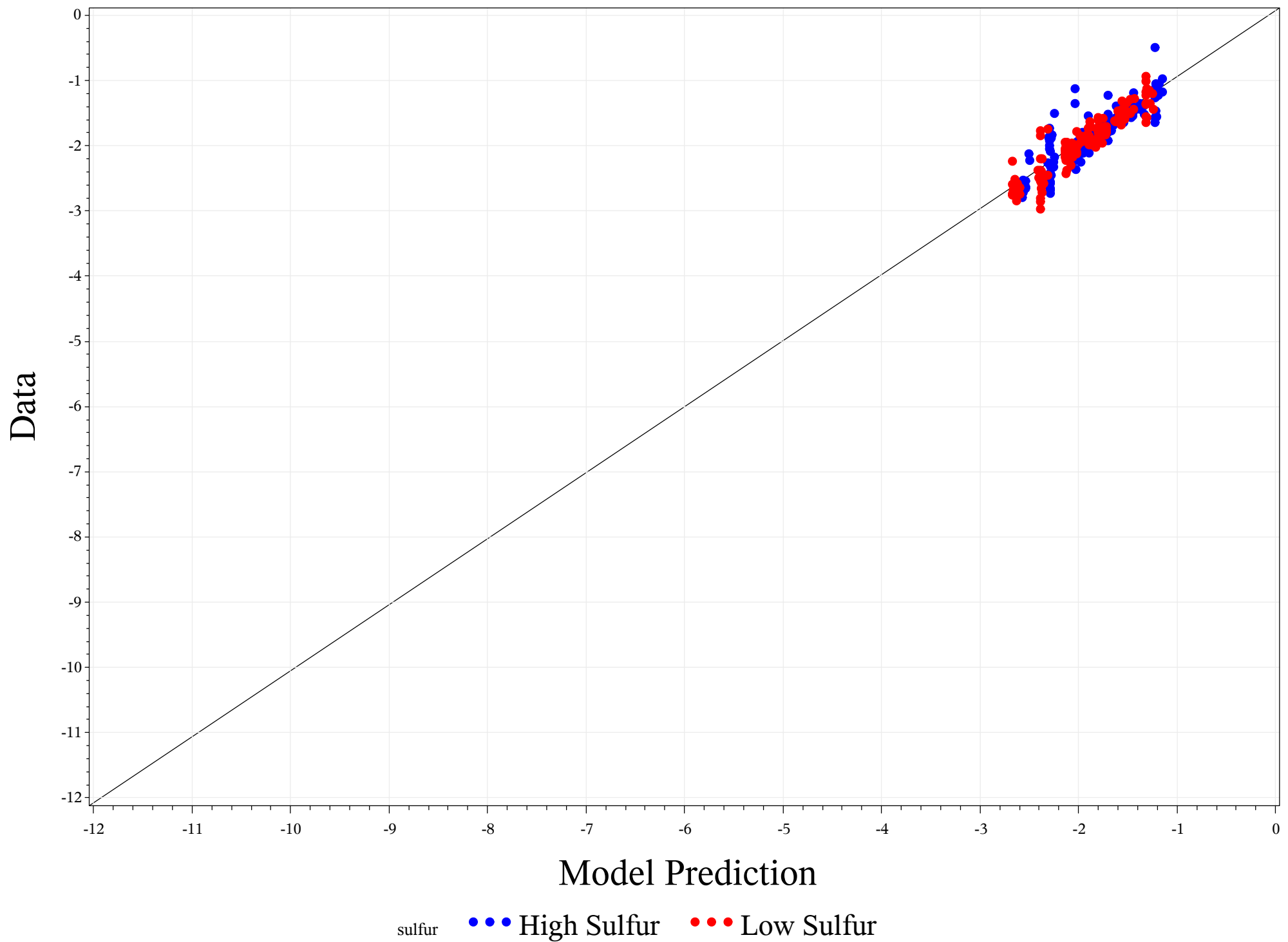
Box plot of individual vehicle families by sulfur level (THC Bag 1)



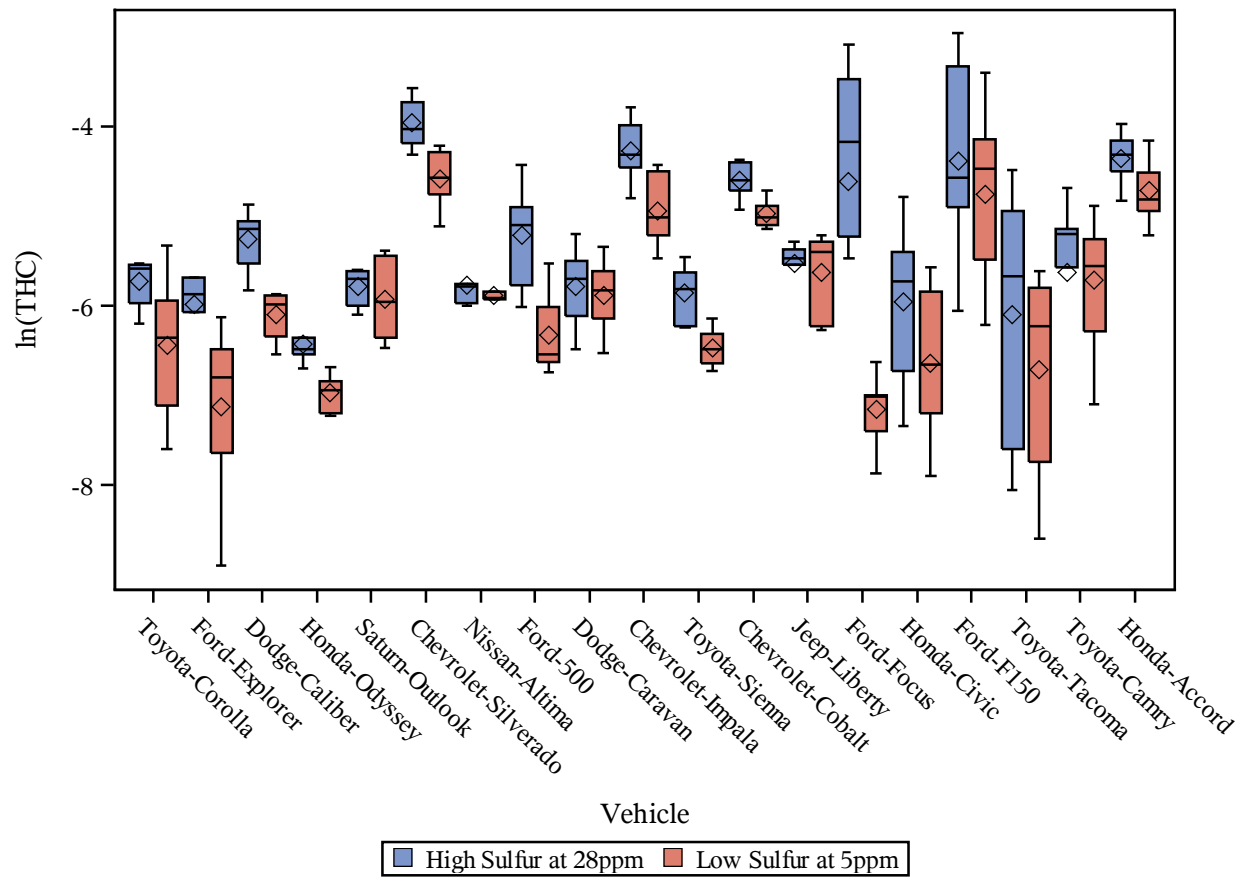
Log-transformed emissions from individual vehicles by sulfur level (THC Bag 1)



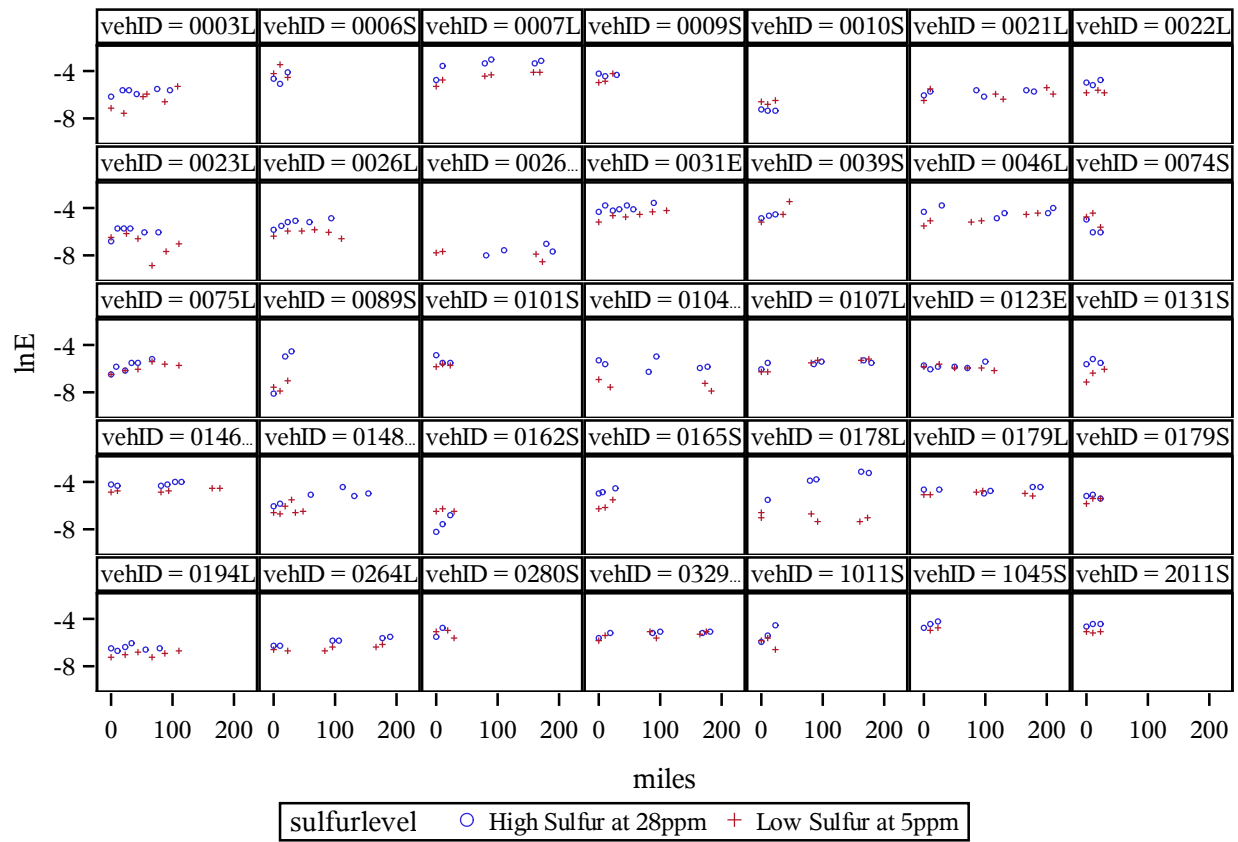
THC Bag 1: Data vs Predicted



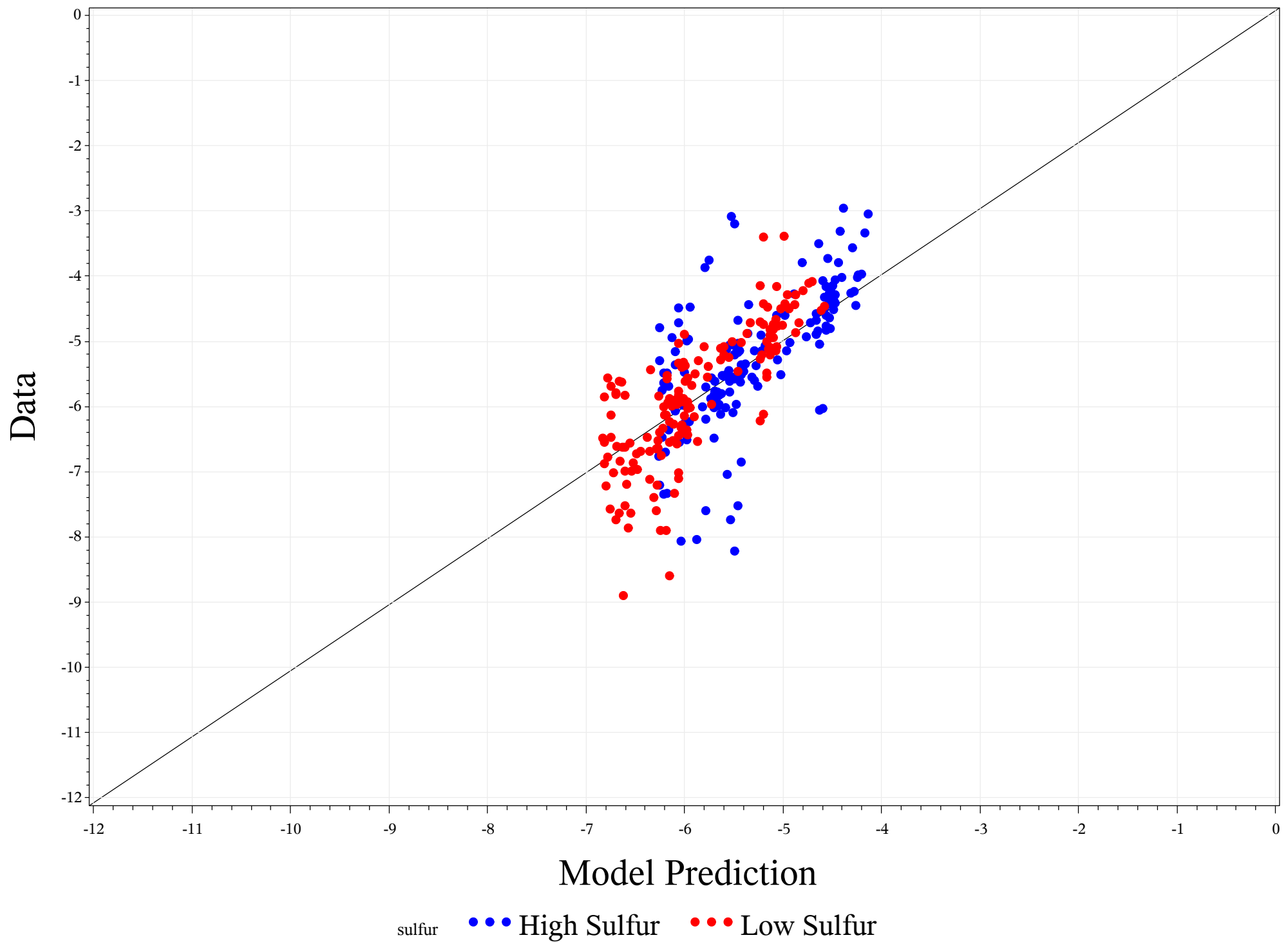
Box plot of individual vehicle families by sulfur level (THC Bag 2)



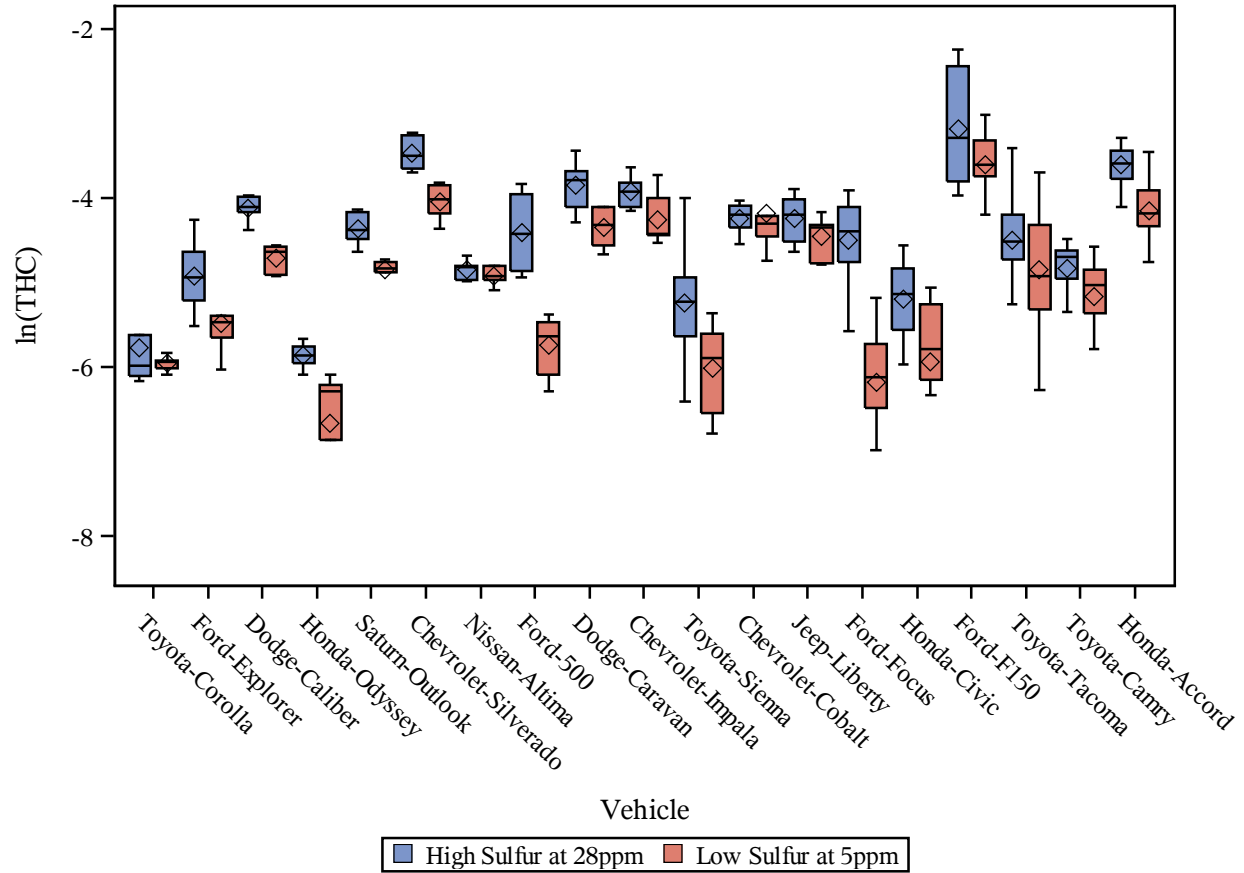
Log-transformed emissions from individual vehicles by sulfur level (THC Bag 2)



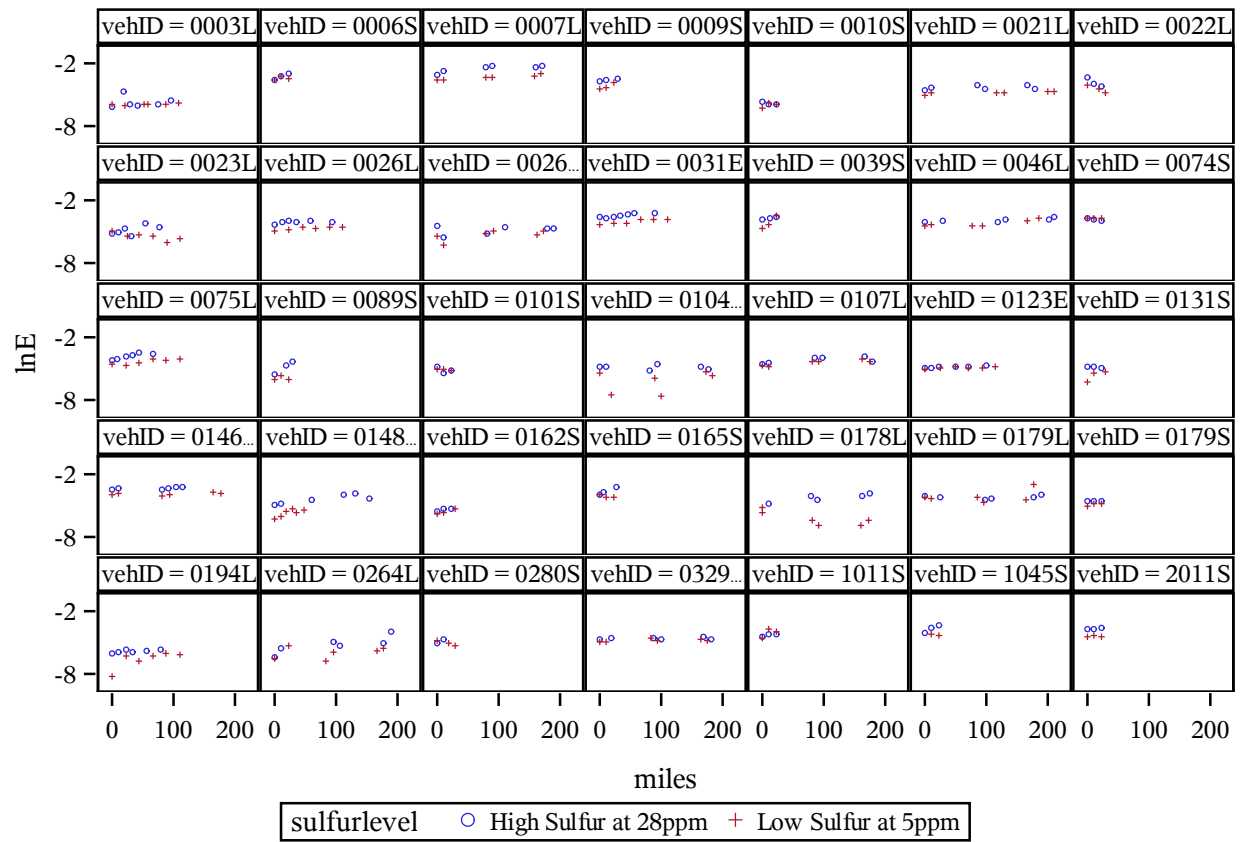
THC Bag 2: Data vs Predicted



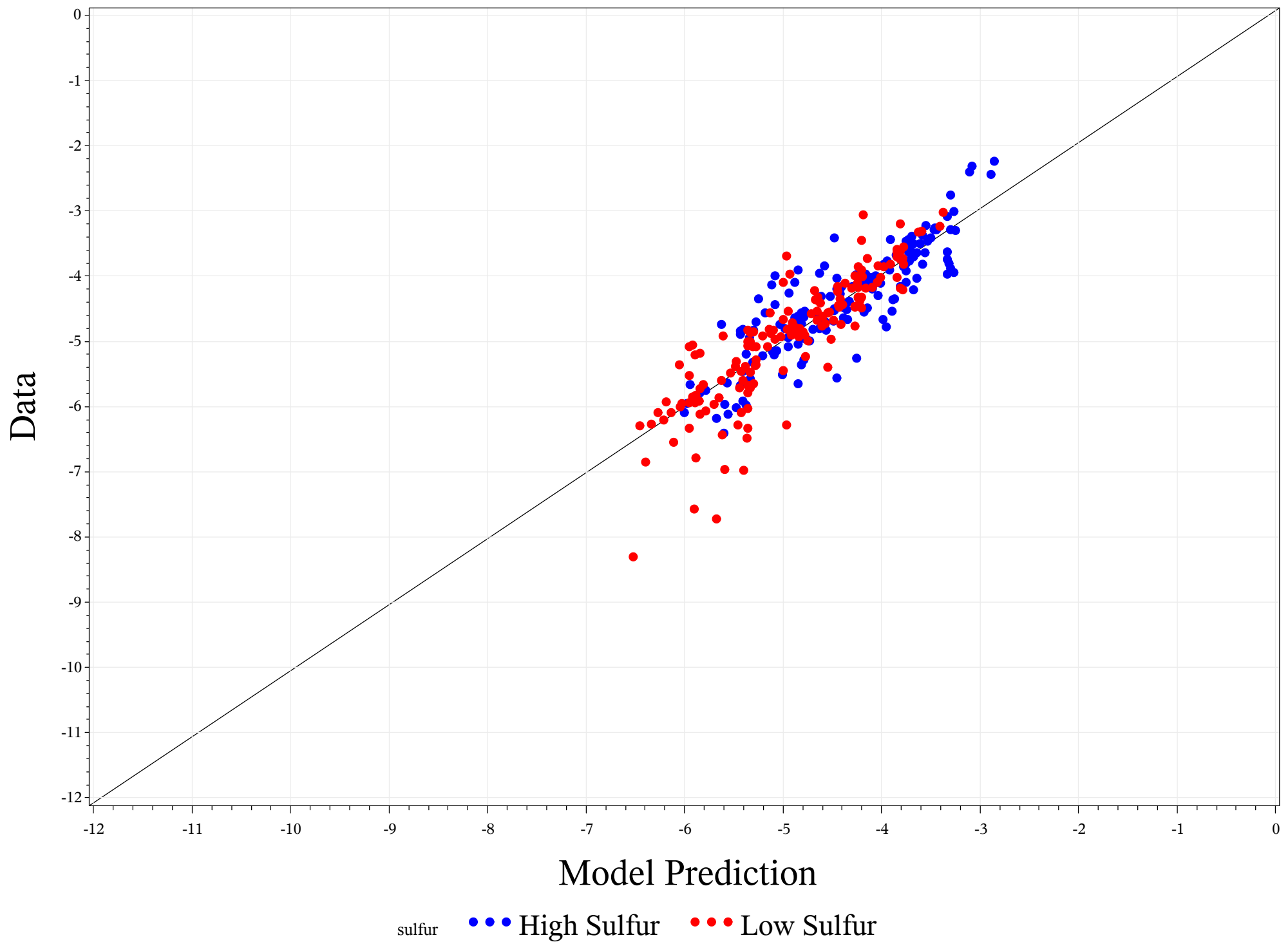
Box plot of individual vehicle families by sulfur level (THC Bag 3)



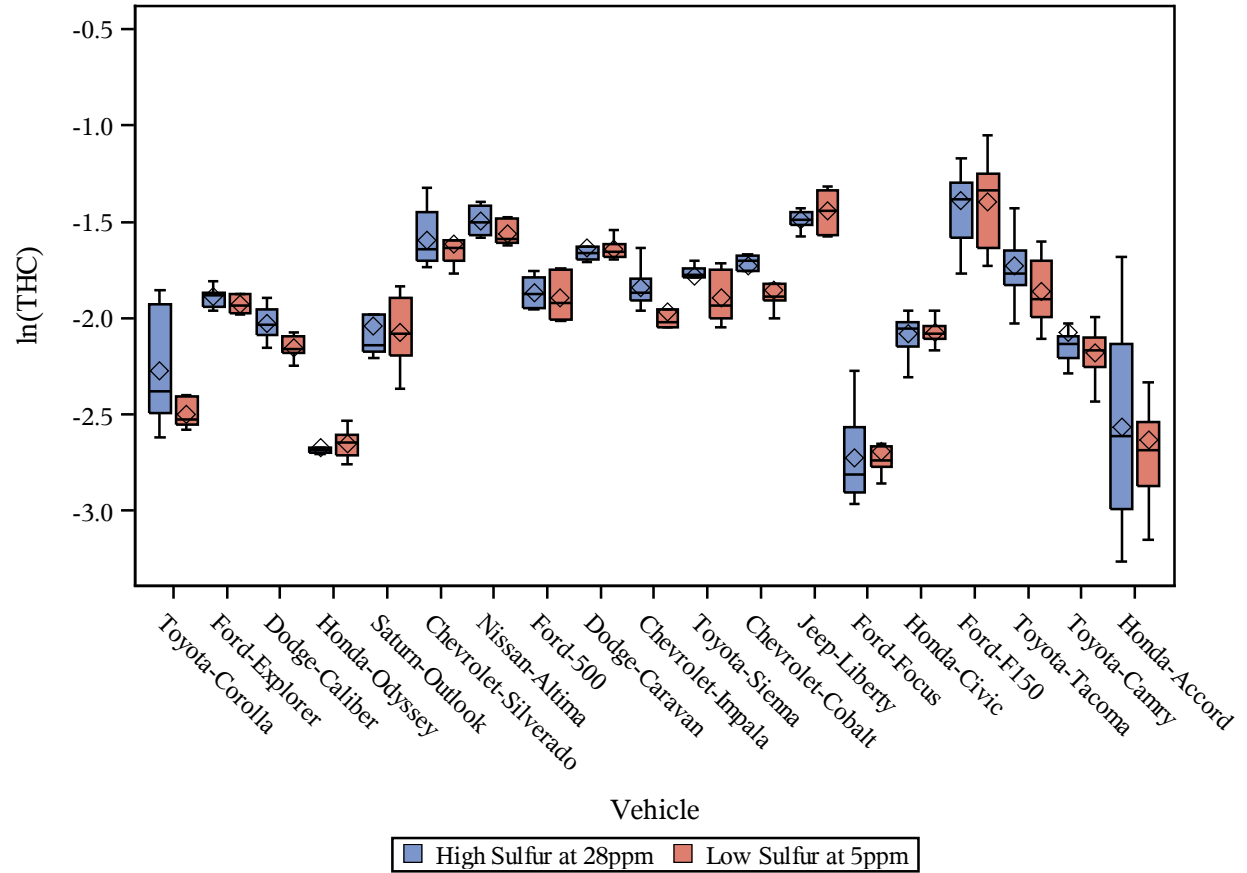
Log-transformed emissions from individual vehicles by sulfur level (THC Bag 3)



