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# Understanding the ability of low-cost MOx sensors to quantify ambient VOCs

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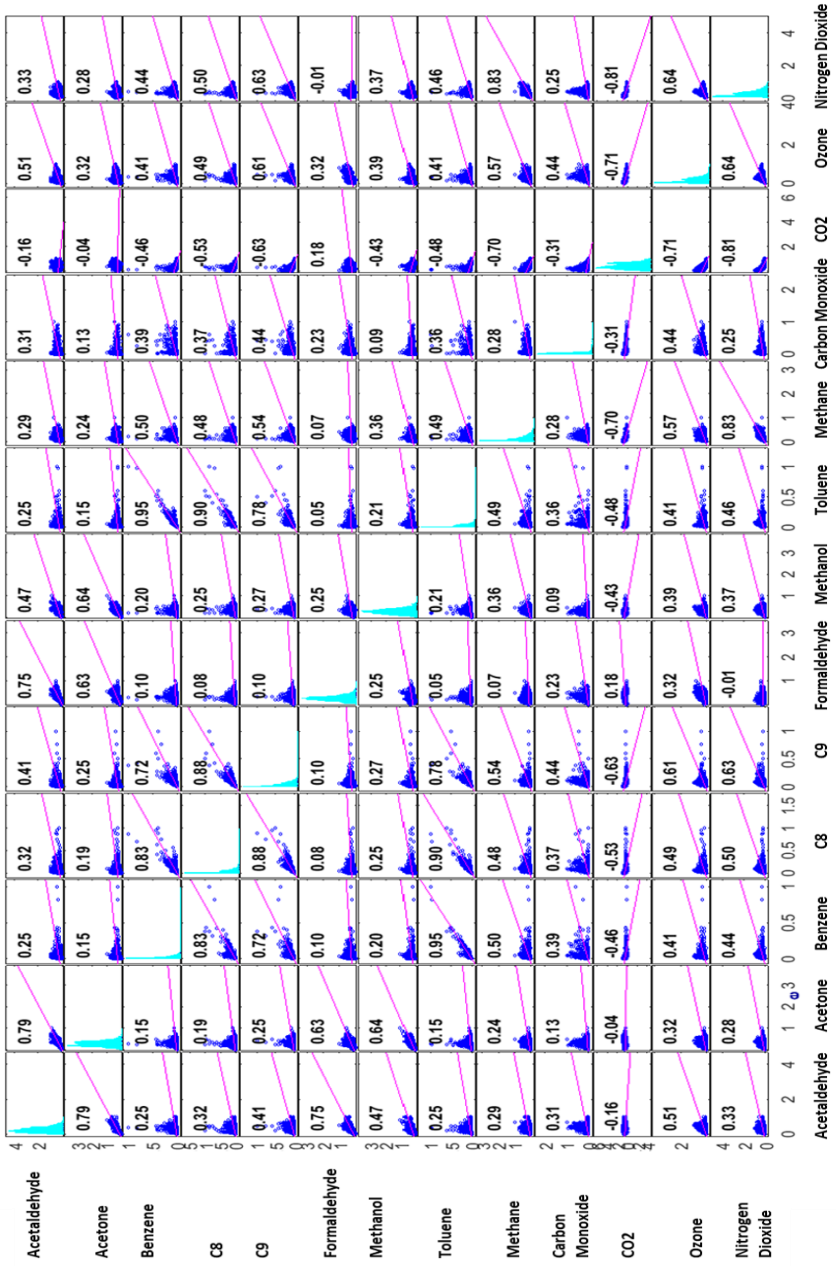
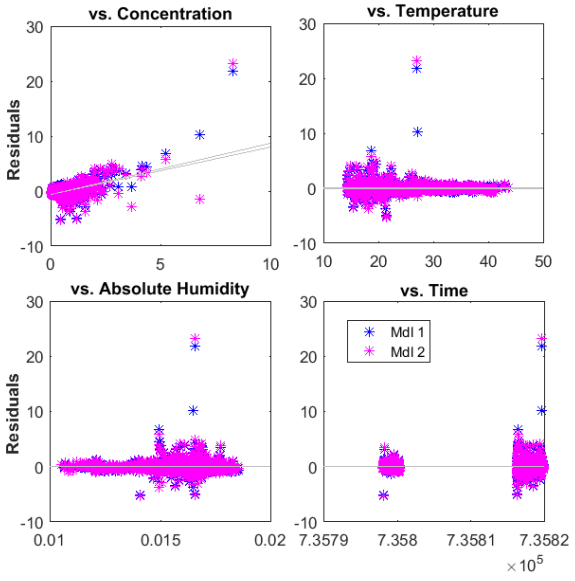
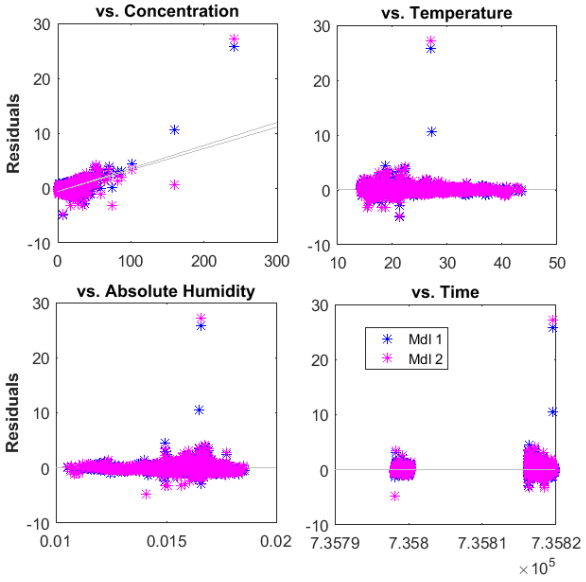
***Figure S1 – Correlation plots for the minute-resolution data from all the NATIVE Trailer instruments***



