

# Emissions of Vehicle With Varying Mileage

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## Background

I tested the emissions of three different vehicles. I am looking to see if mileage really has an effect on emissions. All three of these engines were designed by Toyota; this makes the data that much more accurate and interesting to look at. All vehicles recently have had oil changes which will help level the playing field if there is any oil being burned. I am also interested in looking how the vehicle does when the catalytic converter is cold and when the engine is under load.

## Hypothesis

If the mileage of the vehicle is higher, then the engine will start to not have as tight of tolerances which can cause oil and coolant to burn in the cylinder causing poorer emissions. When all of this is occurring, it is burning unwanted fumes into the atmosphere.

## Materials

- C5 Pod
- 2018 Toyota Tacoma 13,000 miles
- 2013 Lexus RX450h 130,000
- 2002 Chevy Prism 204,000 miles



## Procedure

1. Let pod run for one hour. Set pod inlet level and four inches away from exhaust outlet
2. Perform cold engine start. Idle for five minutes. Then, in drive for five minutes
3. Let pod sit for 15 minutes and repeat two more times

## Analysis

- Lexus had highest CO<sub>2</sub> output
  - This hybrid charges its battery when idling causing a higher load than both vehicles
- Chevy had the highest and most amount of heavy VOC's
- Lexus and Toyota both had a drop in VOC's when catalytic converter warmed up. Then it went back up when the vehicles were put into drive
- Chevy's VOC's did not decline as significant as the Lexus and Toyota

## Conclusion

The results for the CO<sub>2</sub> data was surprising. I did not think that the Lexus would have more CO<sub>2</sub> than the Chevy with over 200,000 miles. I believe the Lexus was producing a higher amount of CO<sub>2</sub> than both vehicles because it is a hybrid system. During idle, the hybrid system is charging the battery which is requiring more power from the engine. The Toyota and Lexus both significantly decreased in VOC's right after the cold engine start up. CO<sub>2</sub> did not vary when vehicle was put into drive compared to heavy VOC's. The Chevy stayed at a very high amount of VOC's during the whole experiment. This could explain that the engine is burning oil or coolant, the fuel is not being completely burned in the chamber, or the catalytic converter is not working how it should be.