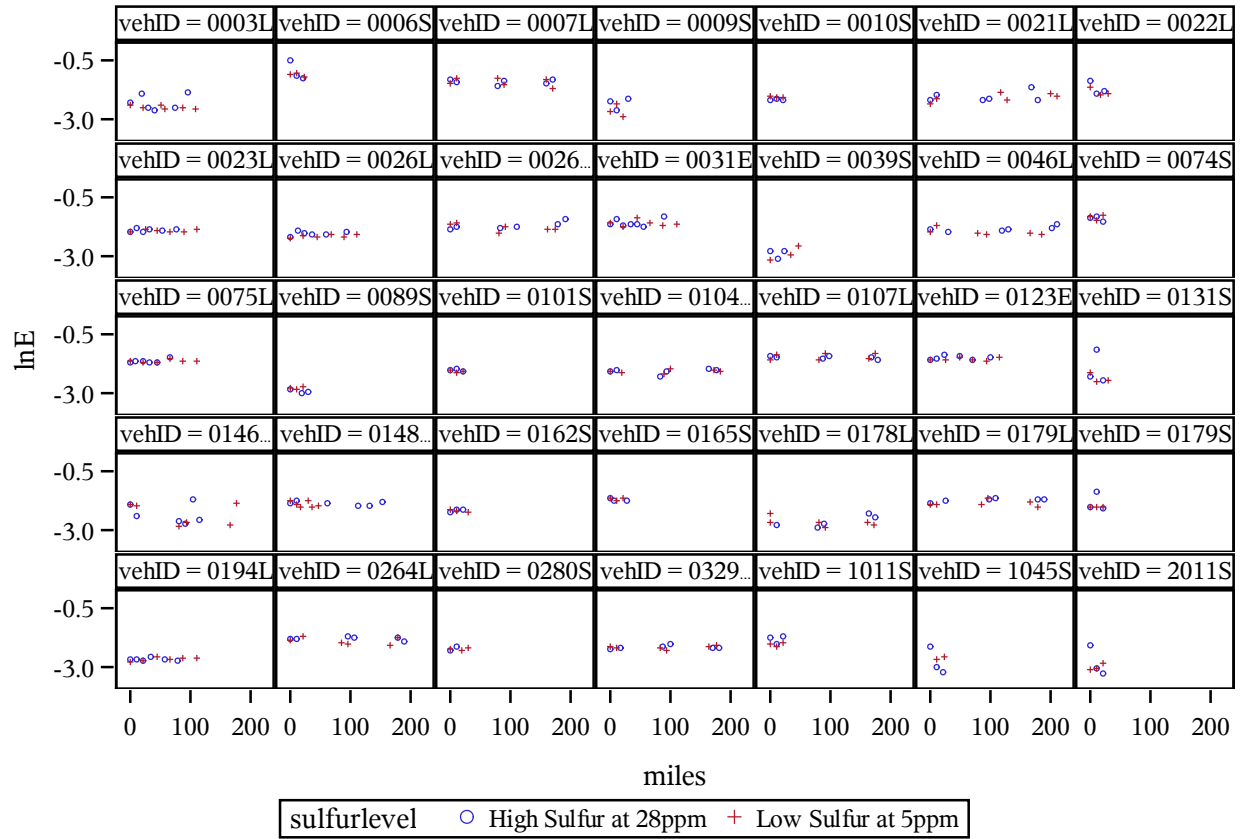
THC Bag 3: Data vs Predicted



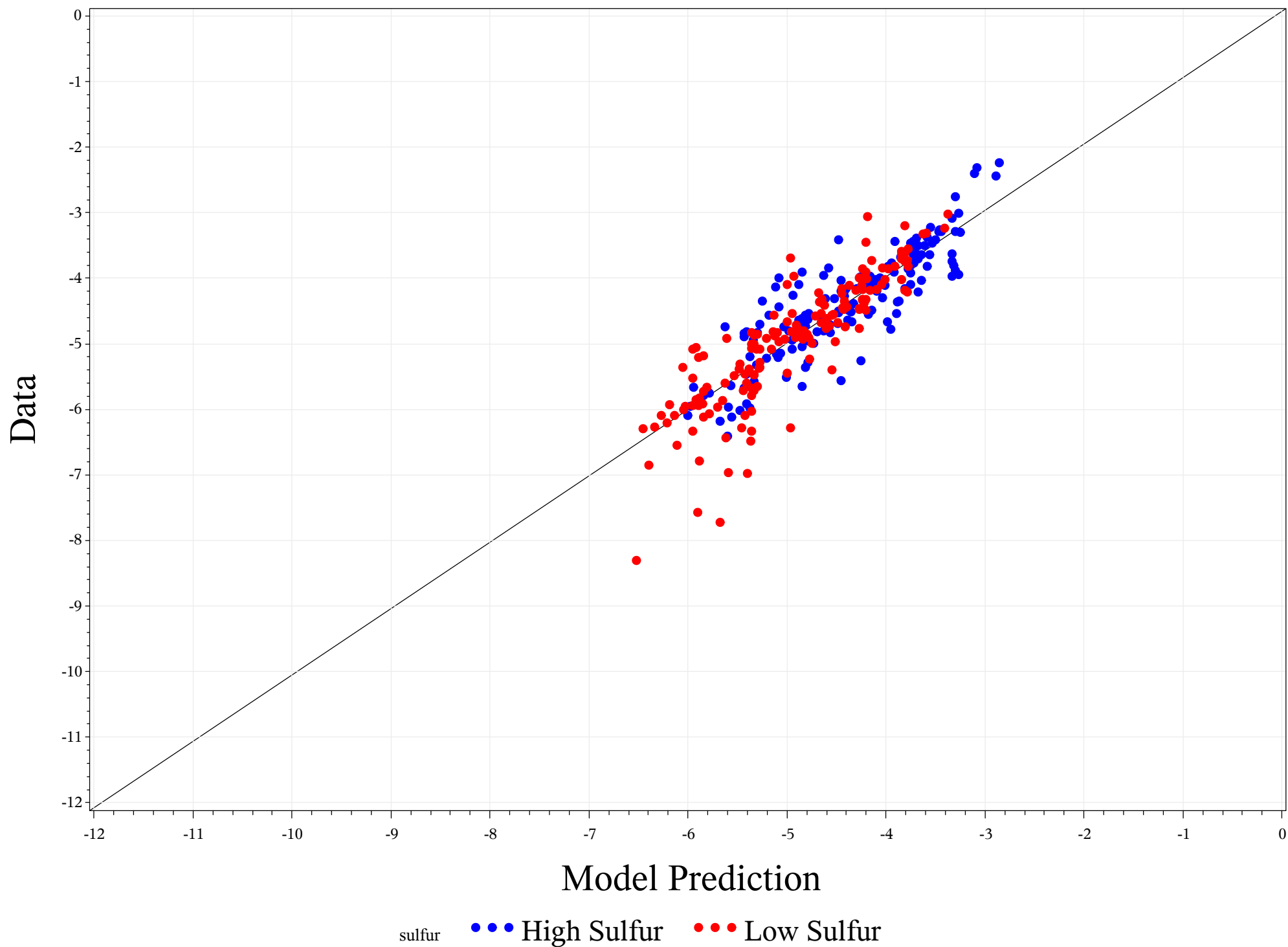
Box plot of individual vehicle families by sulfur level (THC Bag1-Bag3)



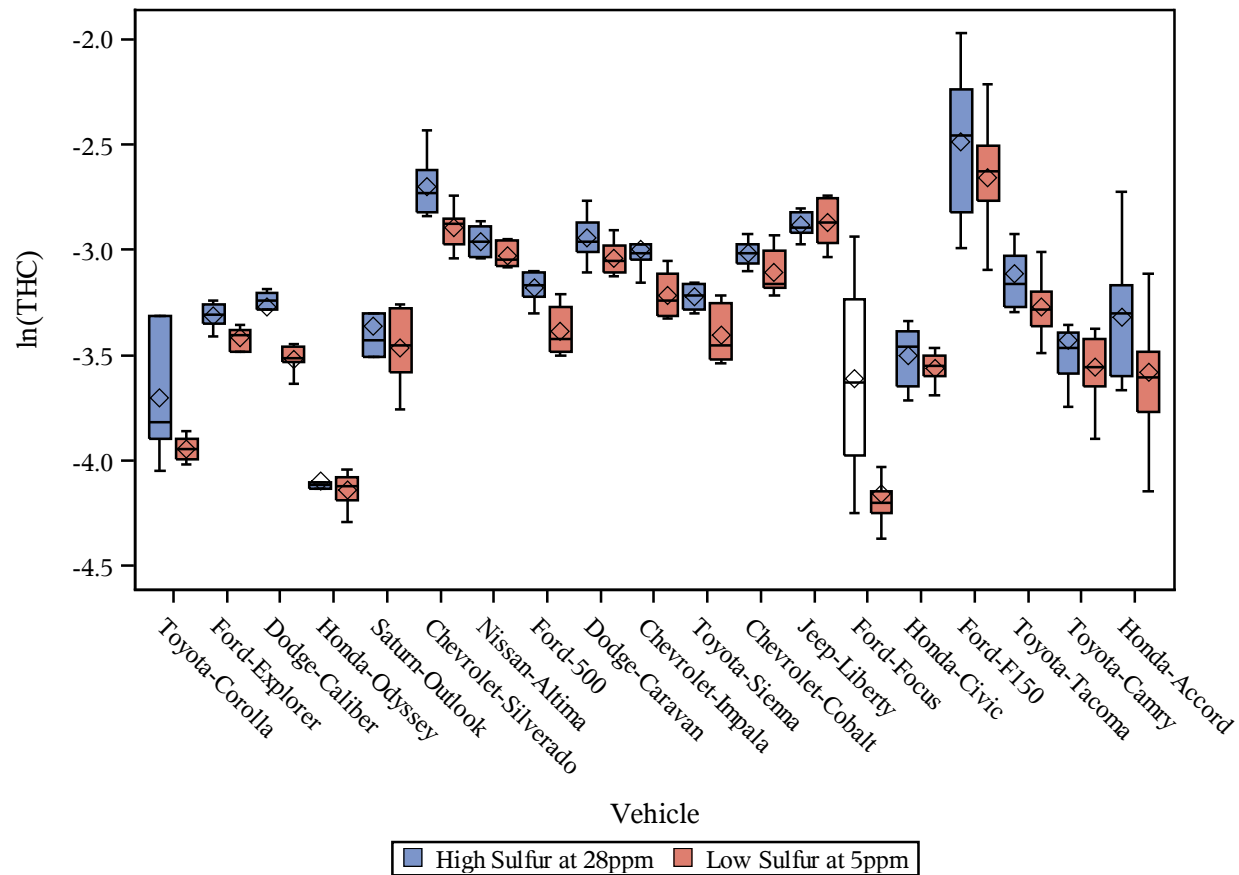
Log-transformed emissions from individual vehicles by sulfur level (THC Bag1-Bag3)



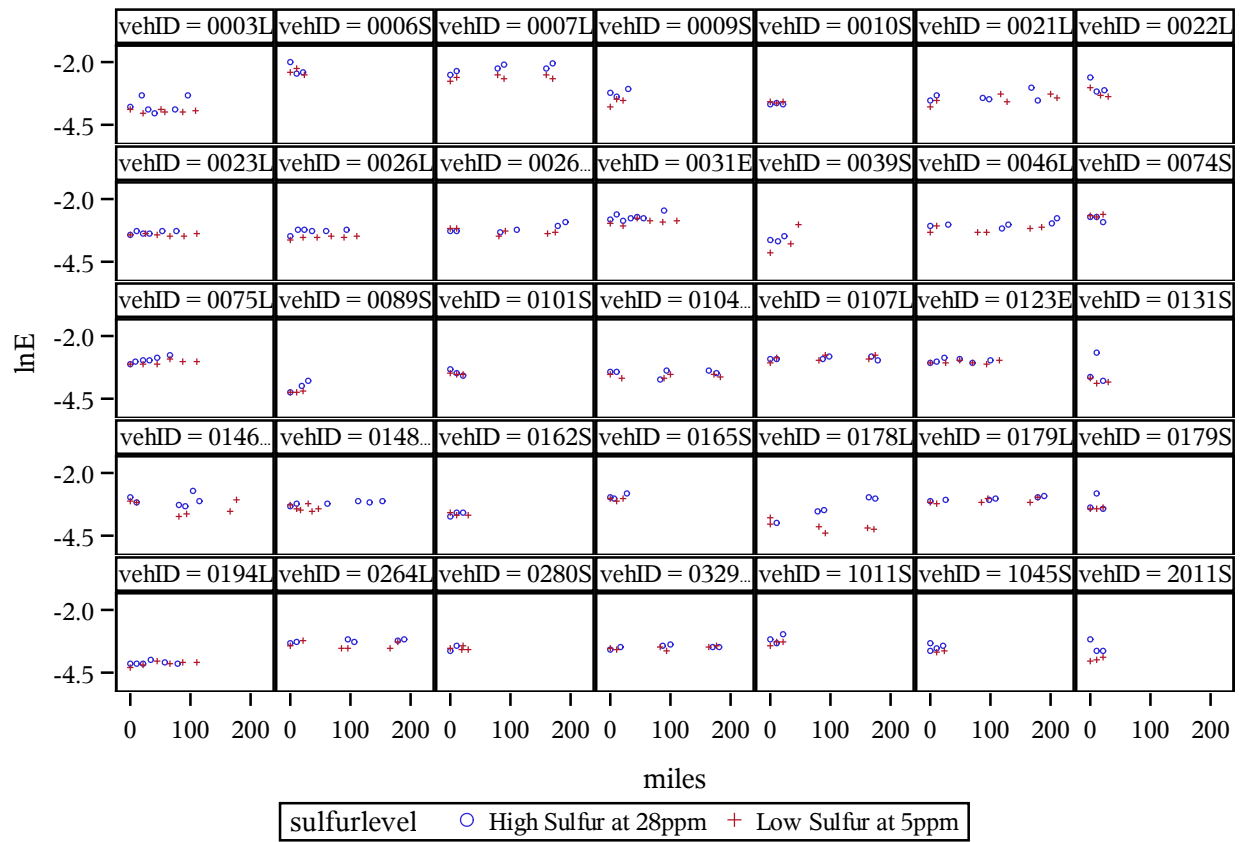
THC Bag1-Bag3: Data vs Predicted



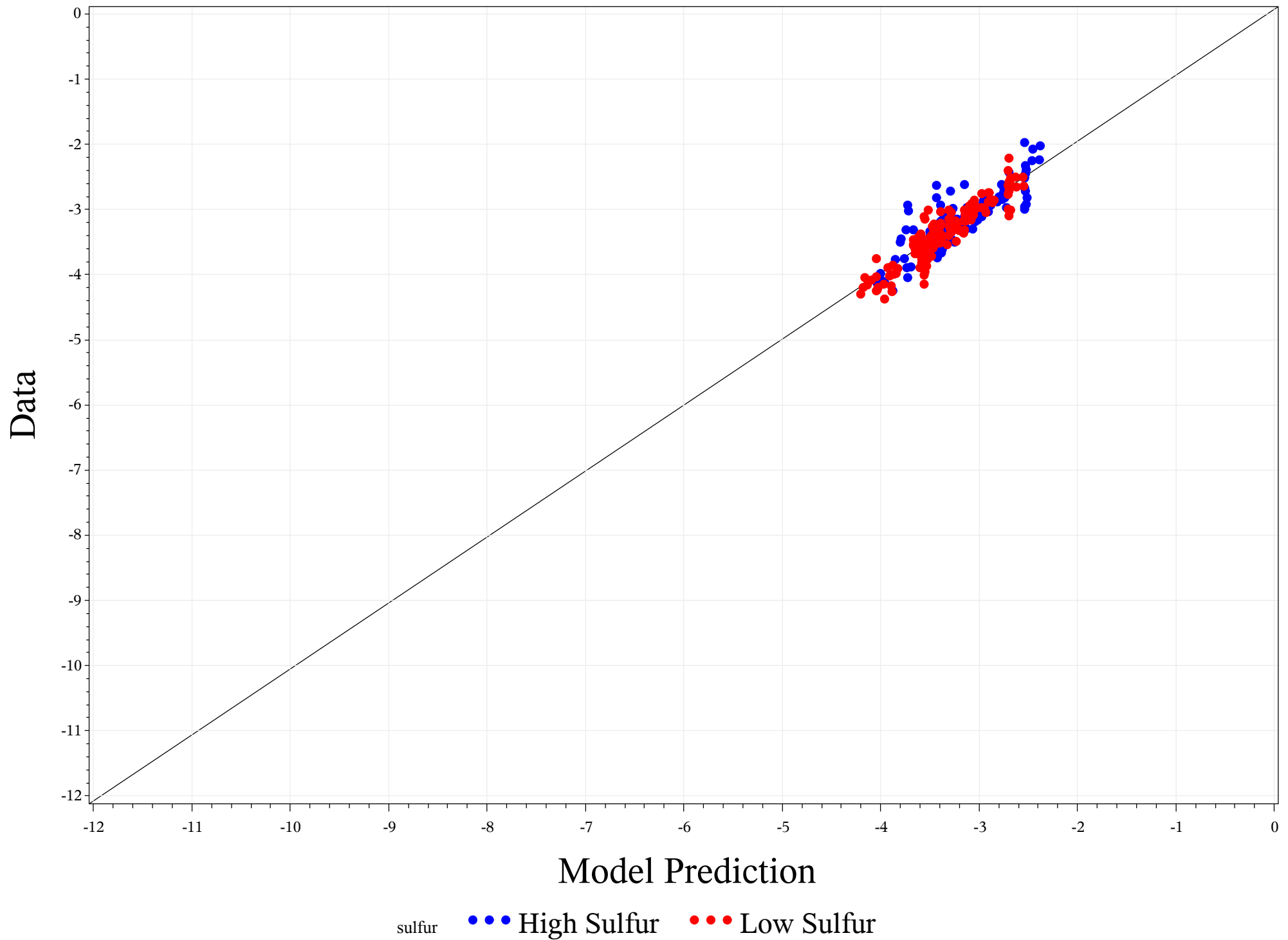
Box plot of individual vehicle families by sulfur level (Wtd THC)



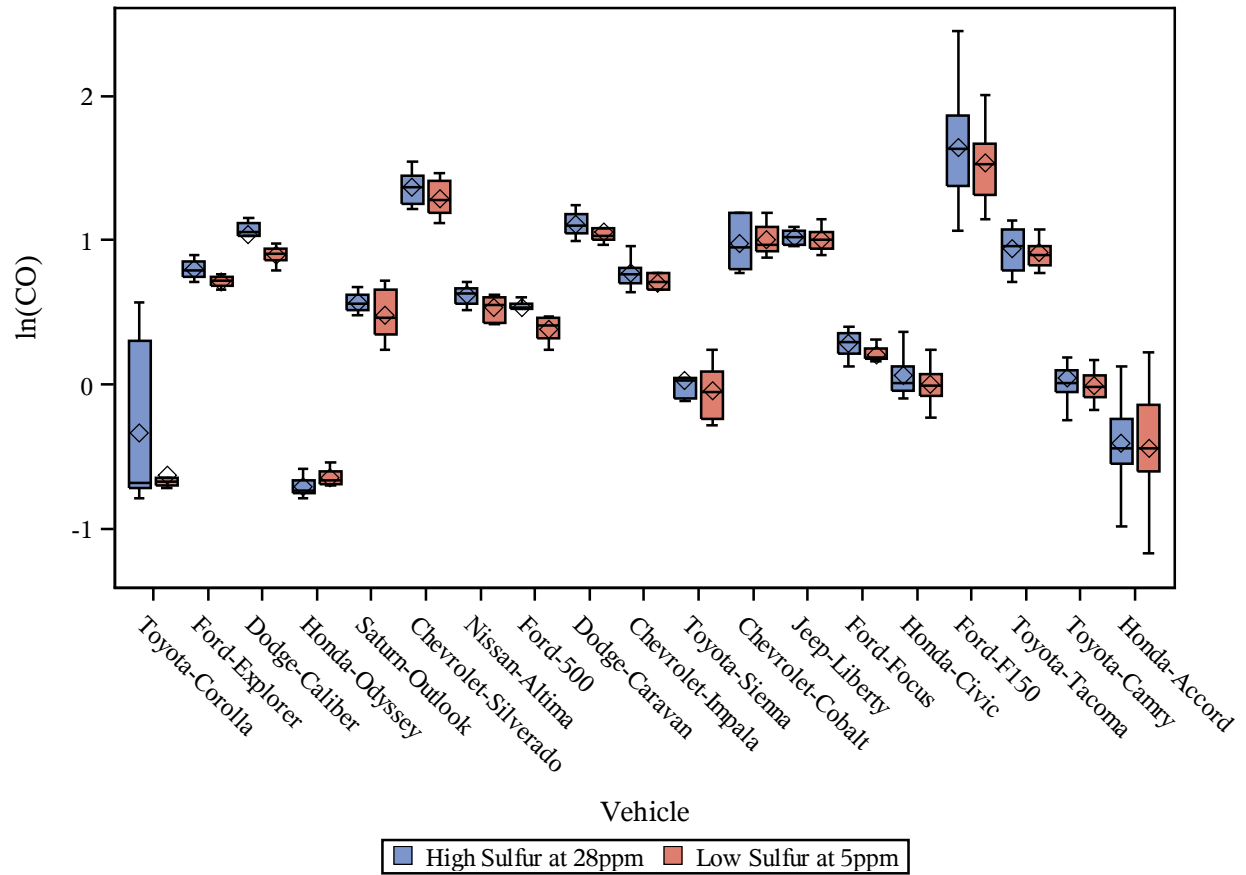
Log-transformed emissions from individual vehicles by sulfur level (Wtd THC)



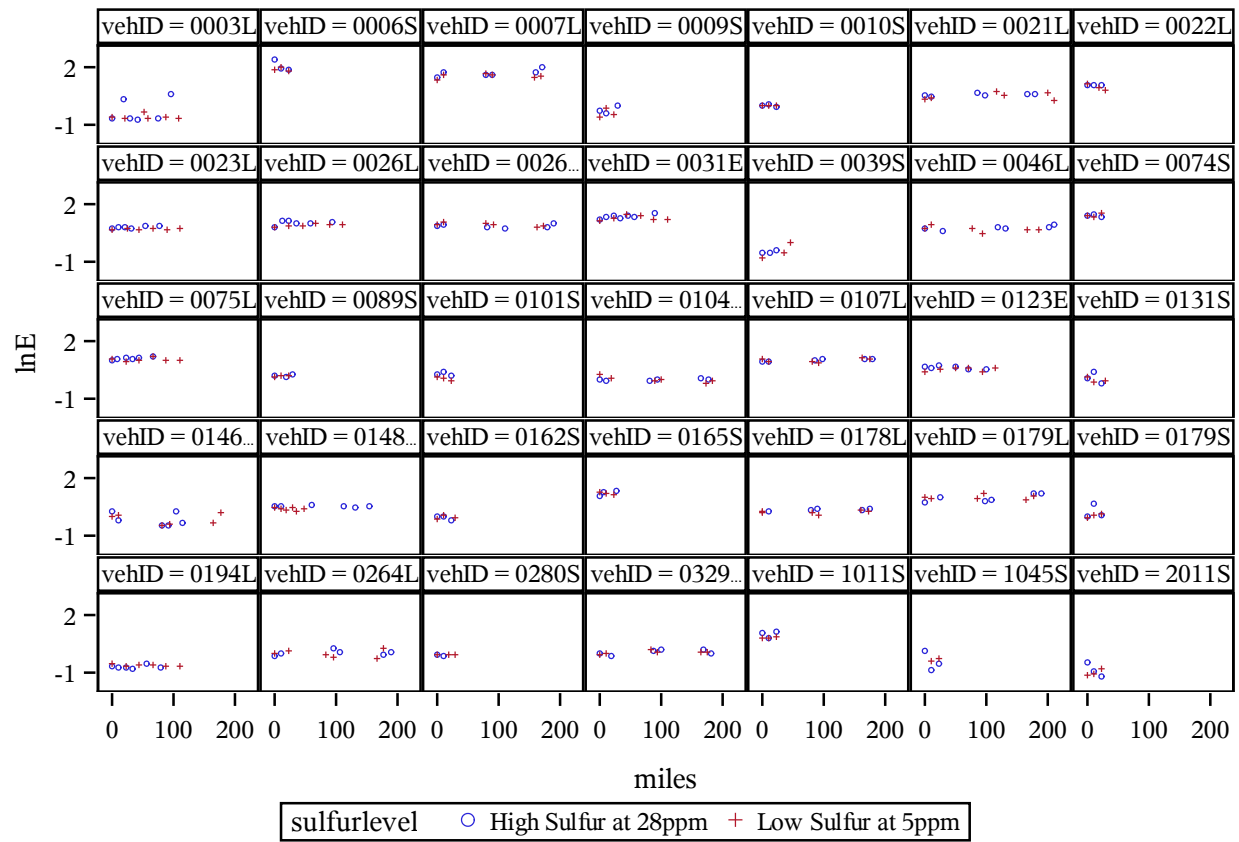
Wtd THC: Data vs Predicted



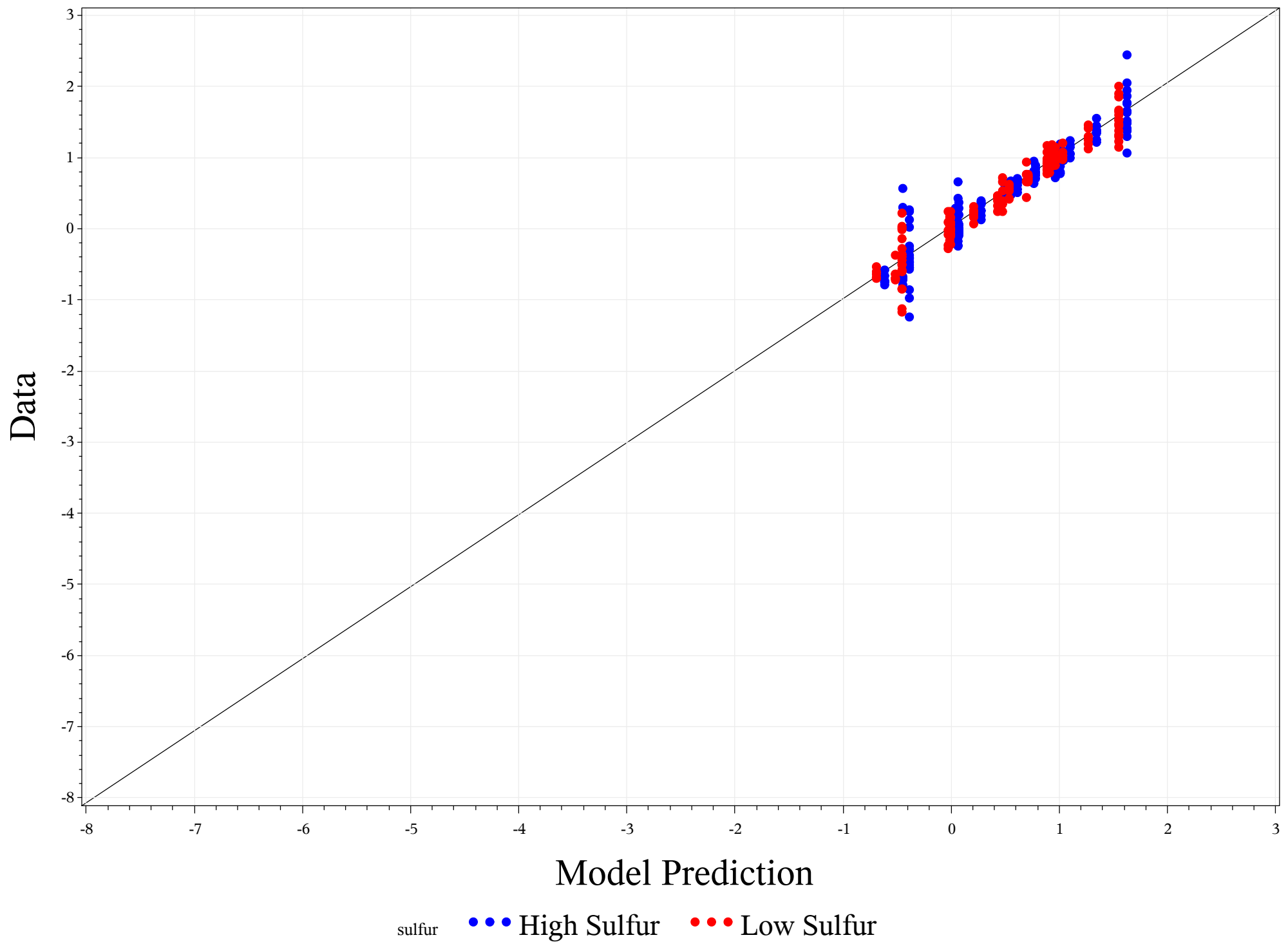
Box plot of individual vehicle families by sulfur level (CO Bag 1)



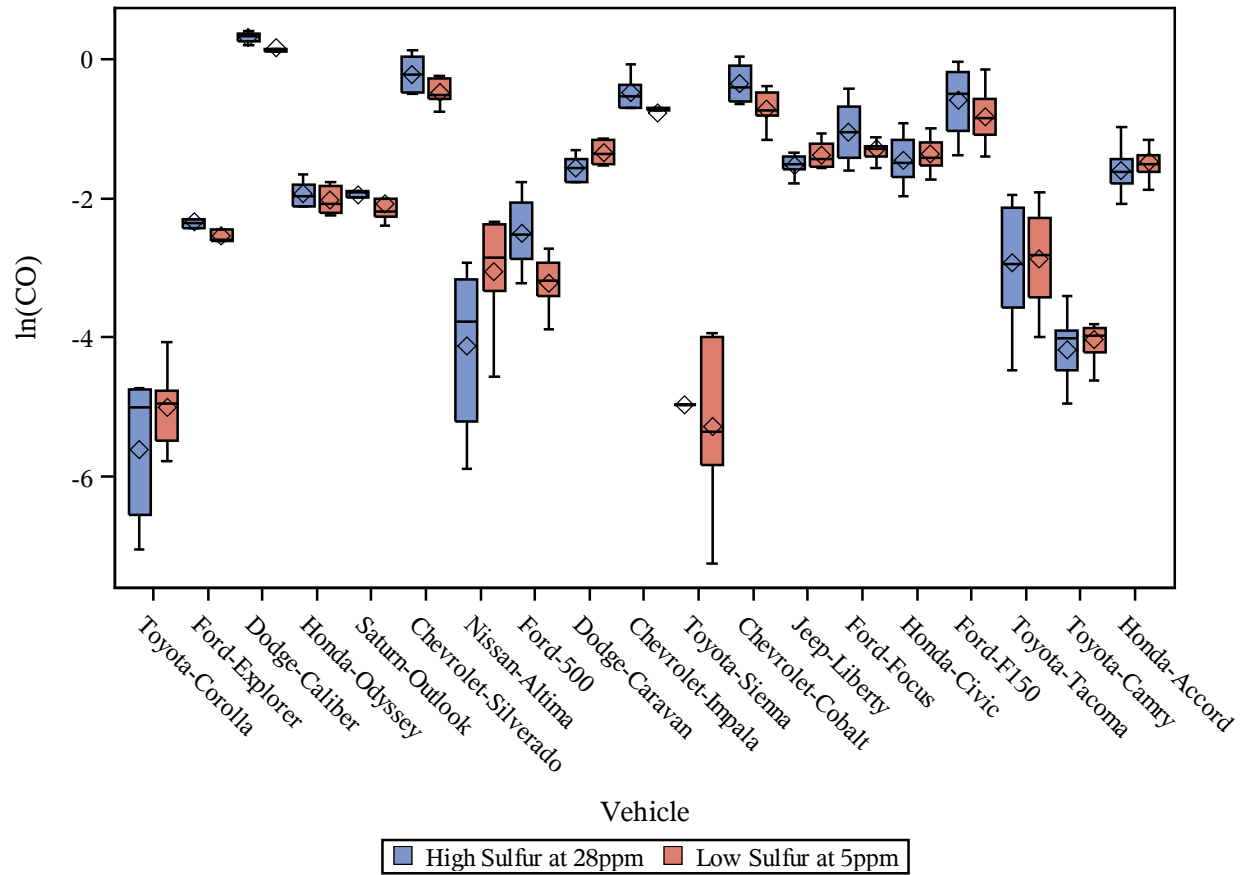
Log-transformed emissions from individual vehicles by sulfur level (CO Bag 1)



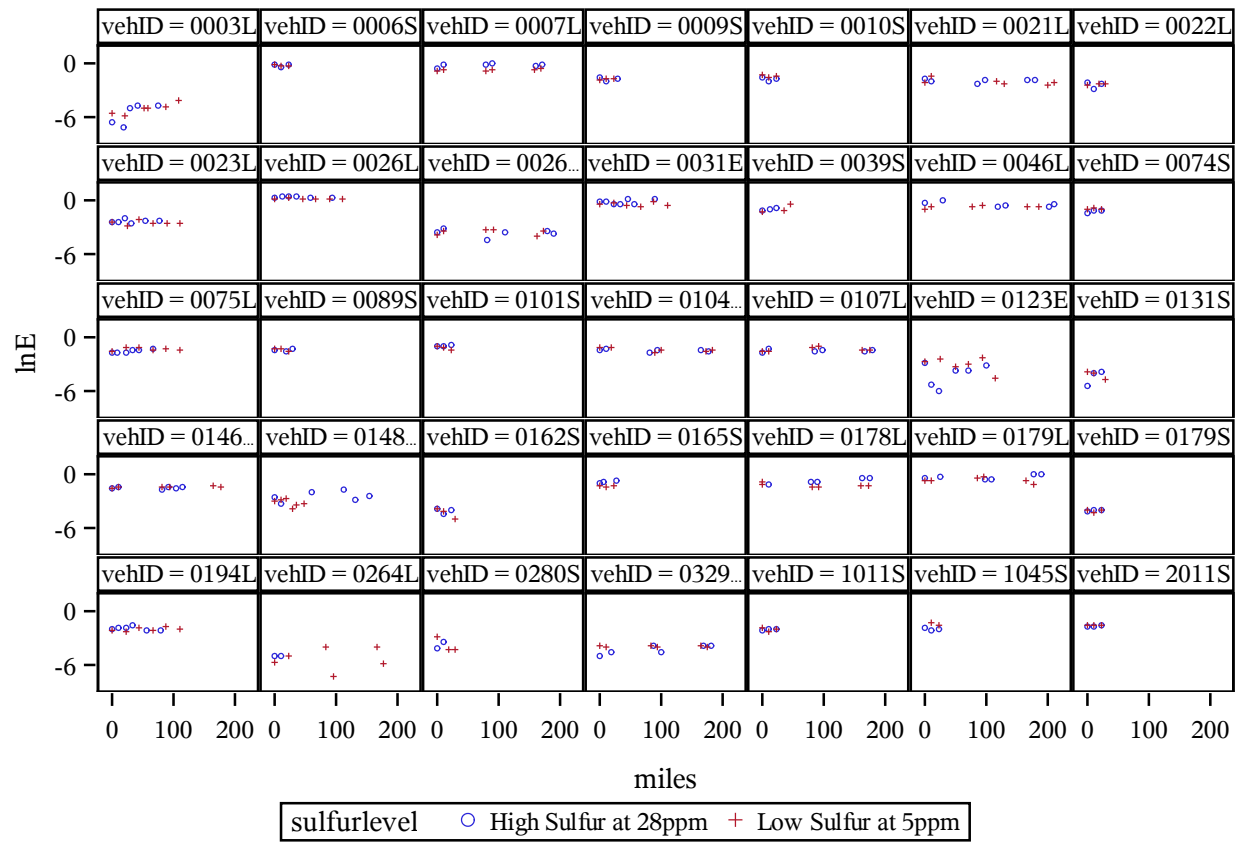
CO Bag 1: Data vs Predicted



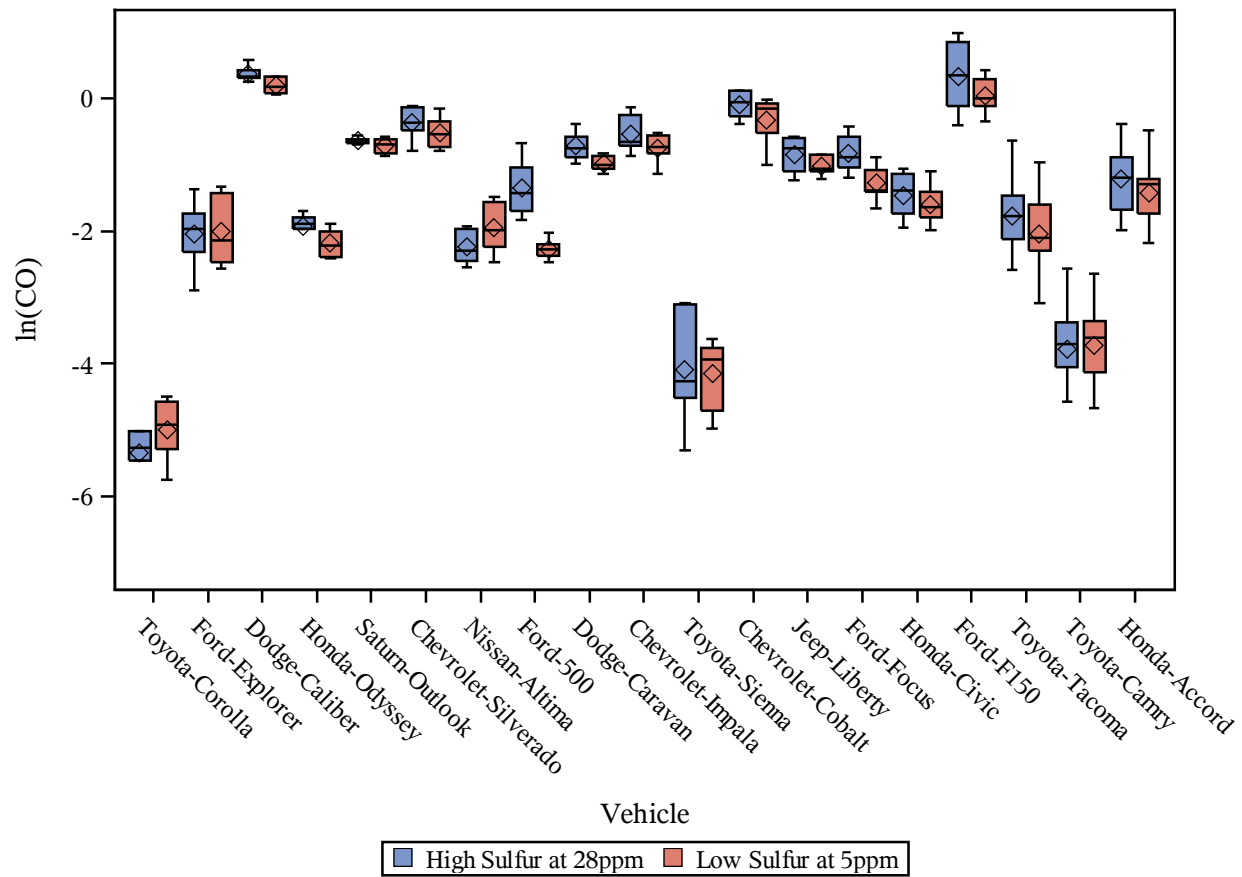
Box plot of individual vehicle families by sulfur level (CO Bag 2)



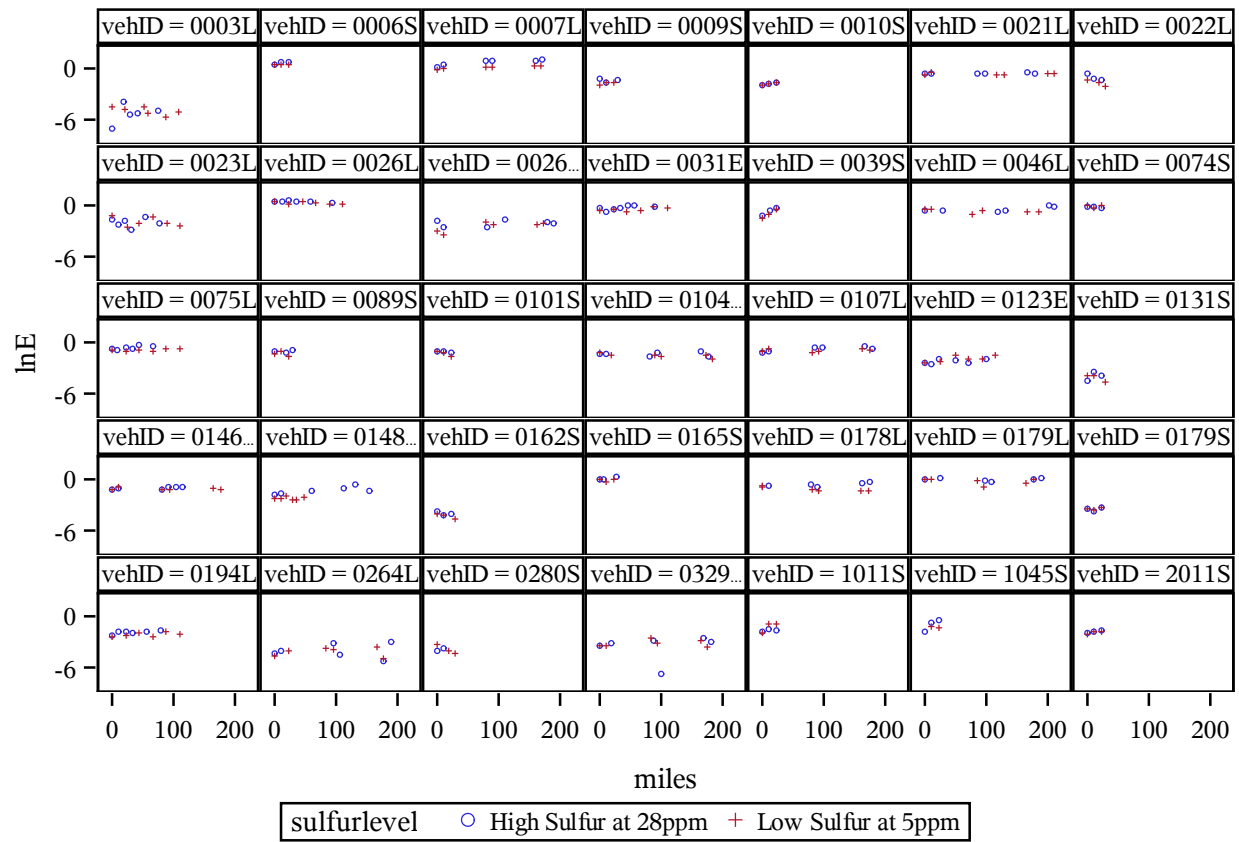
Log-transformed emissions from individual vehicles by sulfur level (CO Bag 2)



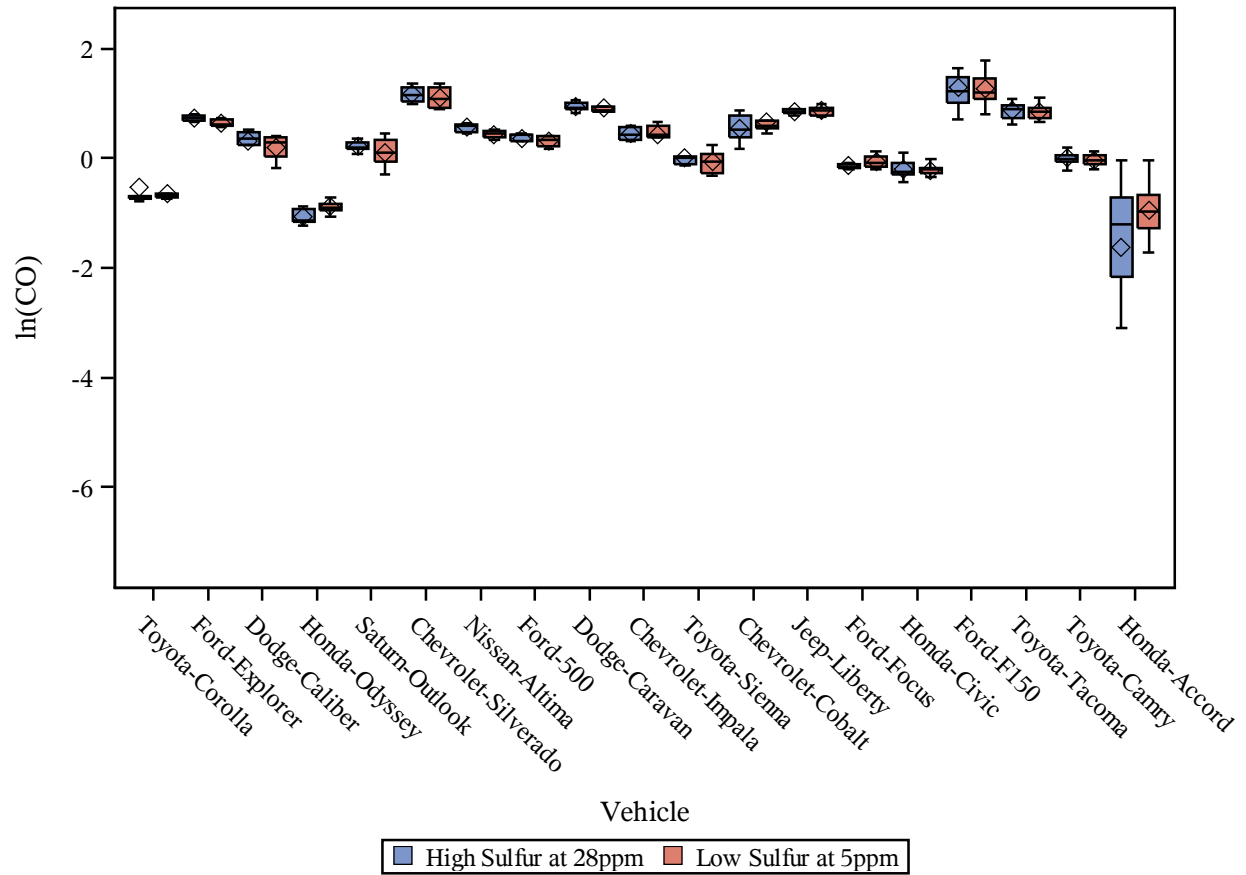
Box plot of individual vehicle families by sulfur level (CO Bag 3)



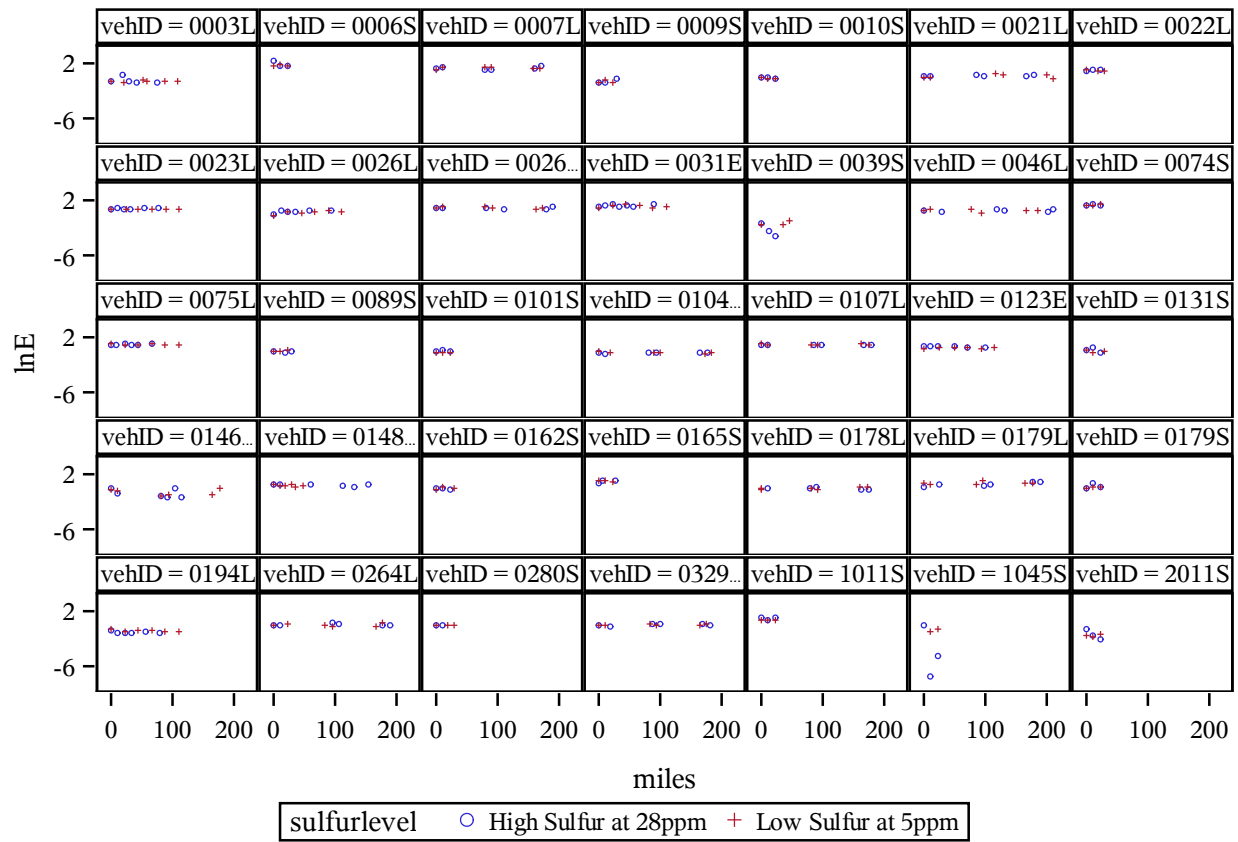
Log-transformed emissions from individual vehicles by sulfur level (CO Bag 3)



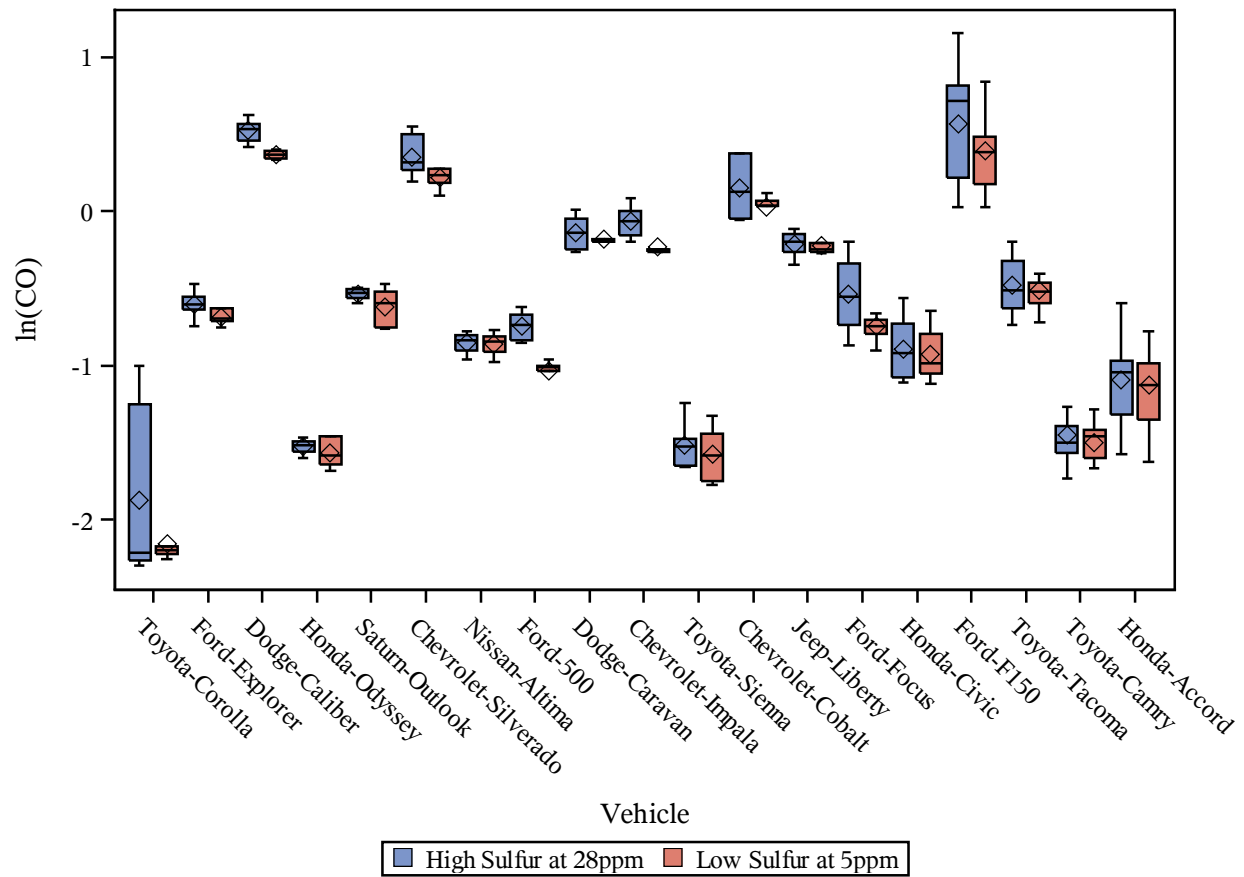
Box plot of individual vehicle families by sulfur level (CO Bag1-Bag3)