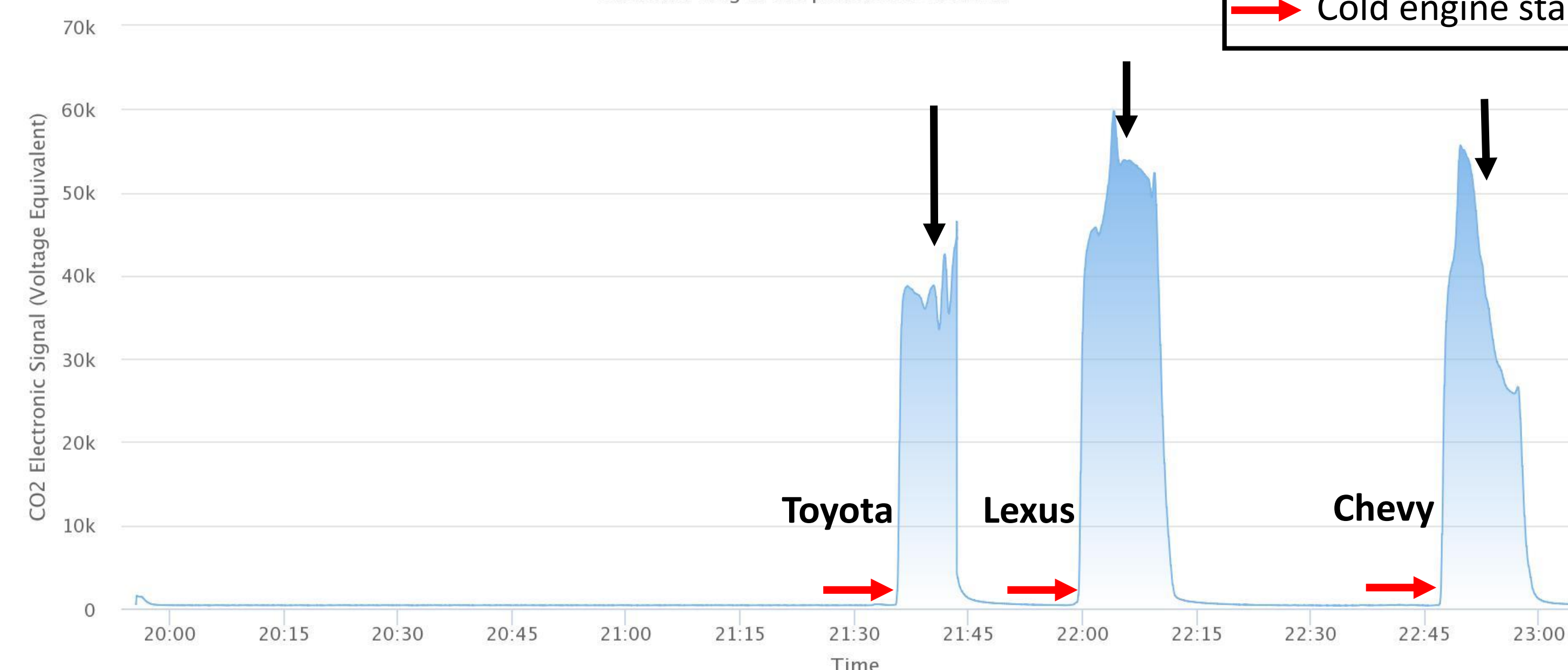
## Acknowledgements

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- Thank you Sarah Carter for letting me use your car for my experiment

## Data

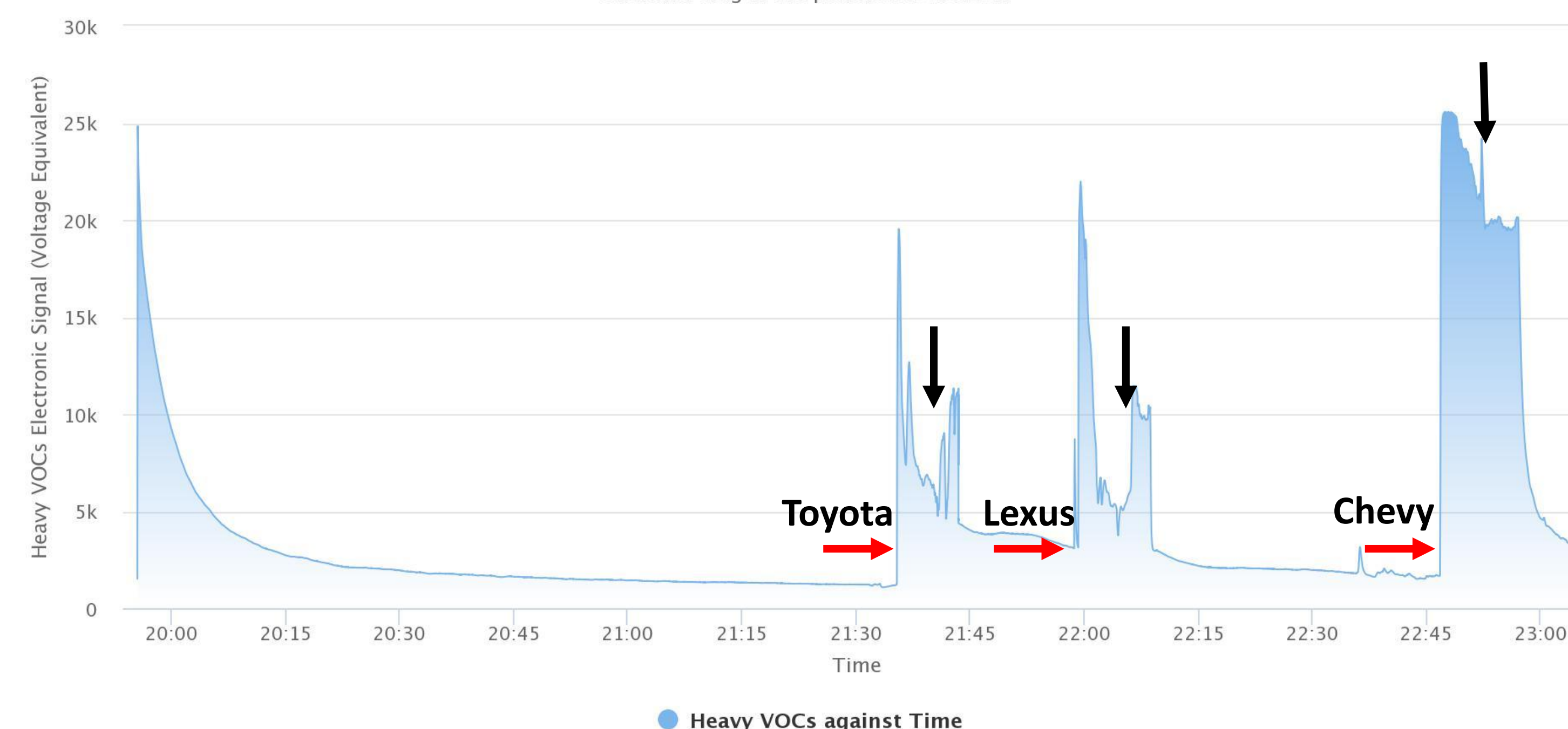
CO<sub>2</sub> against Time

Click and drag in the plot area to zoom in



Heavy VOCs against Time

Click and drag in the plot area to zoom in



Highcharts.com