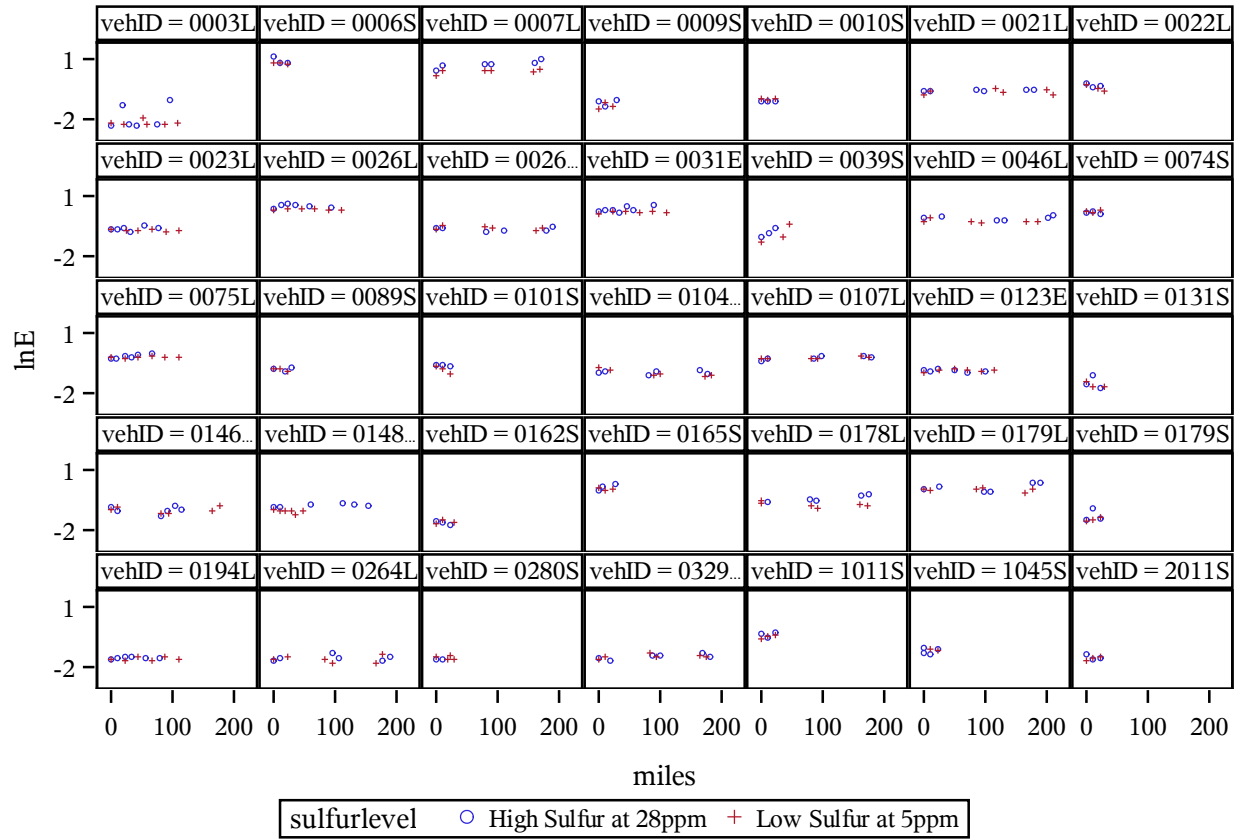
Log-transformed emissions from individual vehicles by sulfur level (CO Bag1-Bag3)



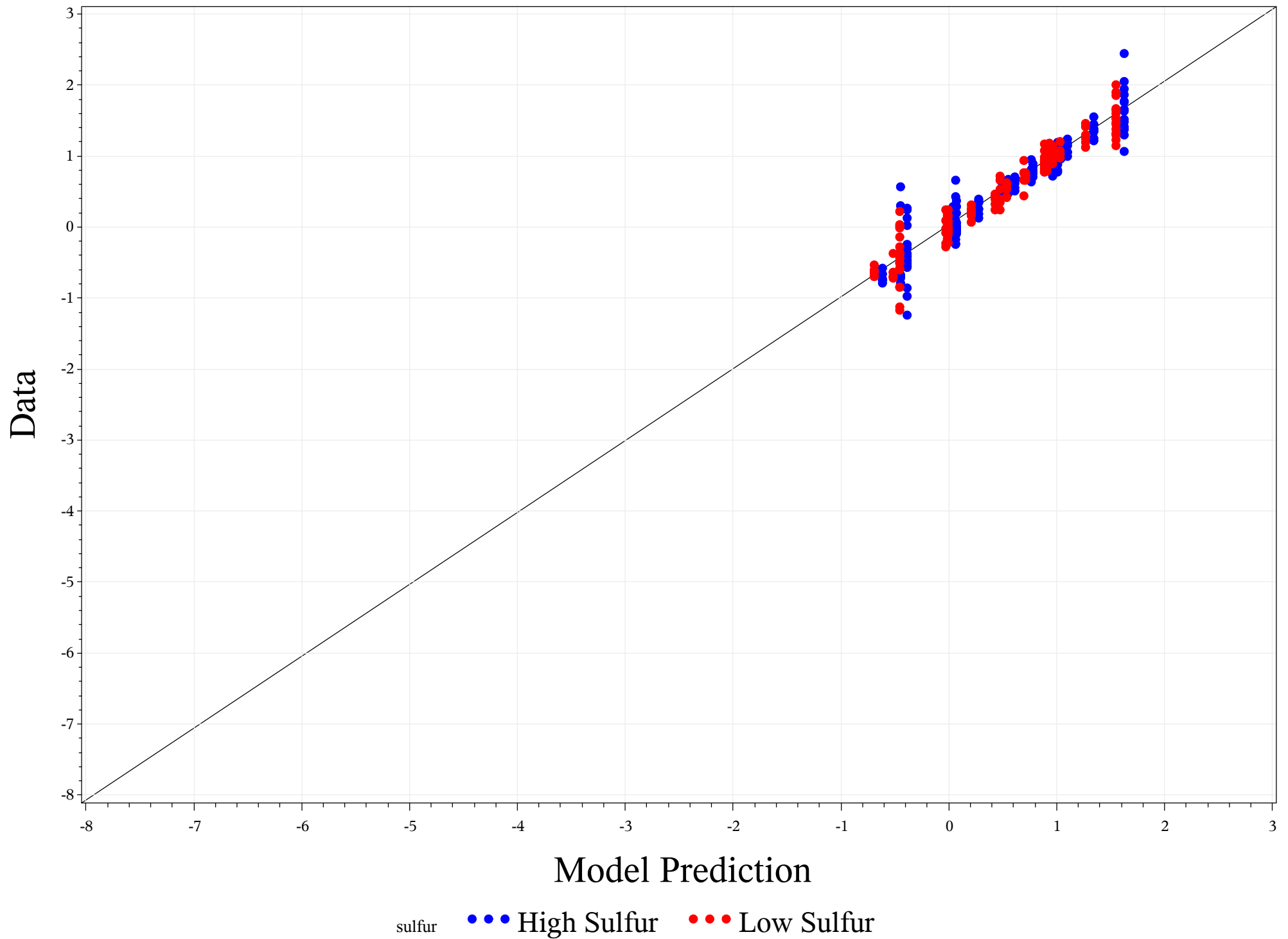
Box plot of individual vehicle families by sulfur level (Wtd CO)



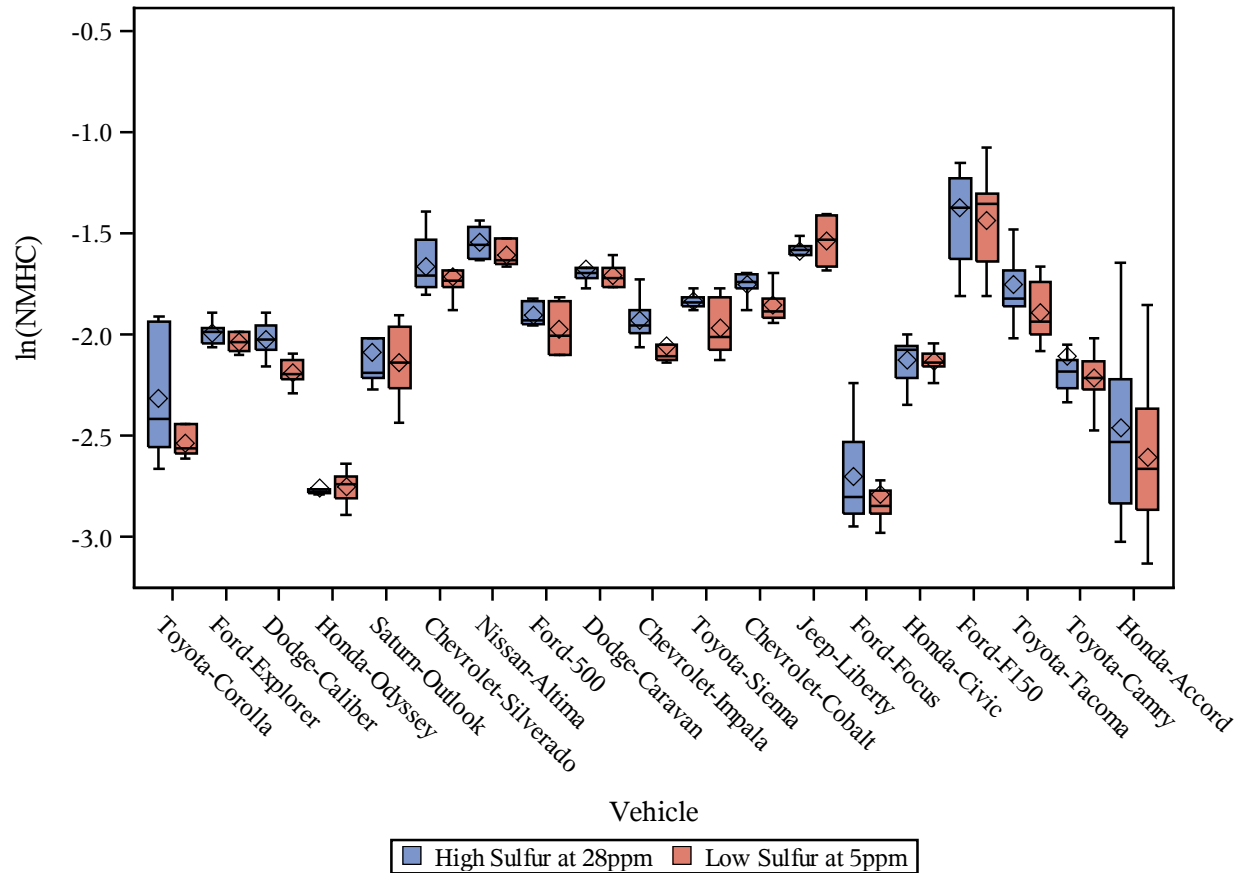
Log-transformed emissions from individual vehicles by sulfur level (Wtd CO)



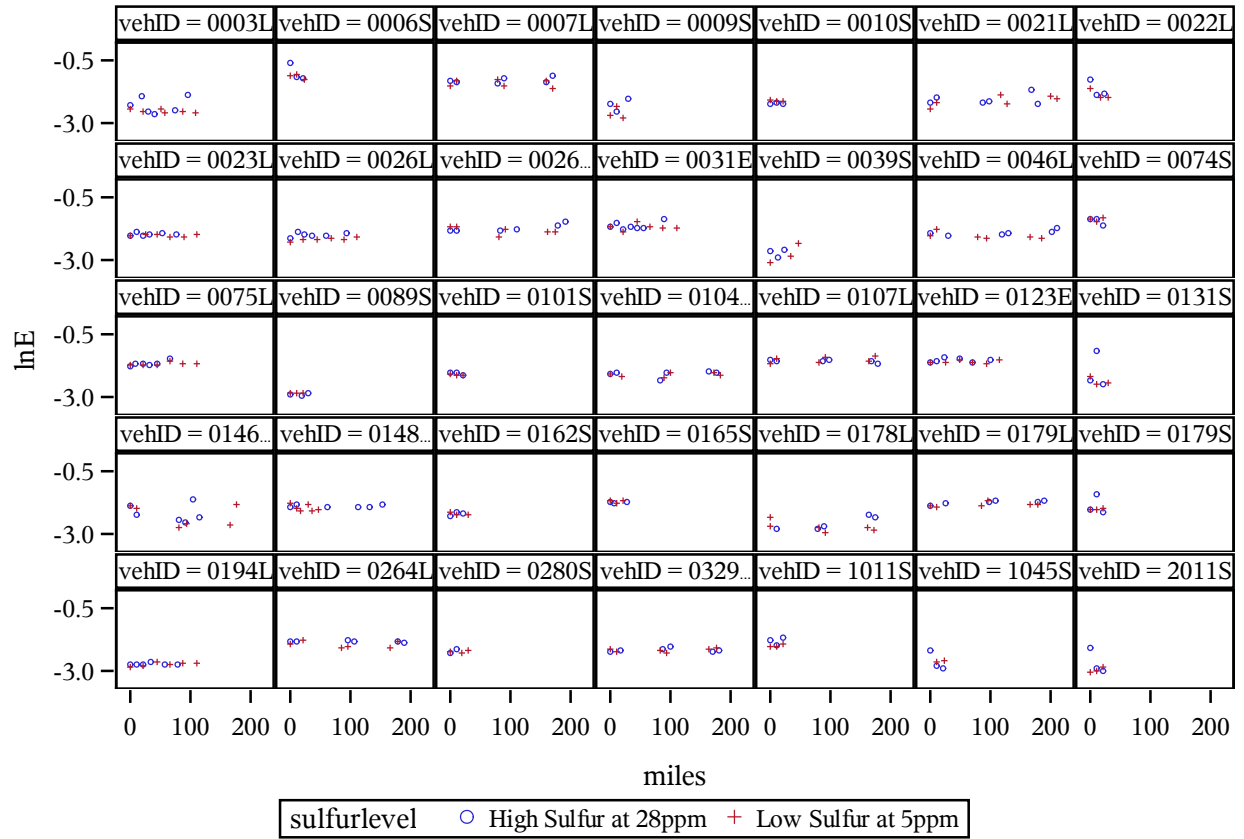
Wtd CO: Data vs Predicted



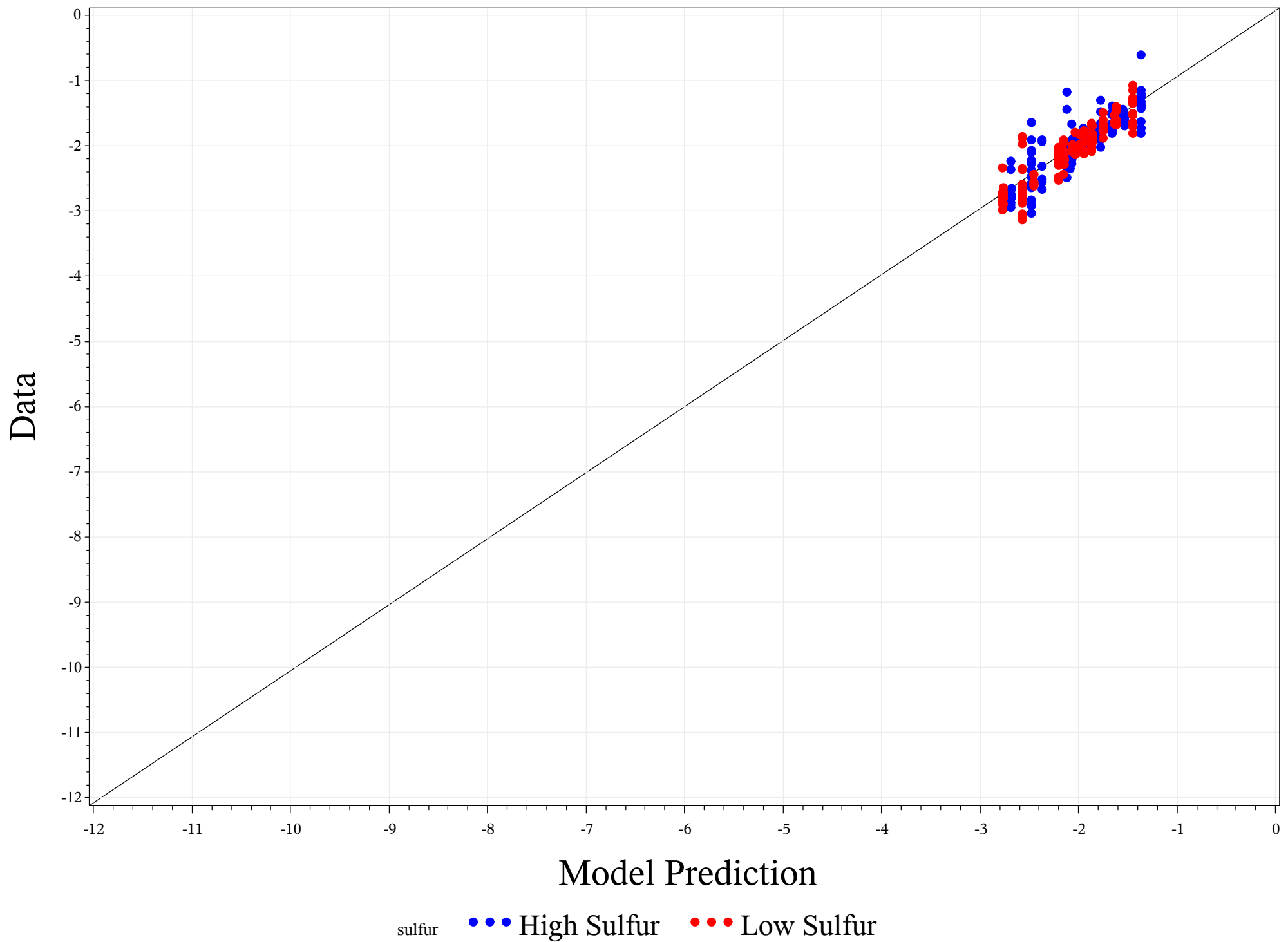
Box plot of individual vehicle families by sulfur level (NMHC Bag 1)



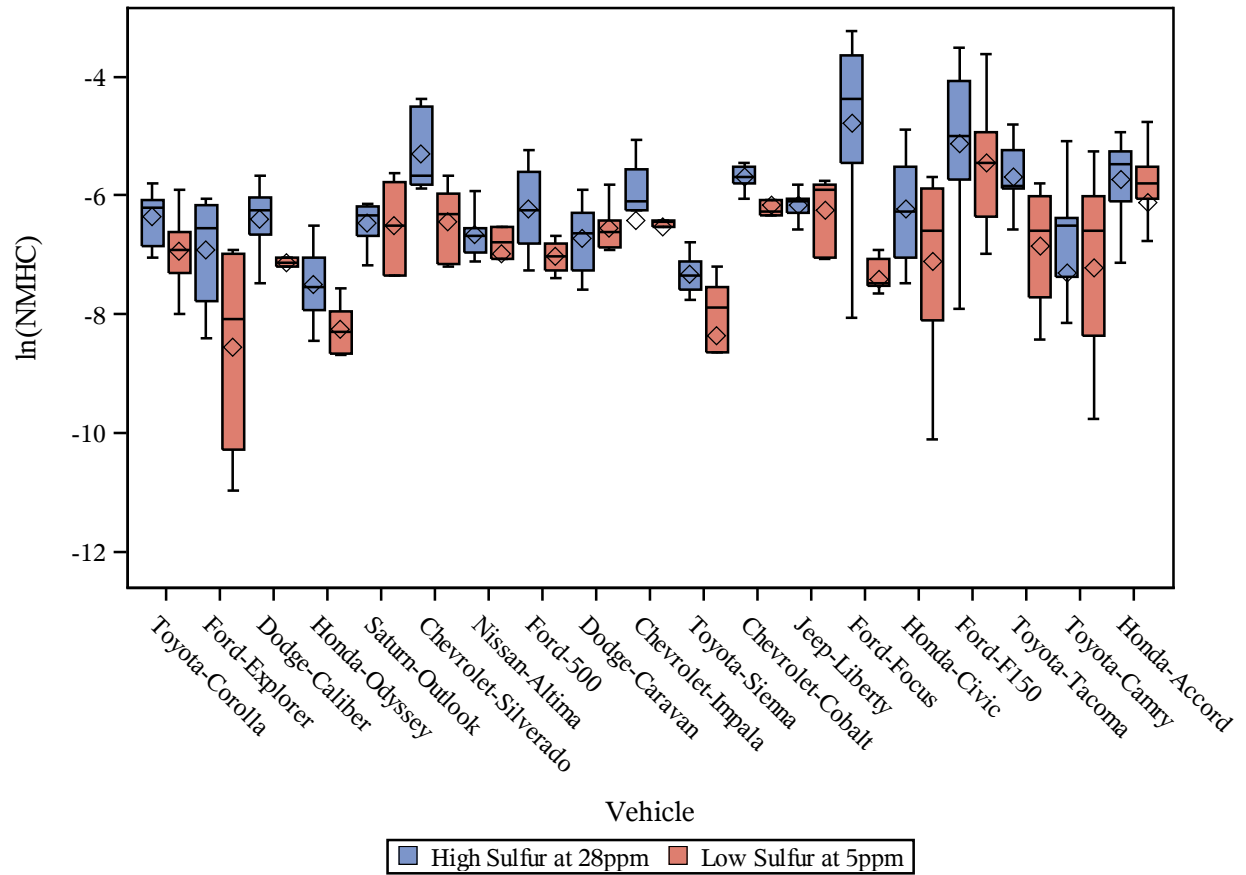
Log-transformed emissions from individual vehicles by sulfur level (NMHC Bag 1)



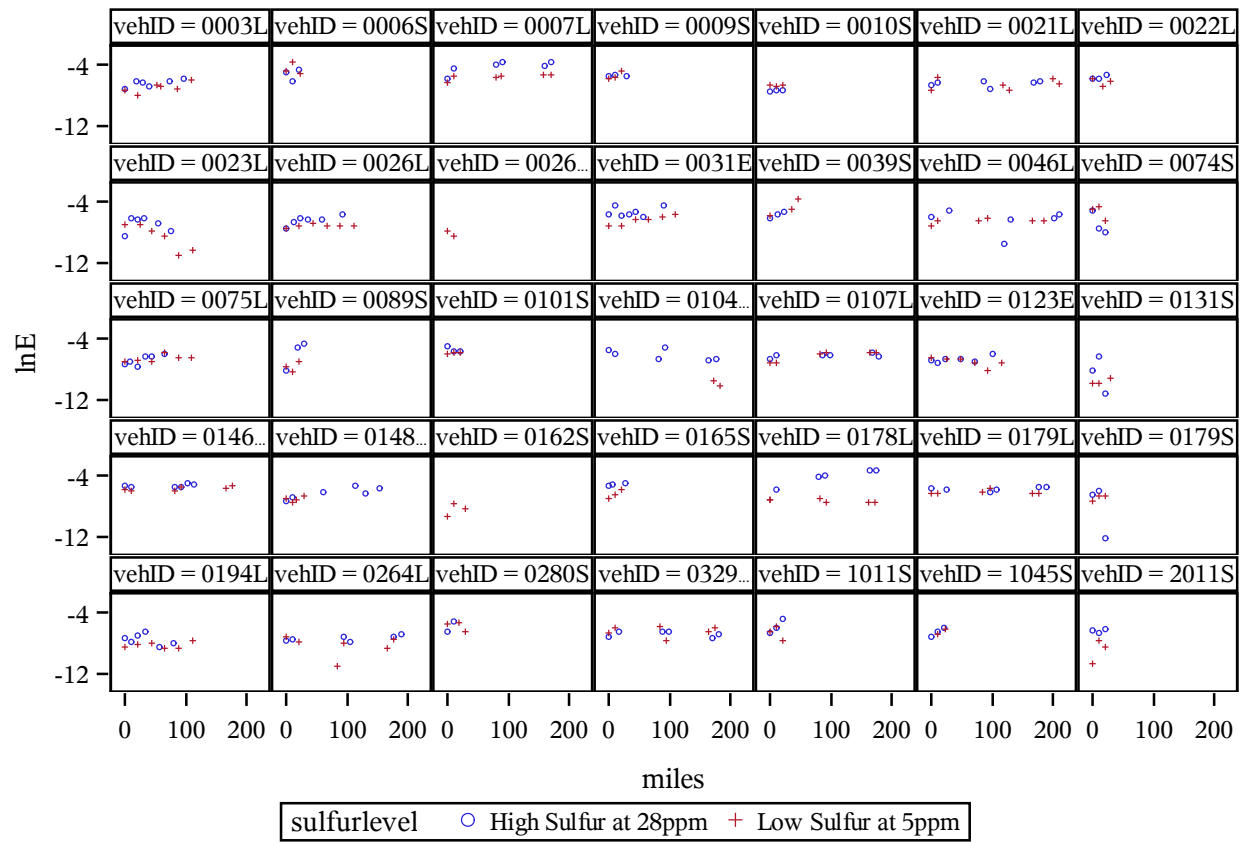
NMHC Bag 1: Data vs Predicted



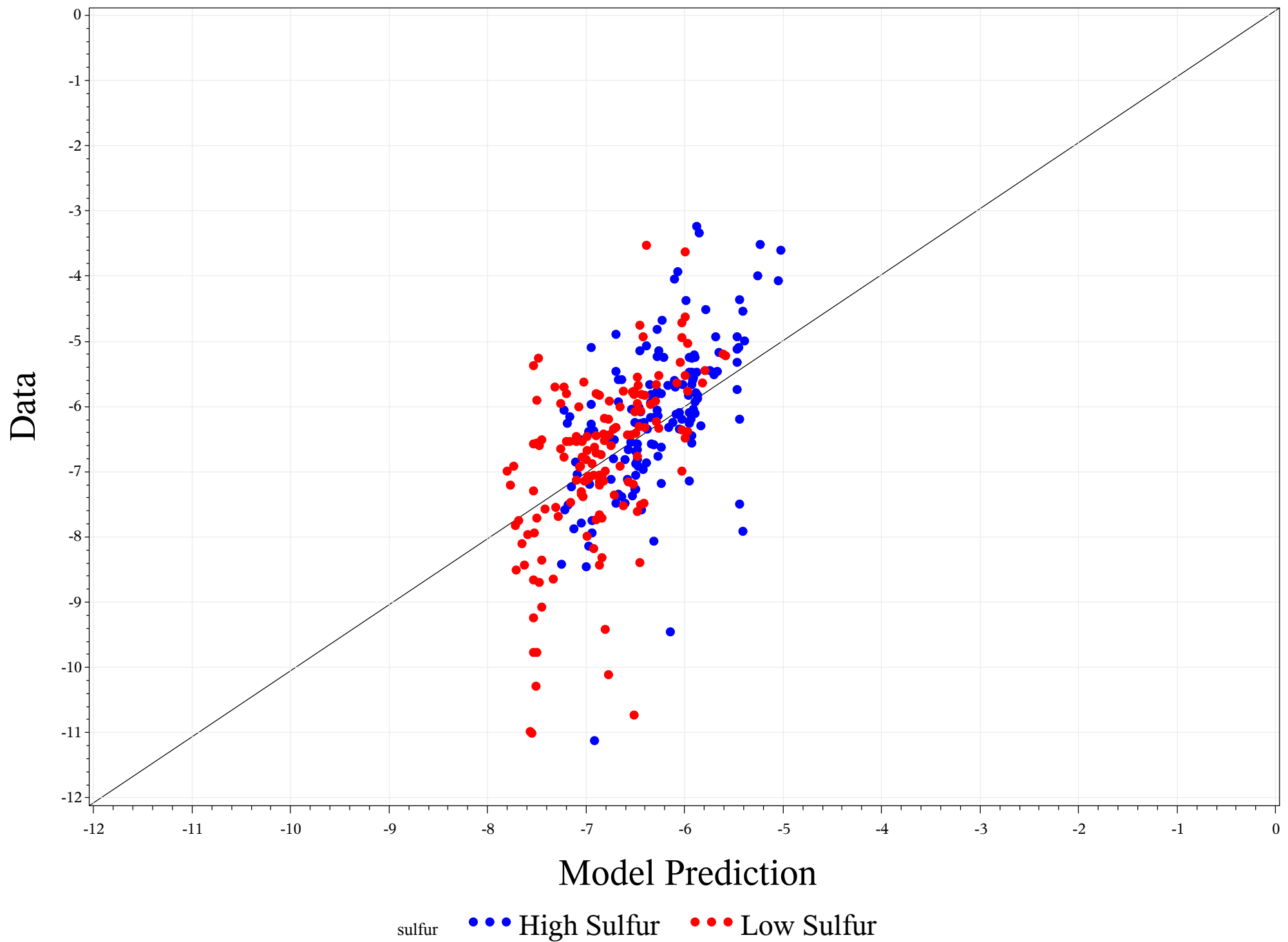
Box plot of individual vehicle families by sulfur level (NMHC Bag 2)



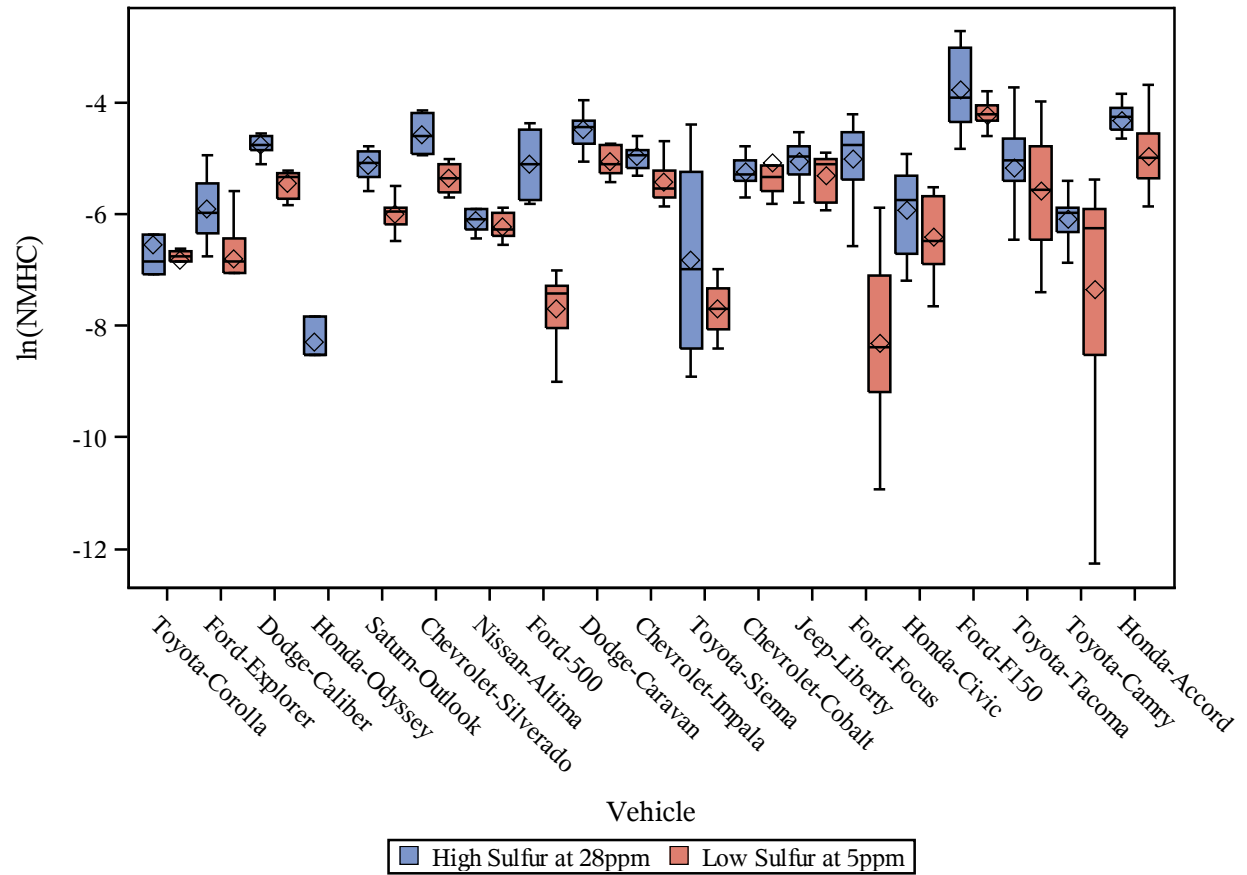
Log-transformed emissions from individual vehicles by sulfur level (NMHC Bag 2)



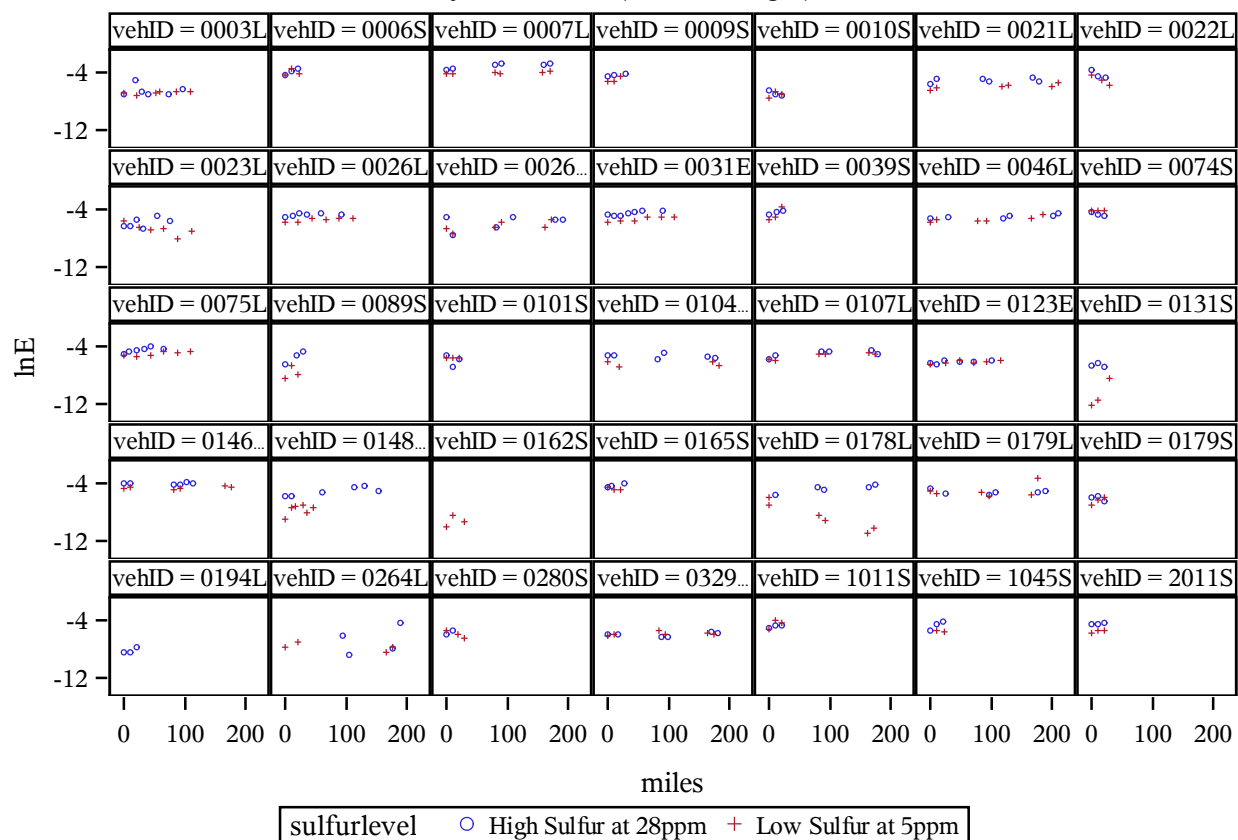
NMHC Bag 2: Data vs Predicted



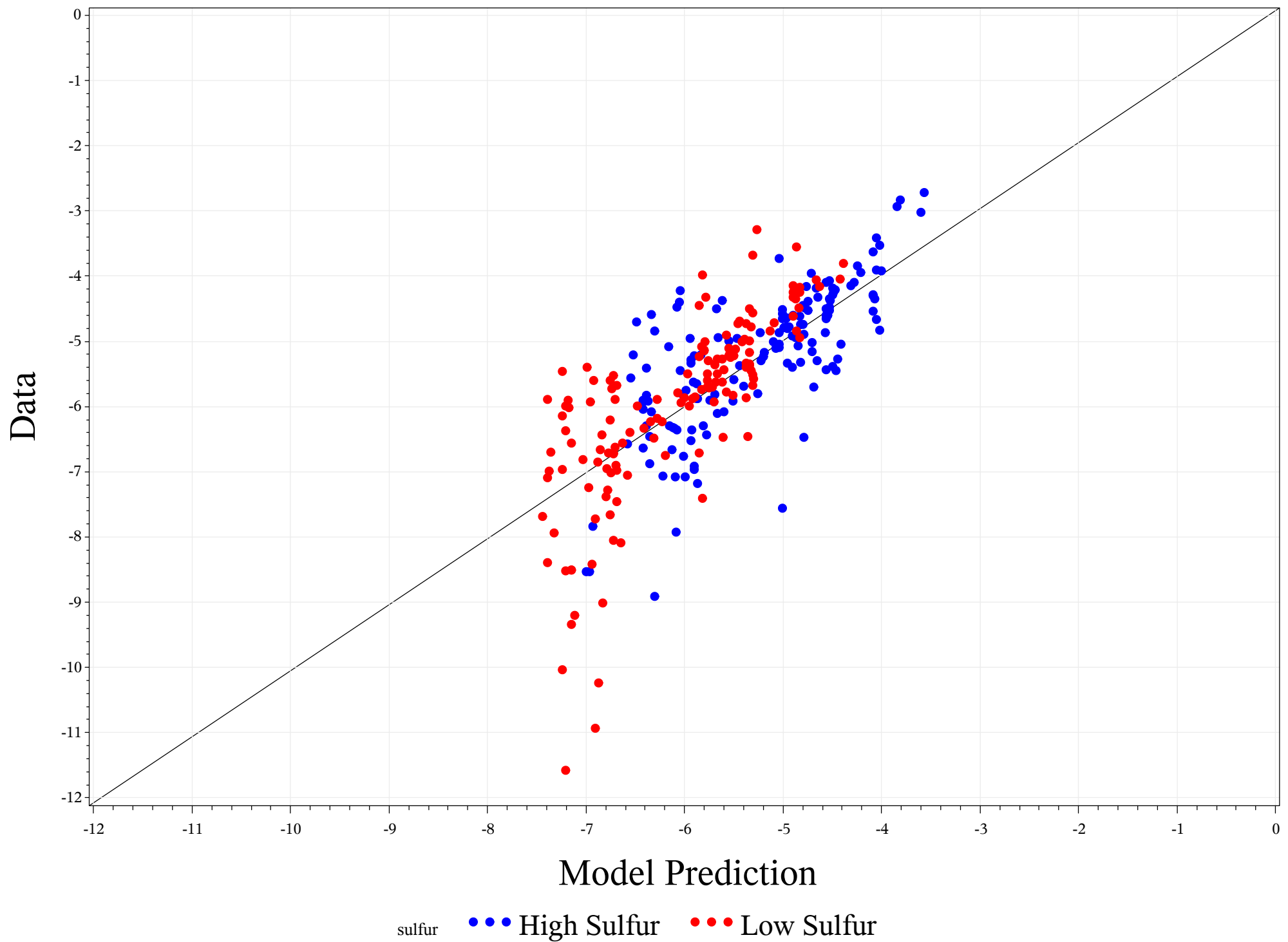
Box plot of individual vehicle families by sulfur level (NMHC Bag 3)



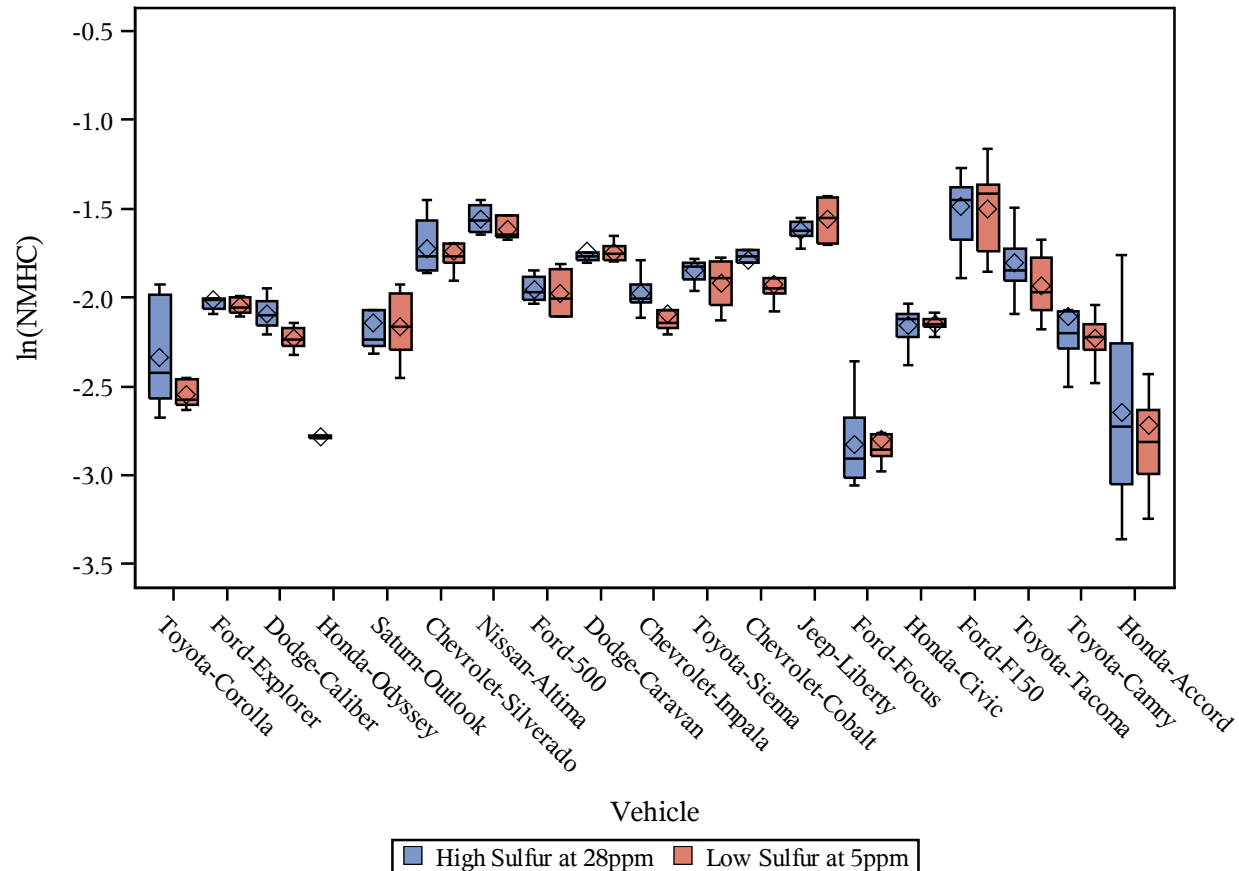
Log-transformed emissions from individual vehicles by sulfur level (NMHC Bag 3)



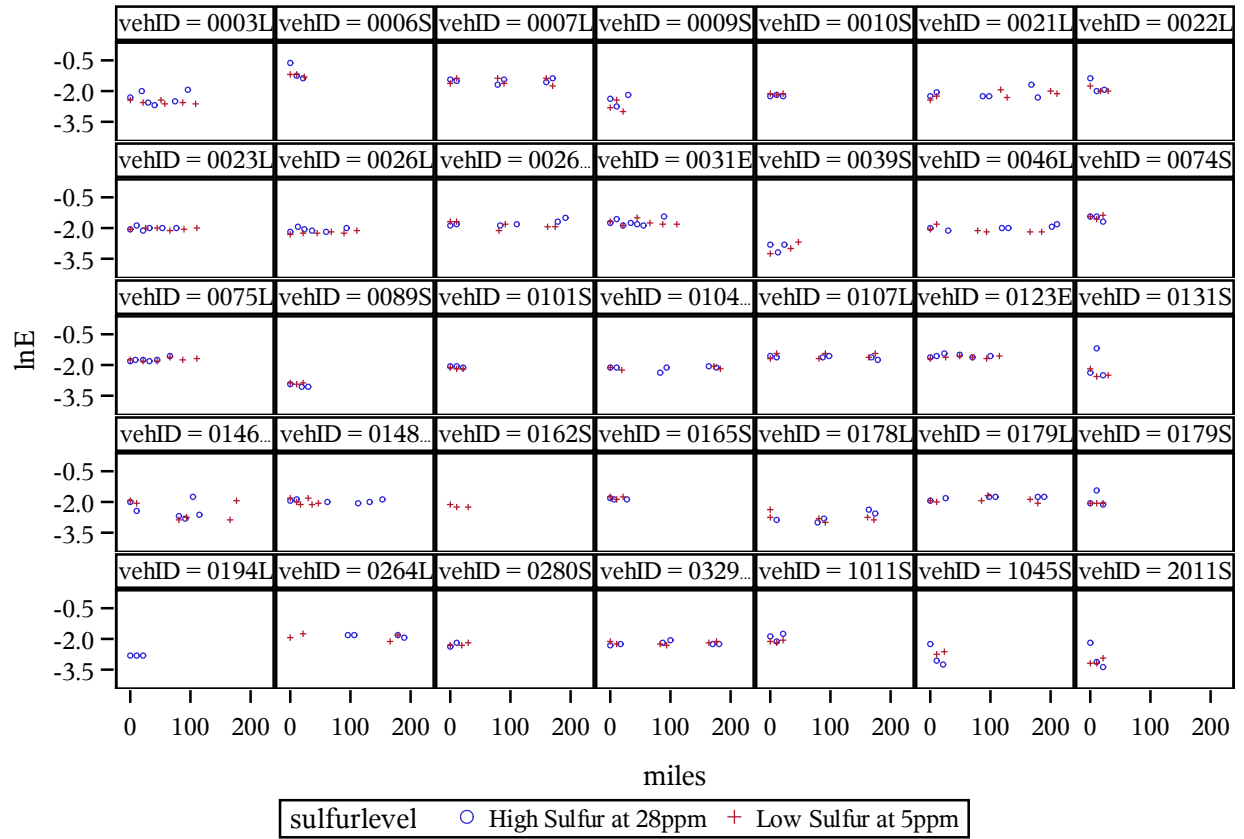
NMHC Bag 3: Data vs Predicted



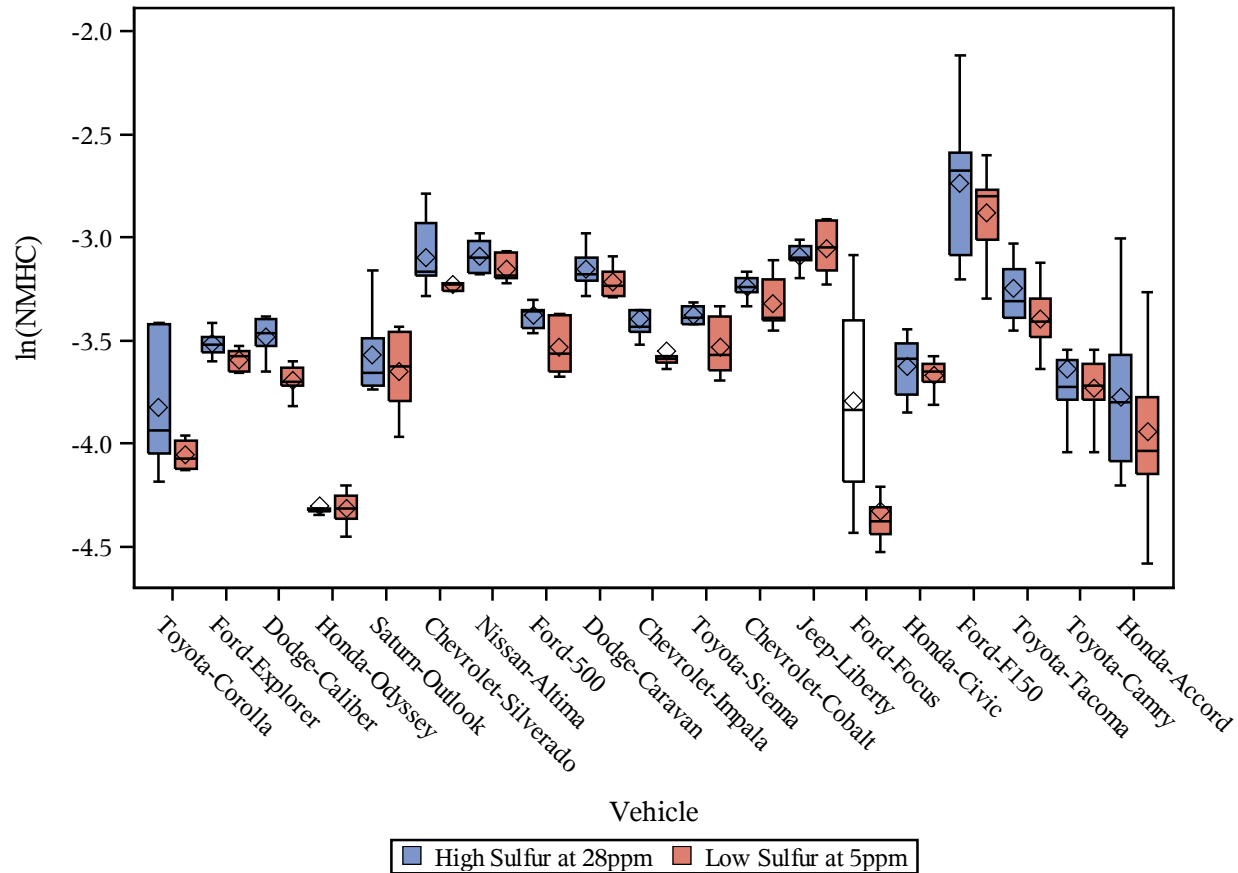
Box plot of individual vehicle families by sulfur level (NMHC Bag1-Bag3)



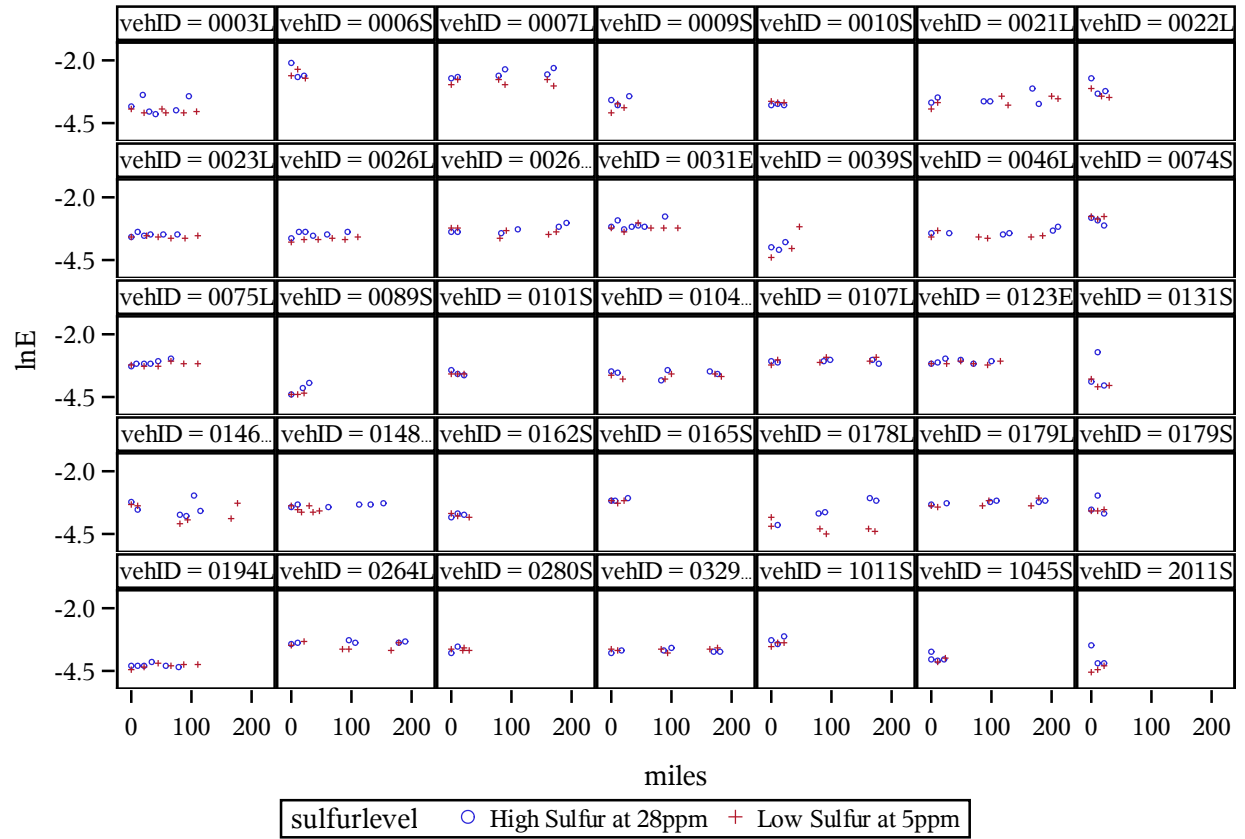
Log-transformed emissions from individual vehicles by sulfur level (NMHC Bag1-Bag3)



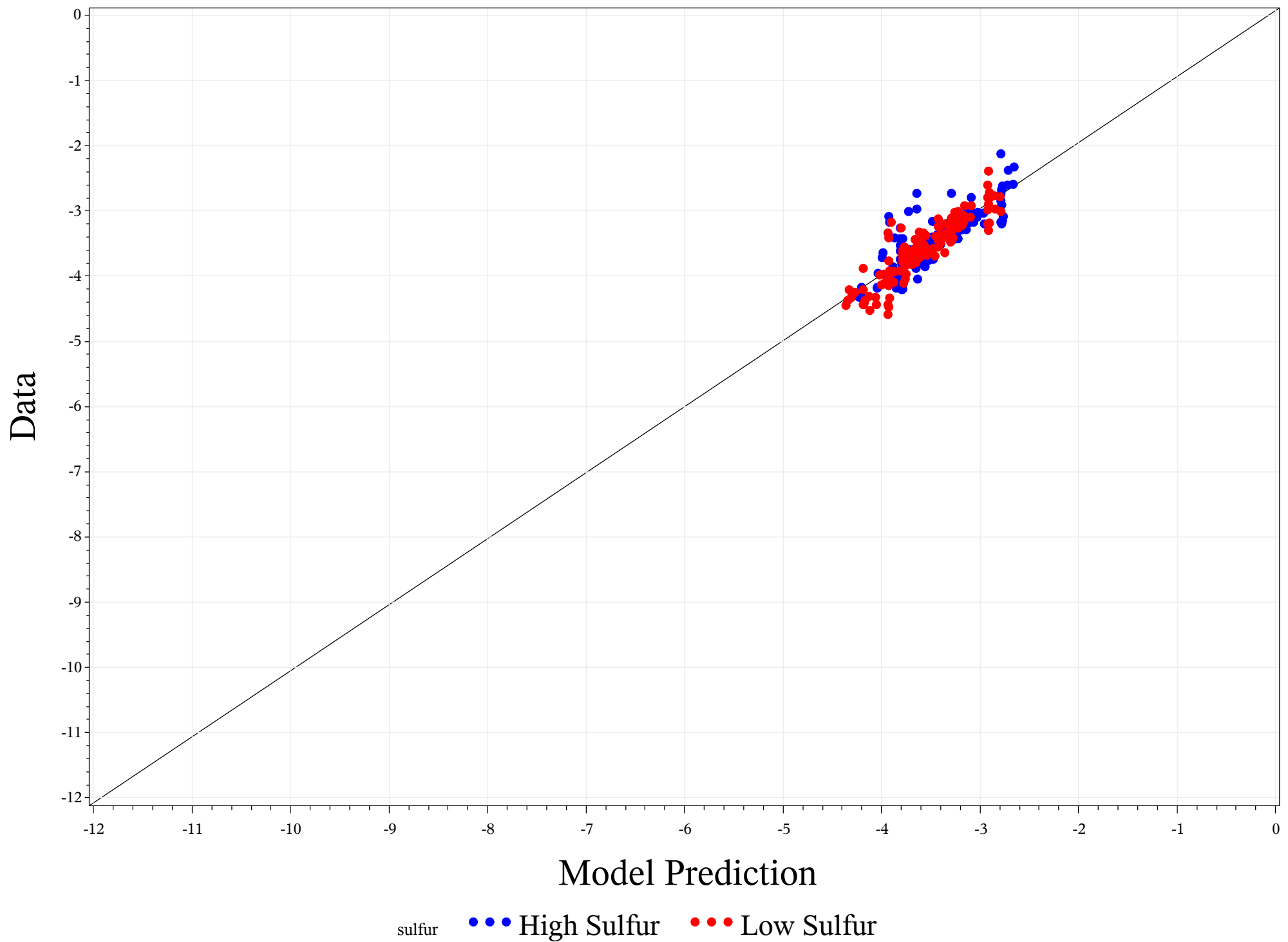
Box plot of individual vehicle families by sulfur level (Wtd NMHC)



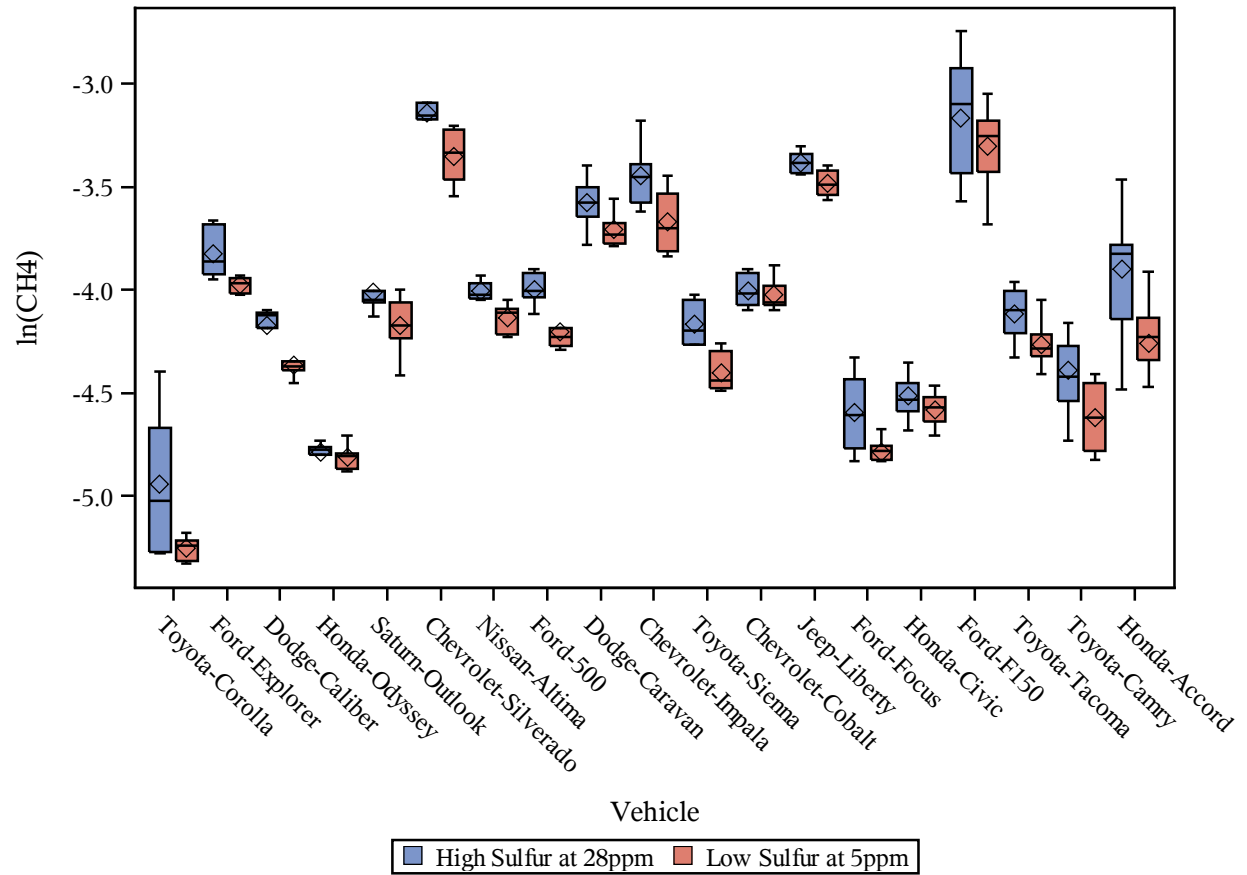
Log-transformed emissions from individual vehicles by sulfur level (Wtd NMHC)



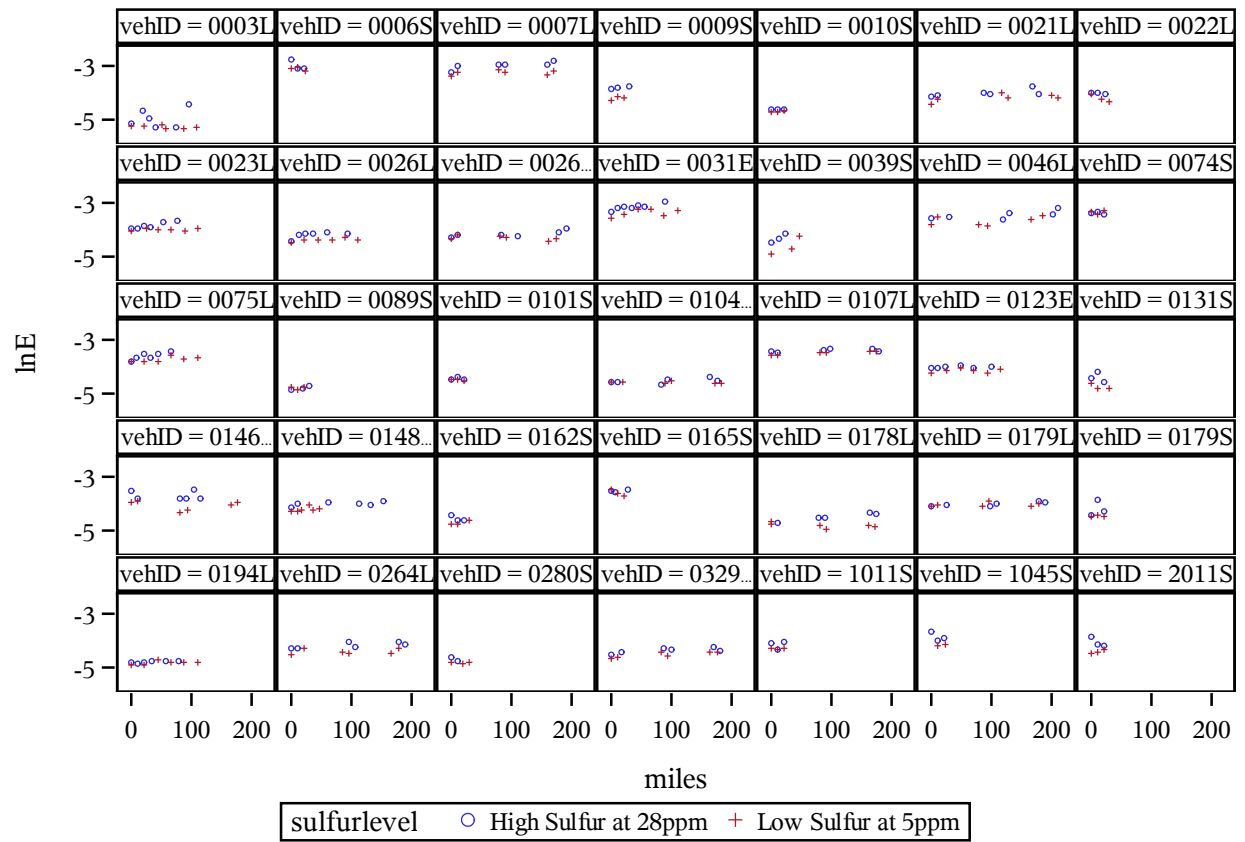
Wtd NMHC: Data vs Predicted



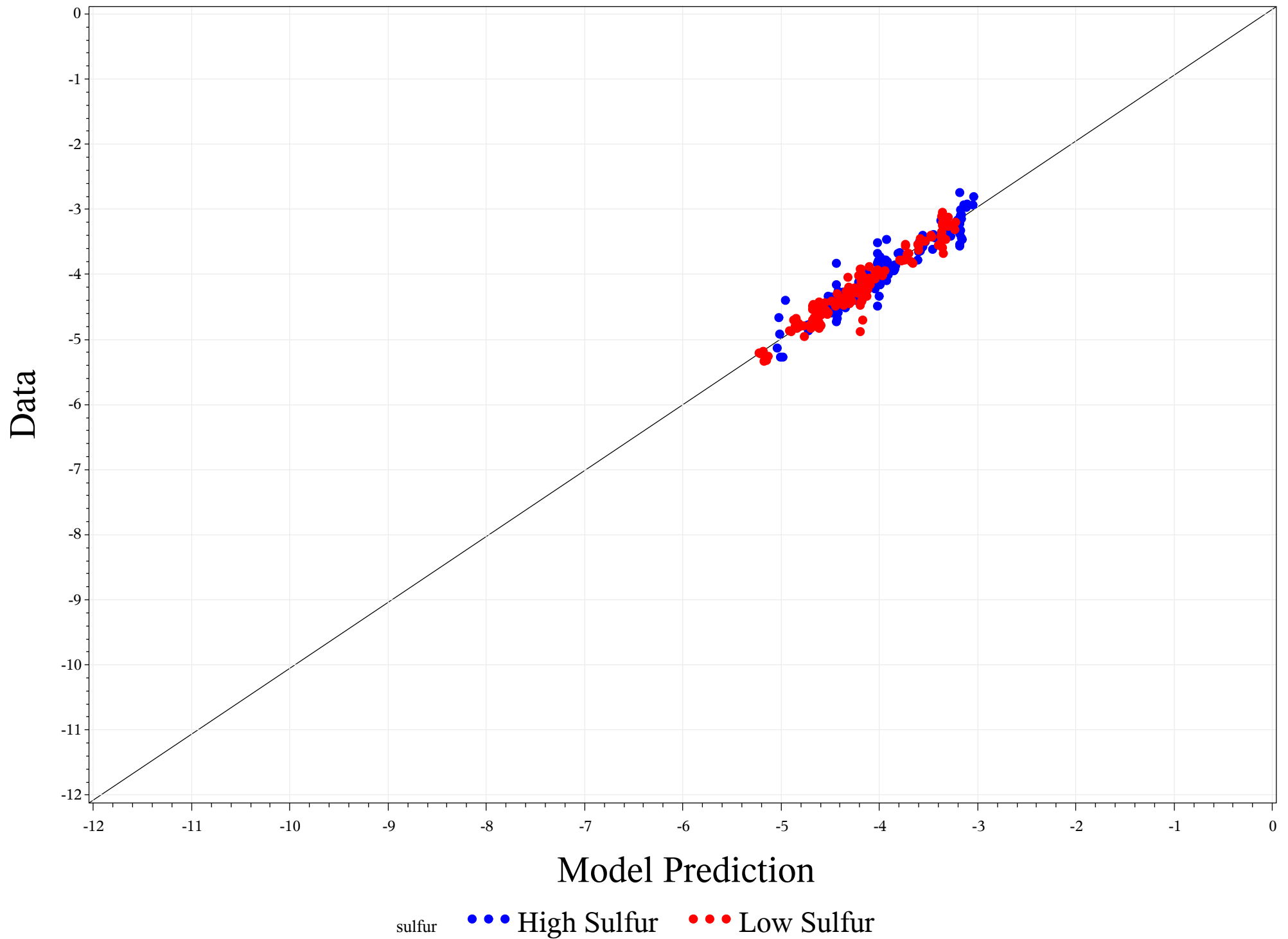
Box plot of individual vehicle families by sulfur level (CH4 Bag 1)



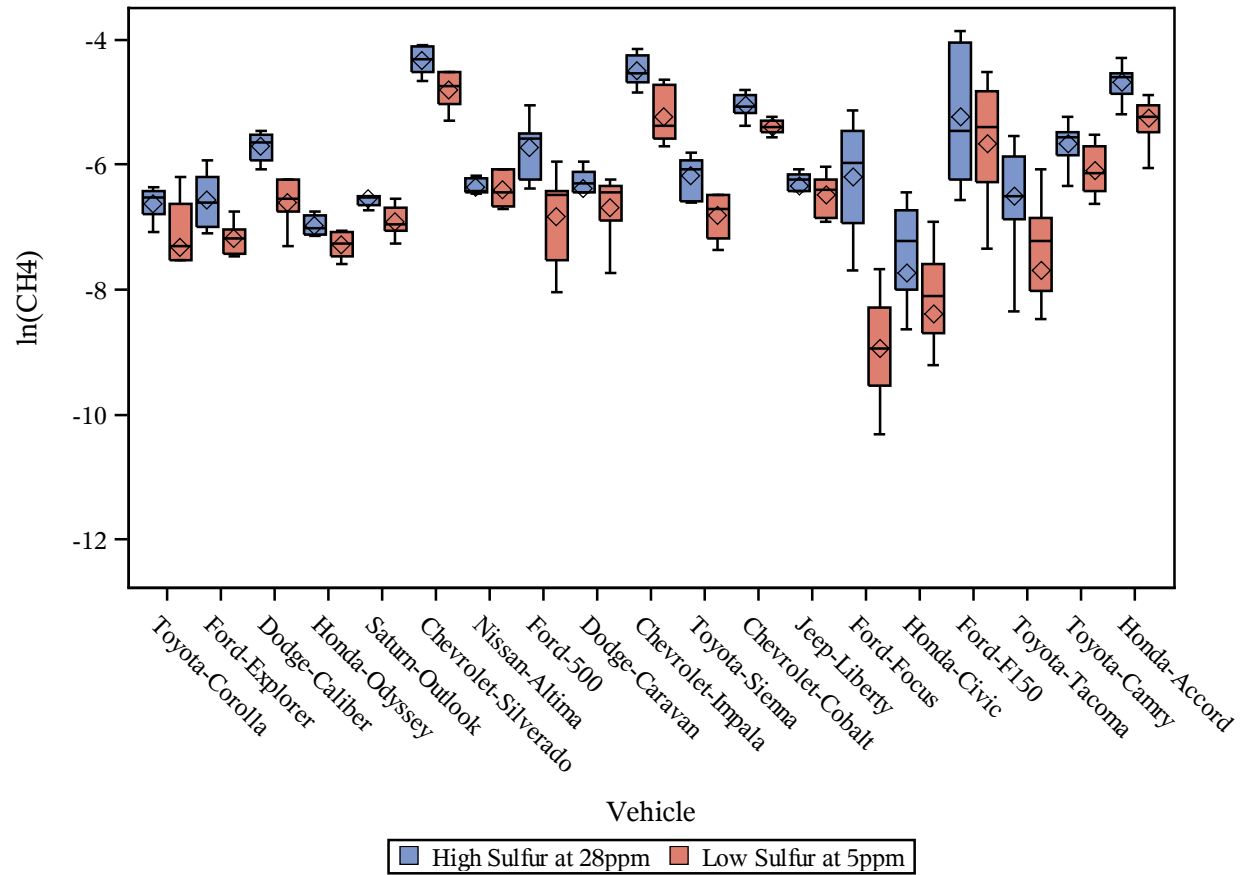
Log-transformed emissions from individual vehicles by sulfur level (CH4 Bag 1)



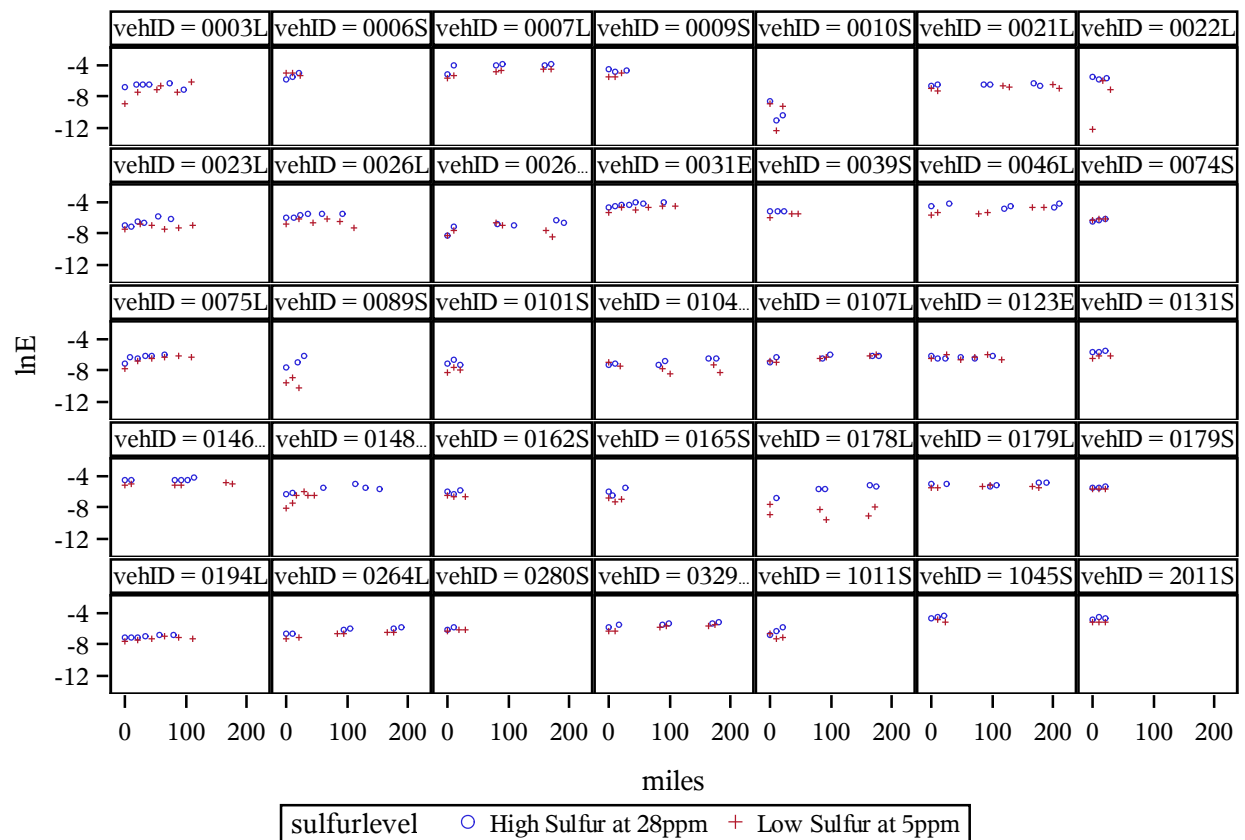
CH4 Bag 1: Data vs Predicted



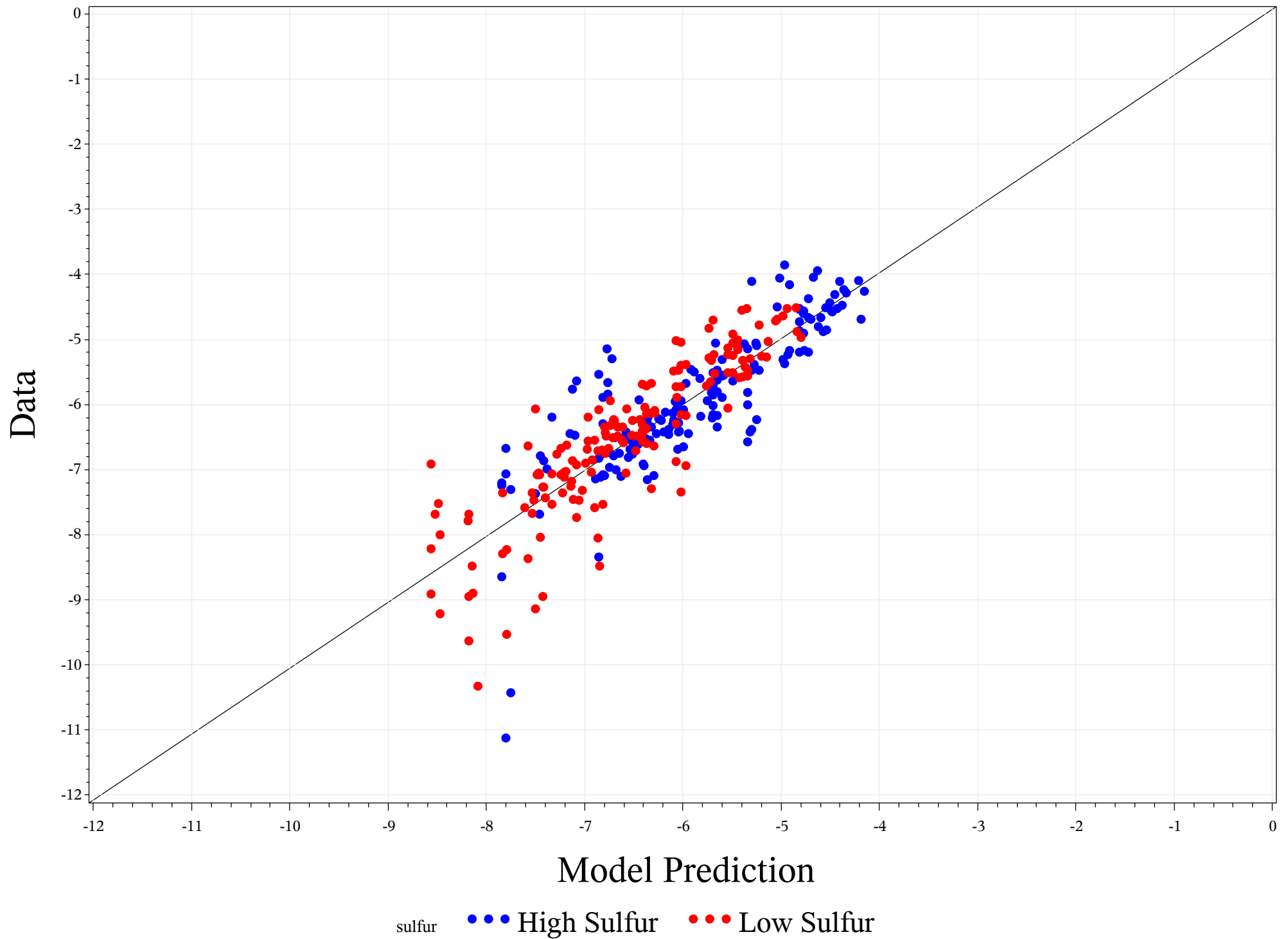
Box plot of individual vehicle families by sulfur level (CH4 Bag 2)



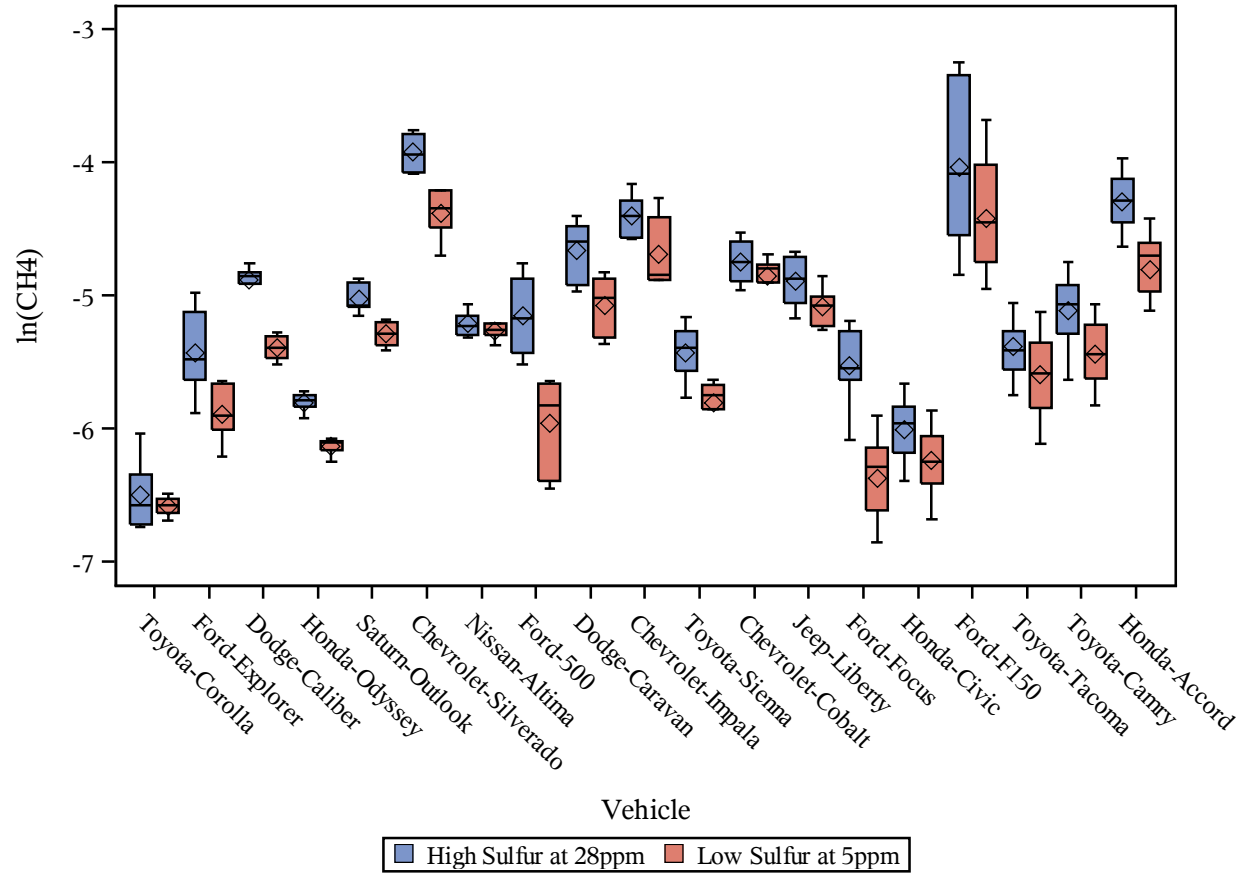
Log-transformed emissions from individual vehicles by sulfur level (CH4 Bag 2)



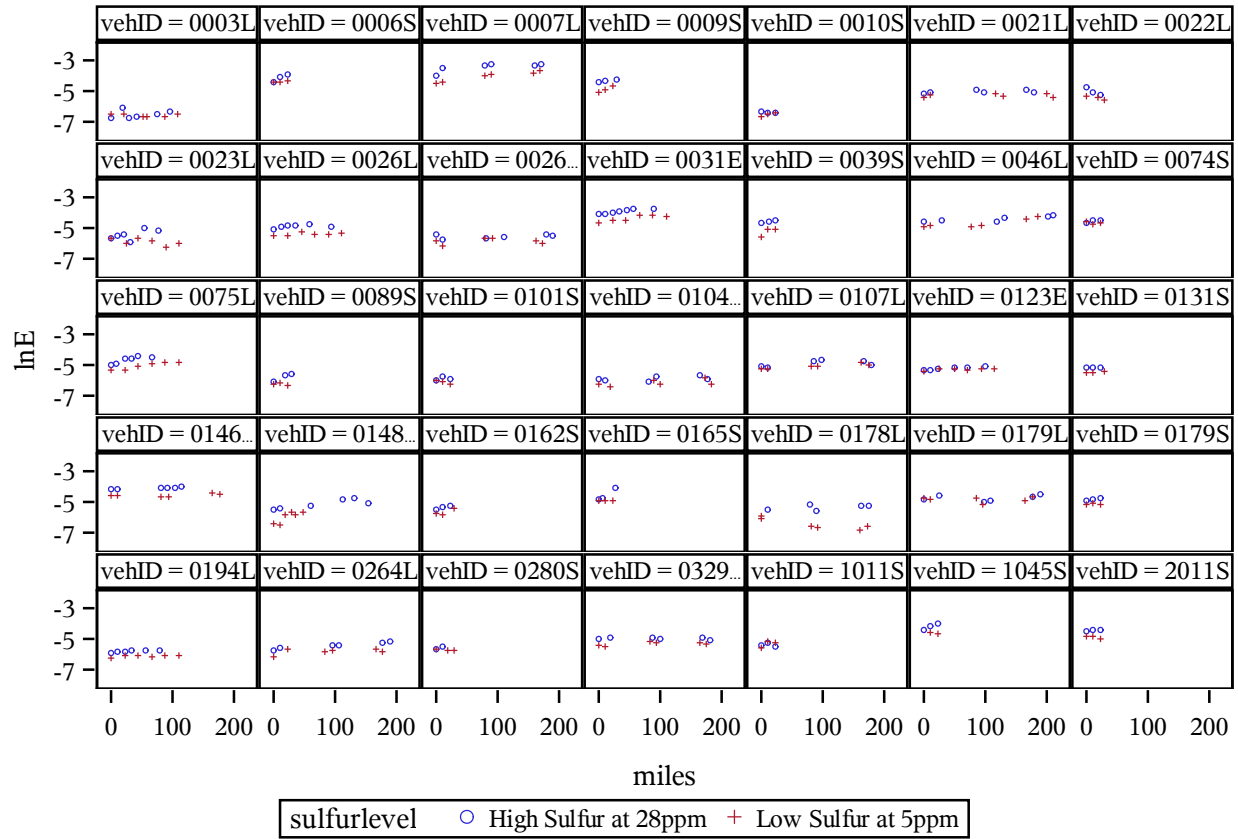
CH4 Bag 2: Data vs Predicted



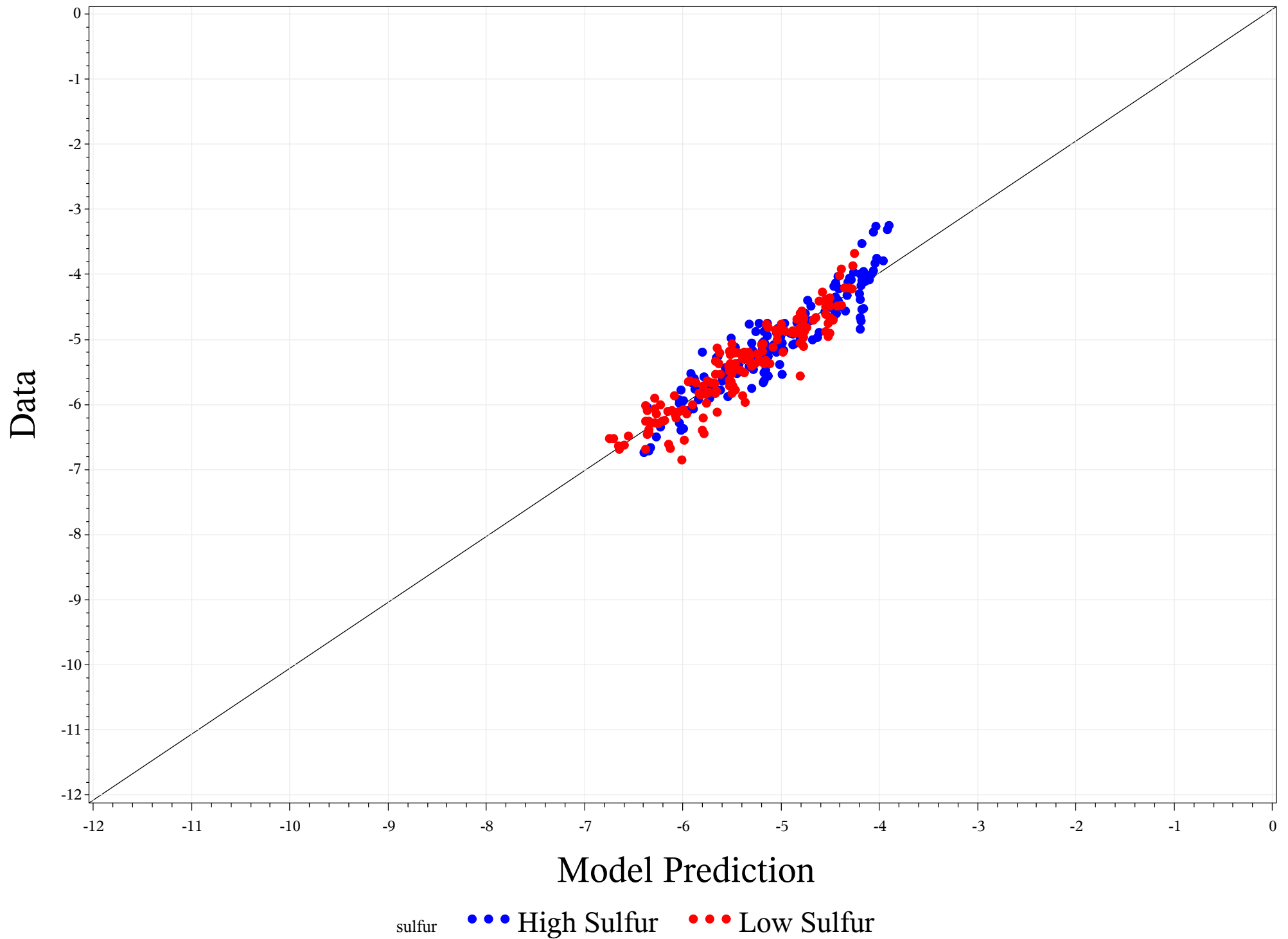
Box plot of individual vehicle families by sulfur level (CH4 Bag 3)



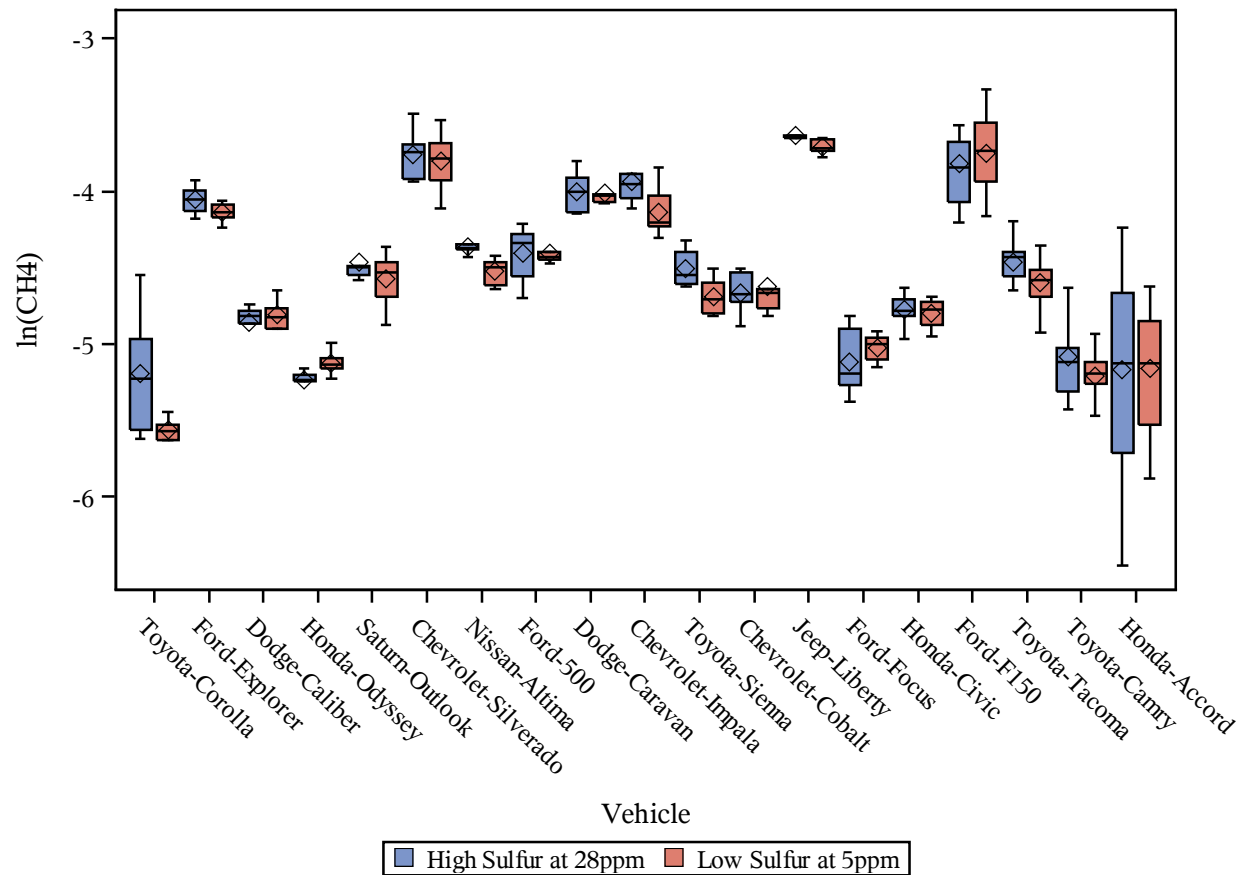
Log-transformed emissions from individual vehicles by sulfur level (CH4 Bag 3)



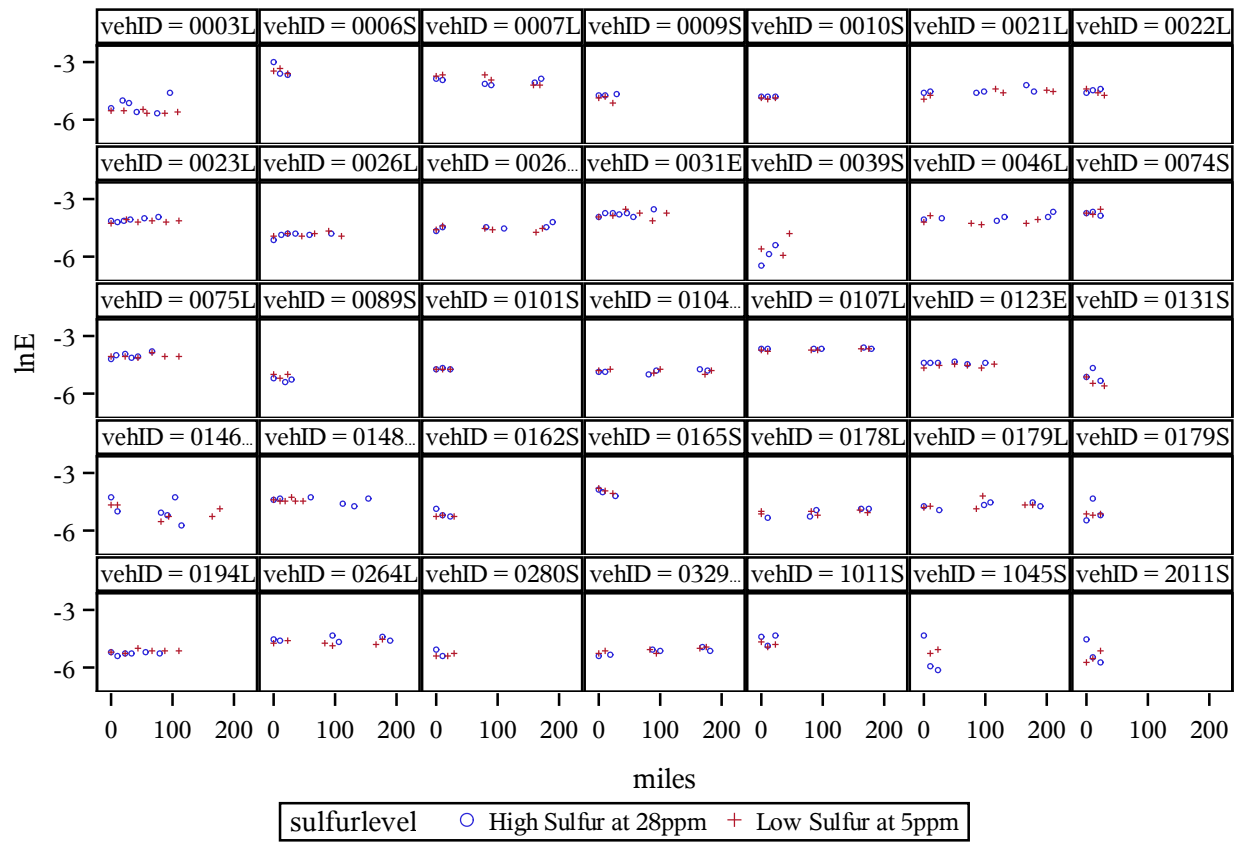
CH4 Bag 3: Data vs Predicted



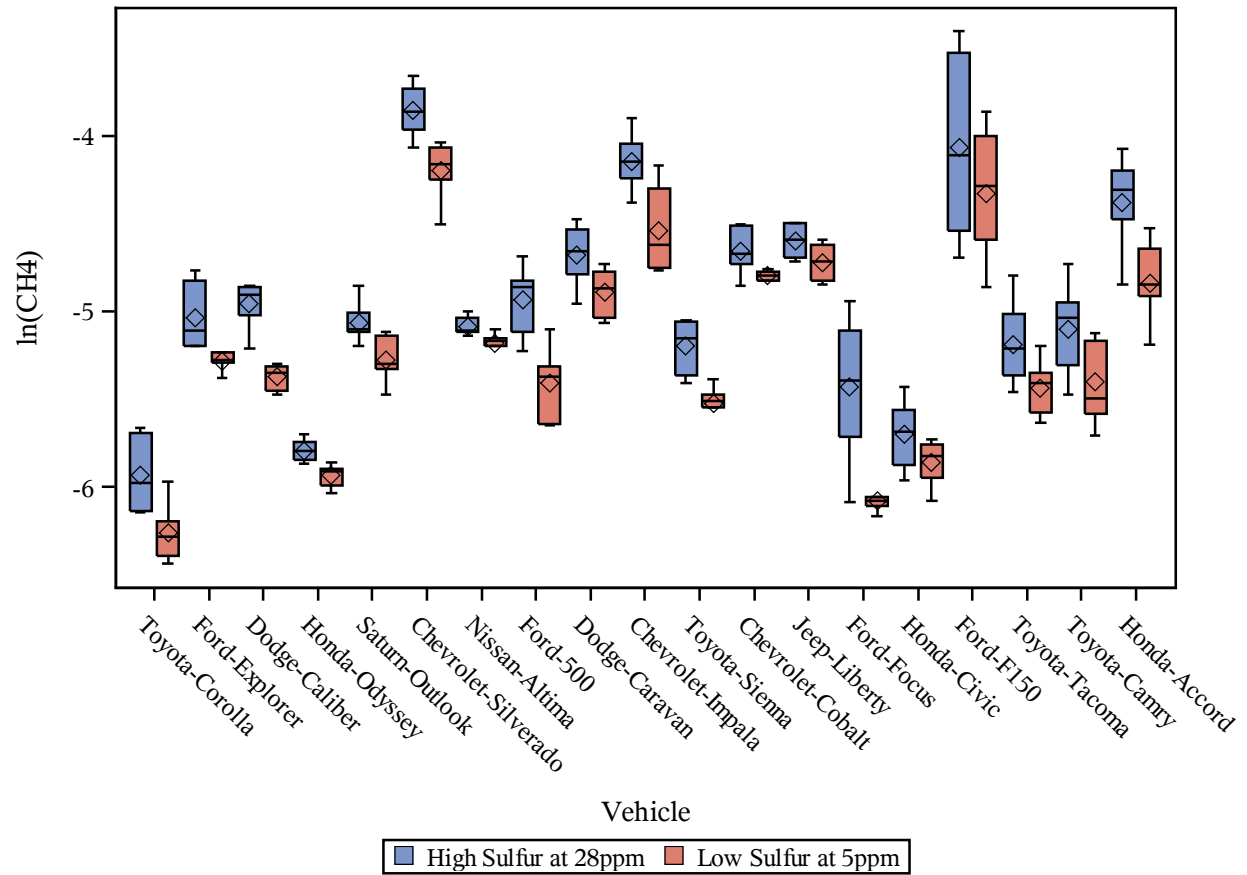
Box plot of individual vehicle families by sulfur level (CH4 Bag1-Bag3)



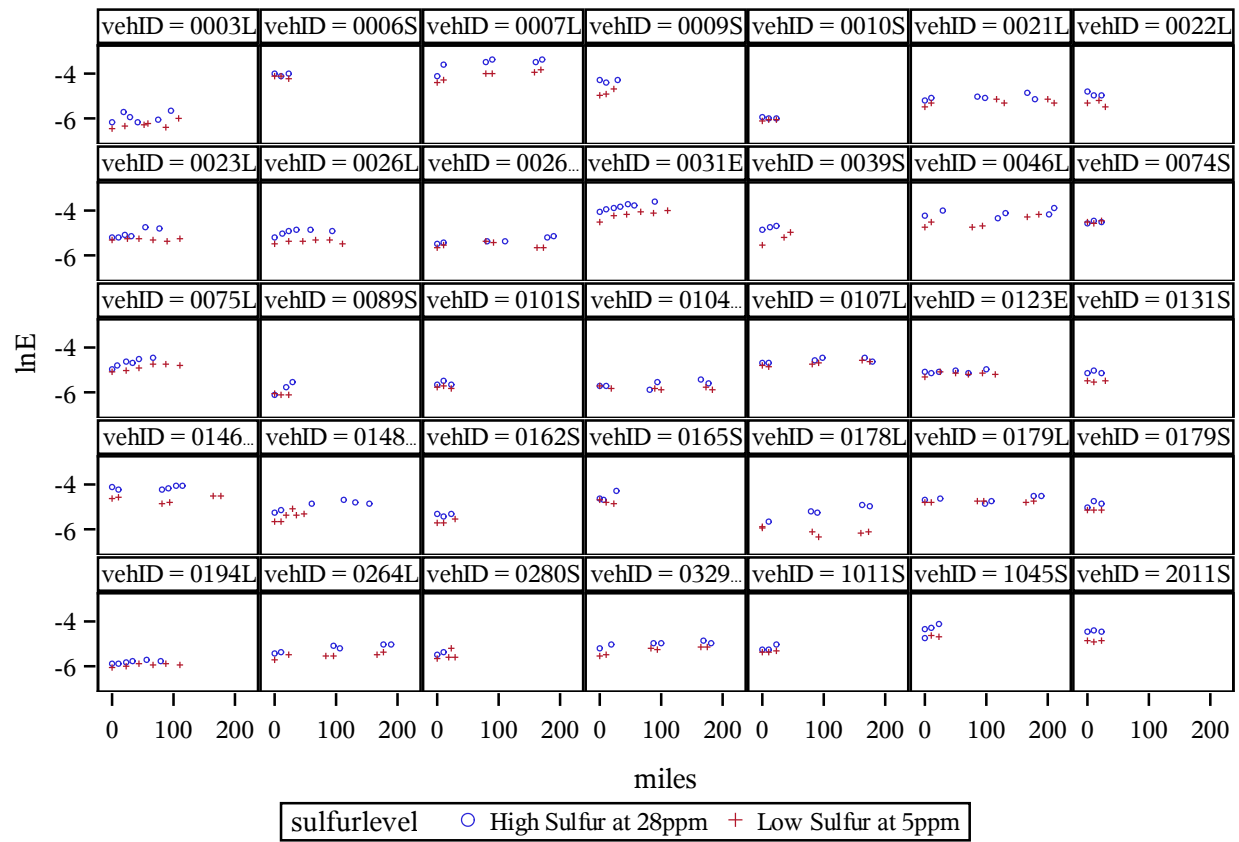
Log-transformed emissions from individual vehicles by sulfur level (CH4 Bag1-Bag3)



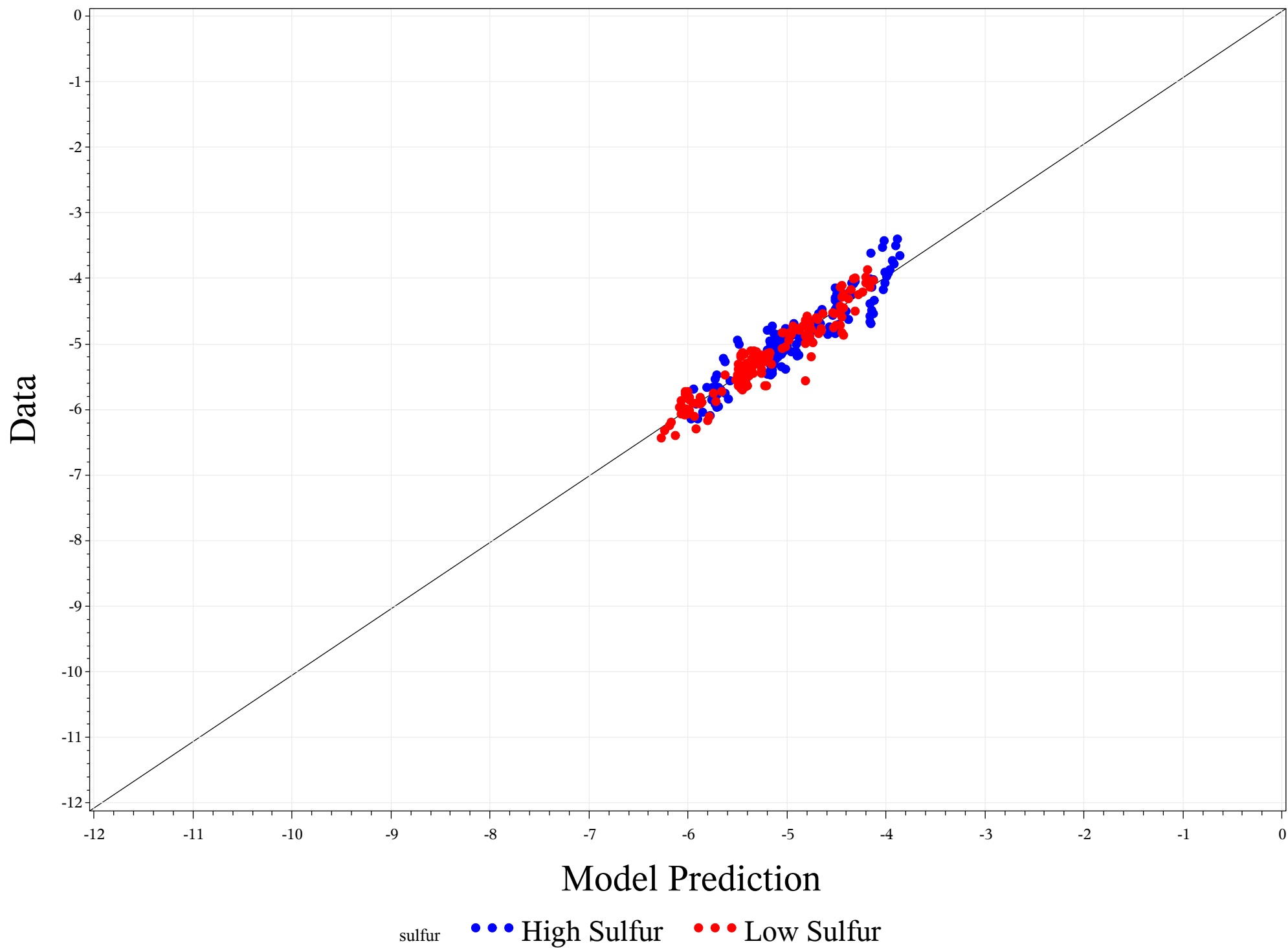
Box plot of individual vehicle families by sulfur level (Wtd CH₄)



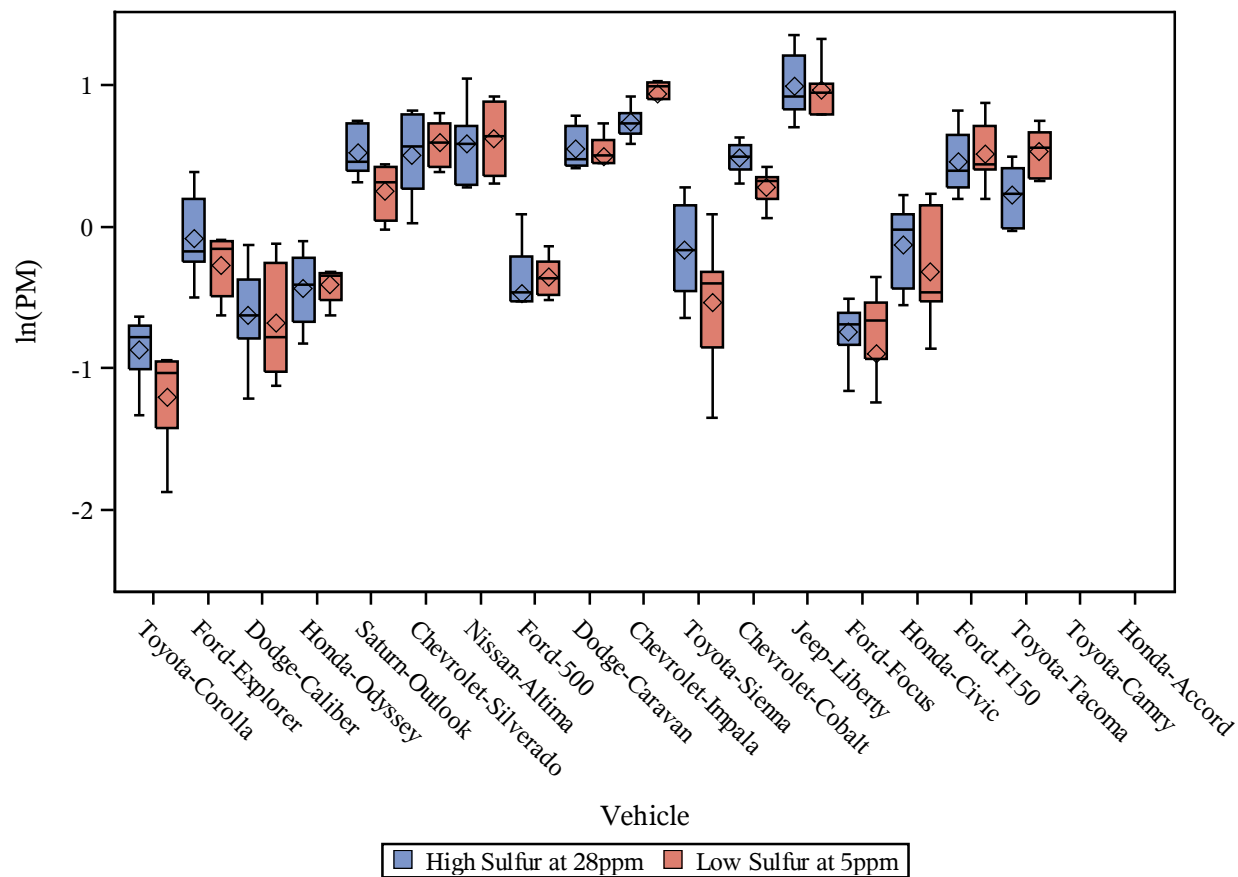
Log-transformed emissions from individual vehicles by sulfur level (Wtd CH4)



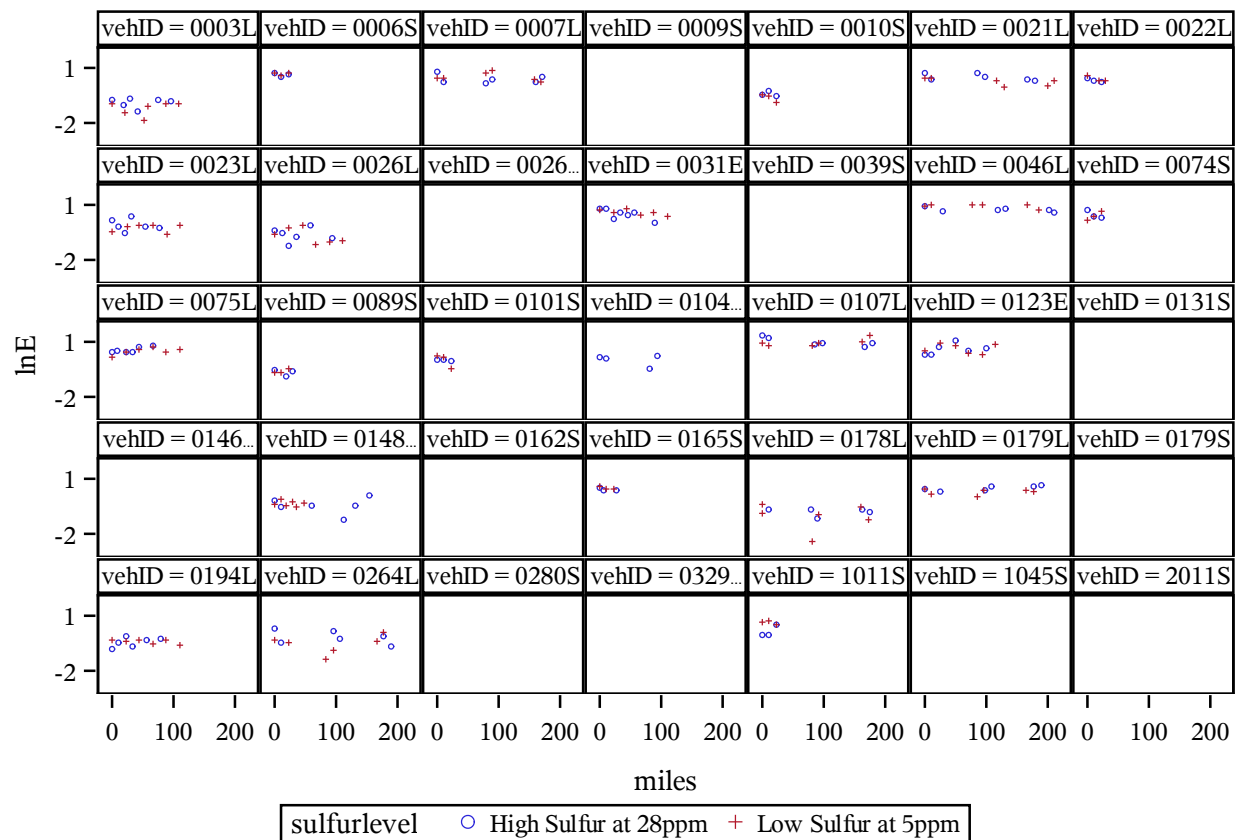
Wtd CH4: Data vs Predicted



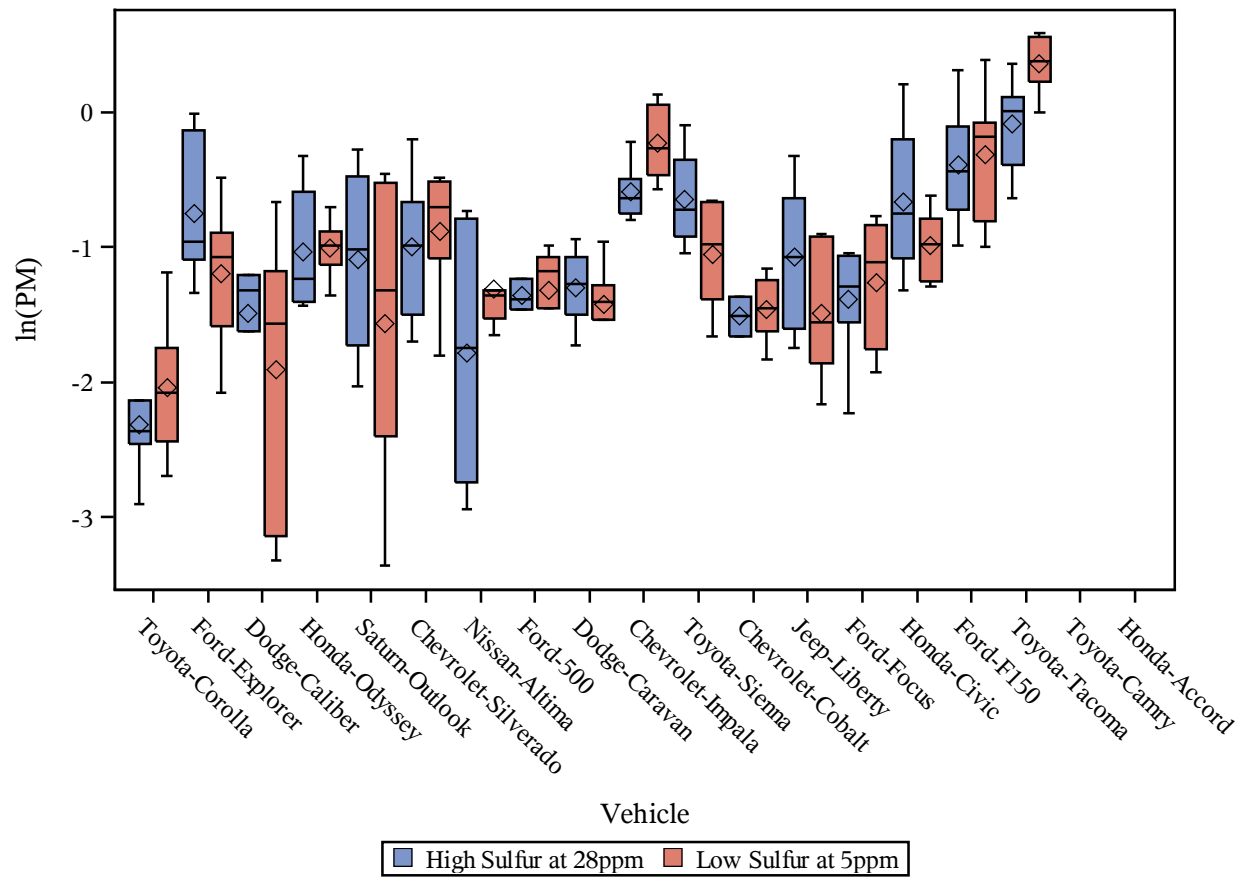
Box plot of individual vehicle families by sulfur level (PM Bag 1)



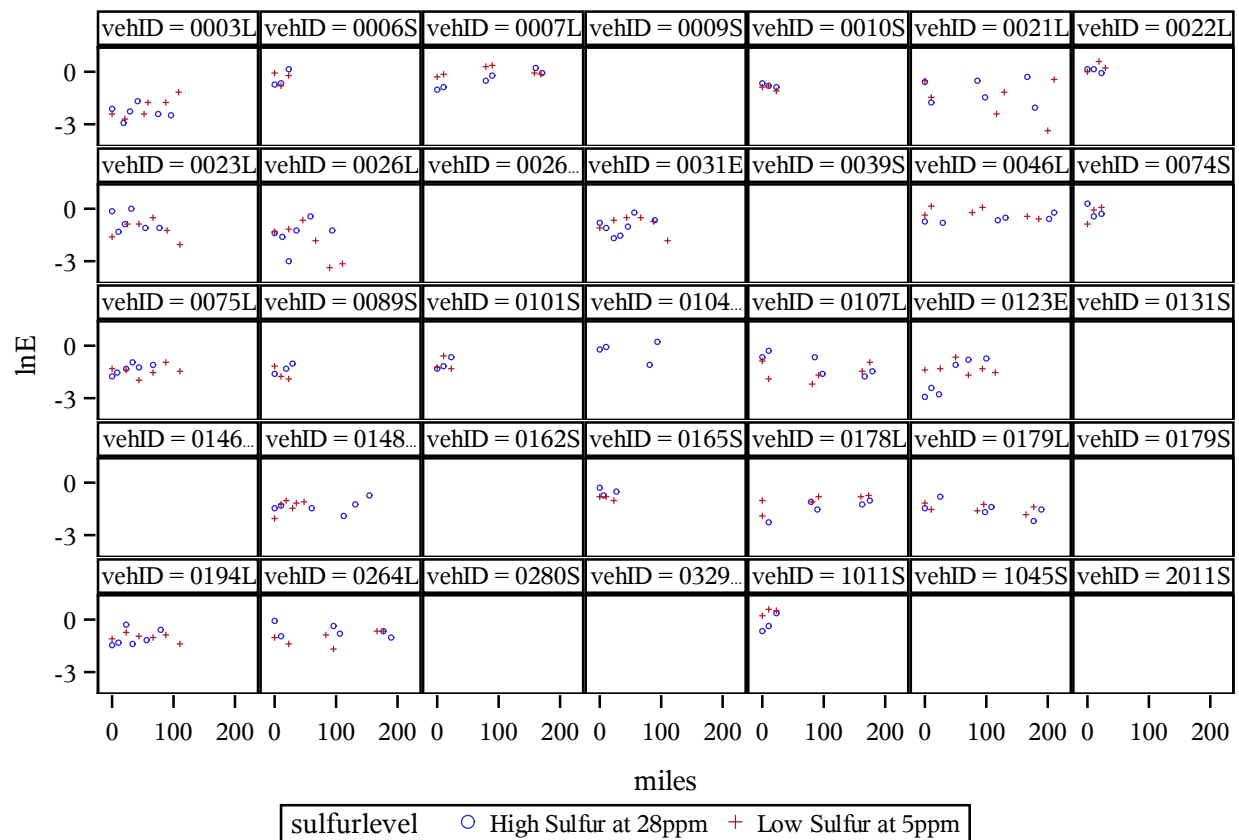
Log-transformed emissions from individual vehicles by sulfur level (PM Bag 1)



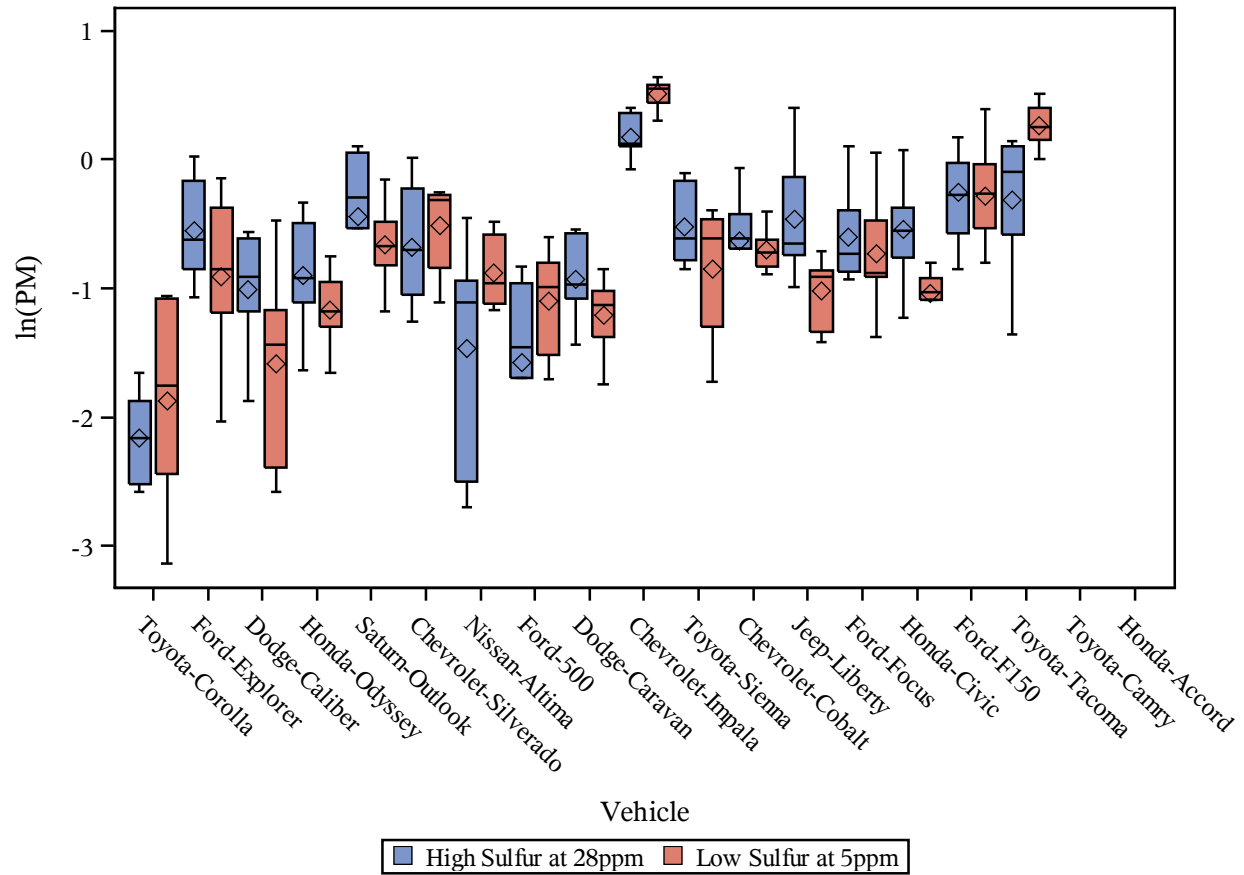
Box plot of individual vehicle families by sulfur level (PM Bag 2)



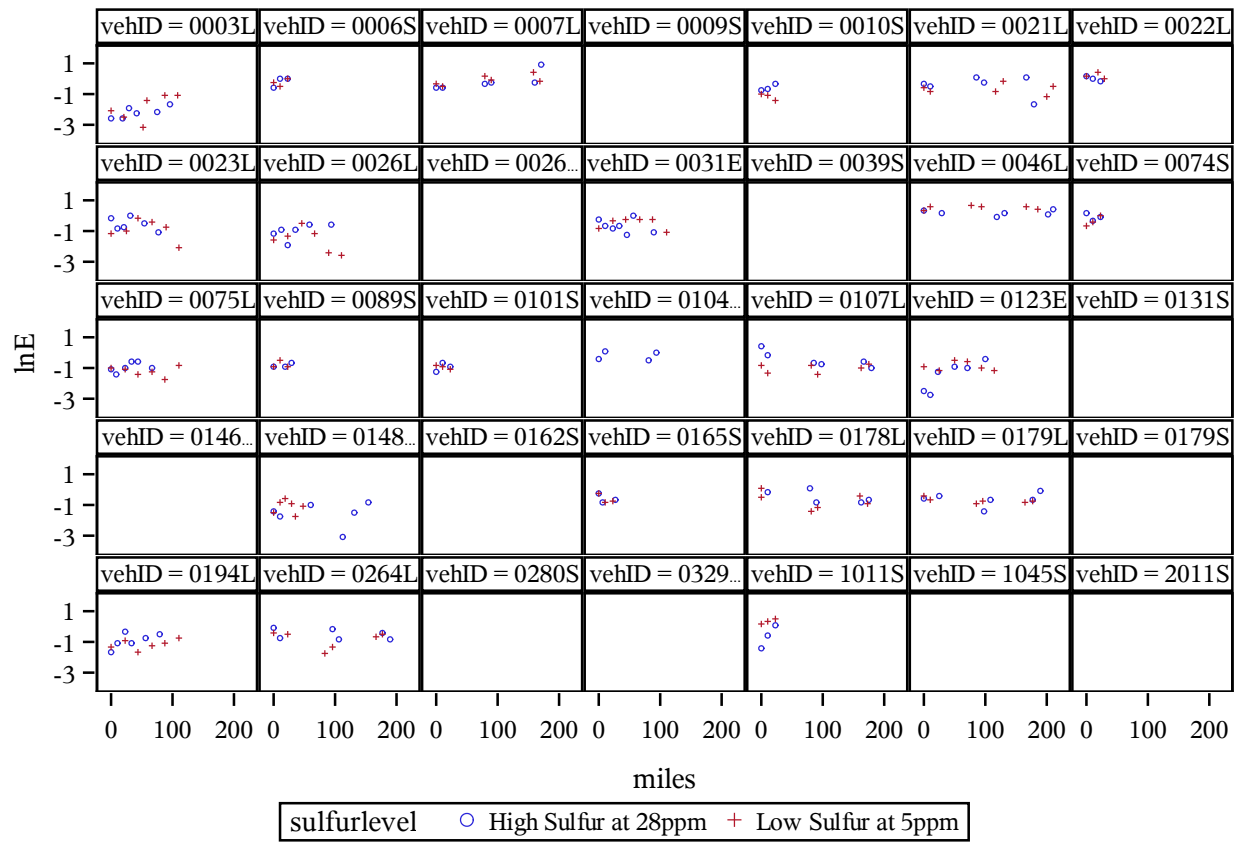
Log-transformed emissions from individual vehicles by sulfur level (PM Bag 2)



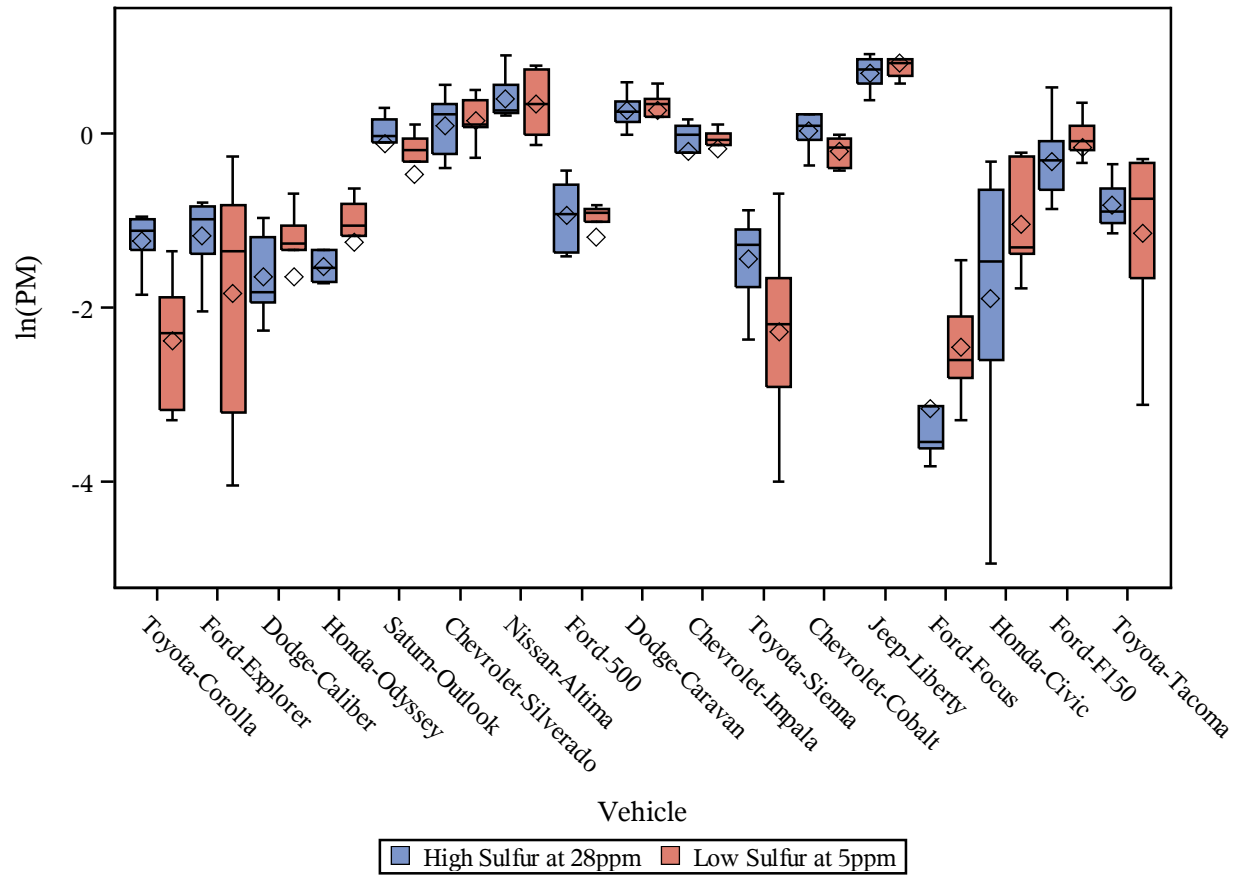
Box plot of individual vehicle families by sulfur level (PM Bag 3)



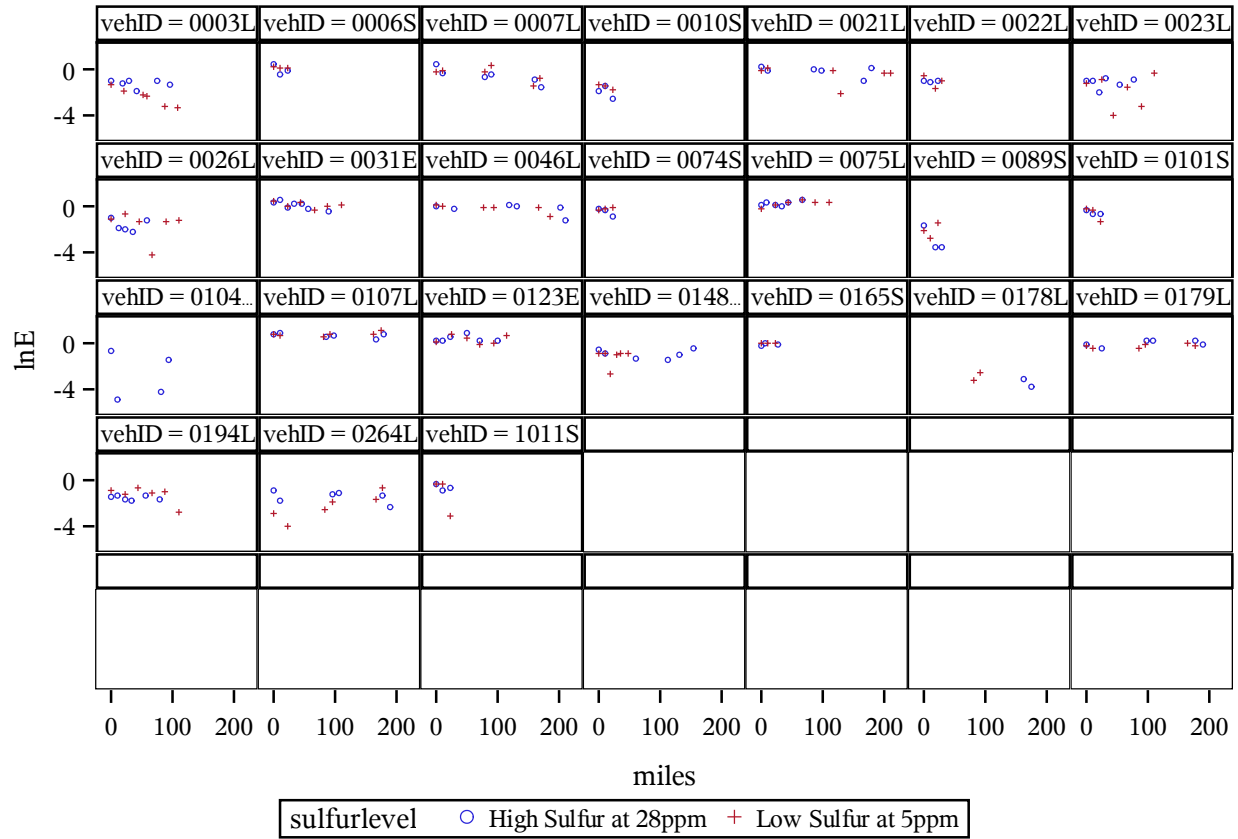
Log-transformed emissions from individual vehicles by sulfur level (PM Bag 3)



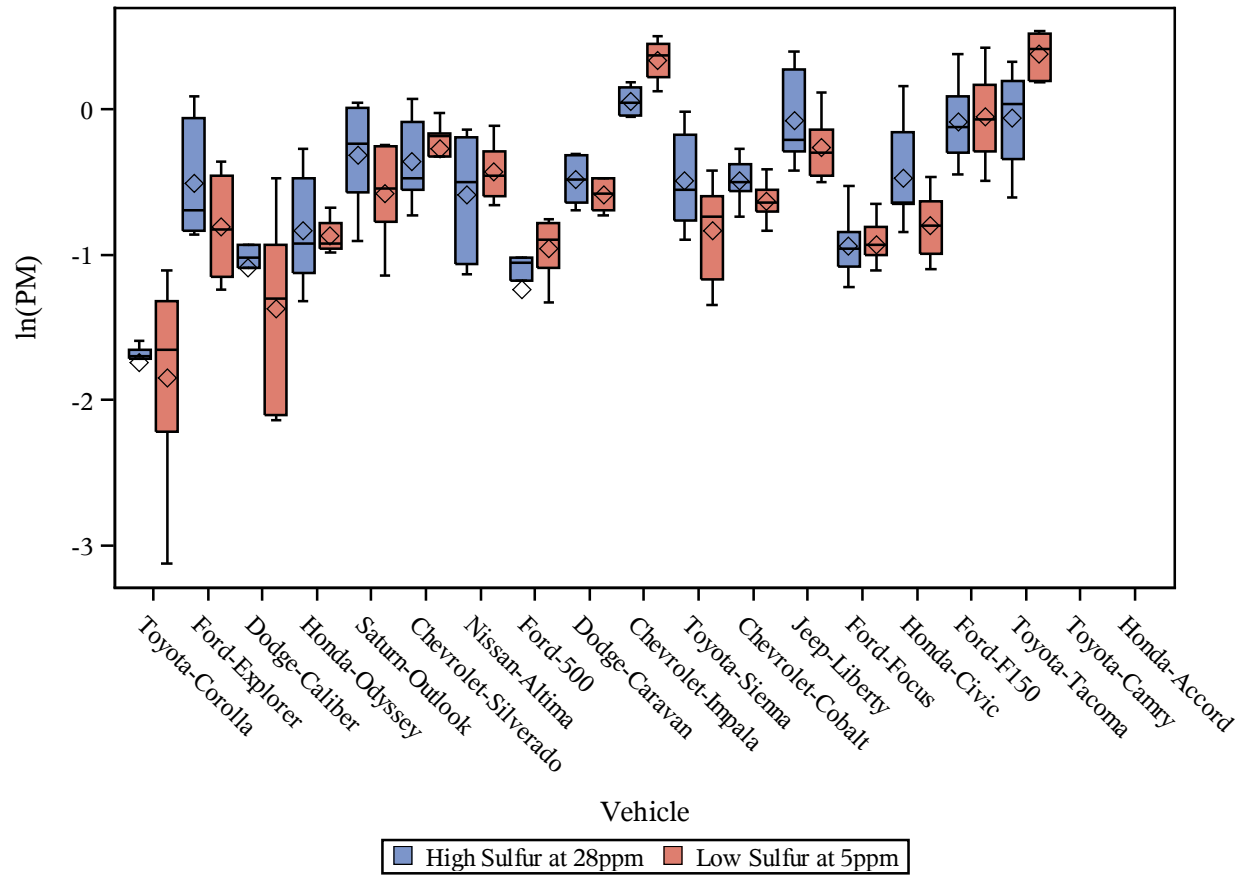
Box plot of individual vehicle families by sulfur level (PM Bag1-Bag3)



Log-transformed emissions from individual vehicles by sulfur level (PM Bag1-Bag3)



Box plot of individual vehicle families by sulfur level (Wtd PM)



Log-transformed emissions from individual vehicles by sulfur level (Wtd PM)