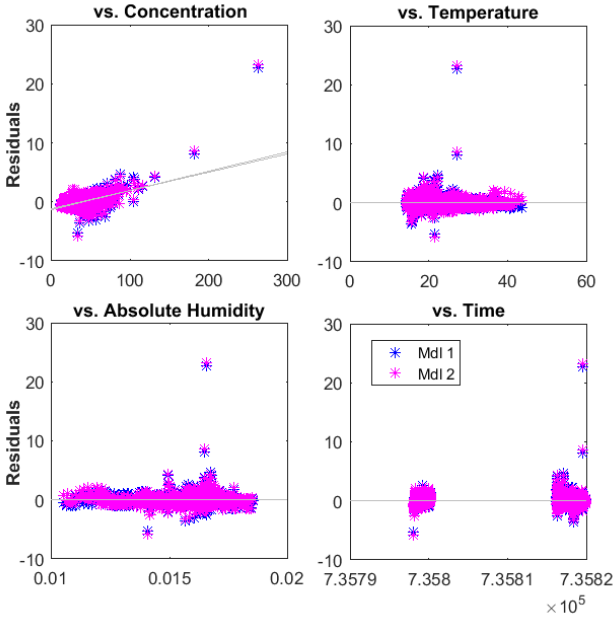
***Figures S2 - Regression model residuals (from Section 3.1); the following plots depict the residuals from the Model 1 and Model 2's for each benzene (a: top left four panels), summed aromatics (top right four panels), summed VOCs (bottom left four panels),and methane (d: bottom right four panels); the residuals for the training data for each model are plotted vs. the pollutant concentration being estimated, temperature, humidity values, and time.***



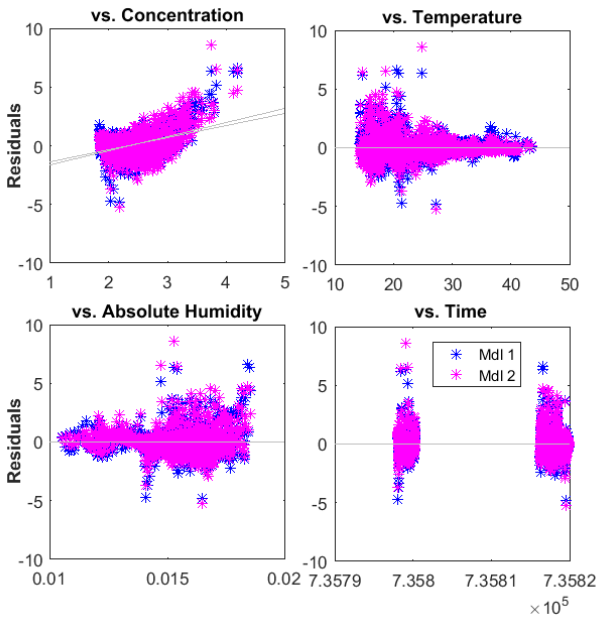

a.




b.

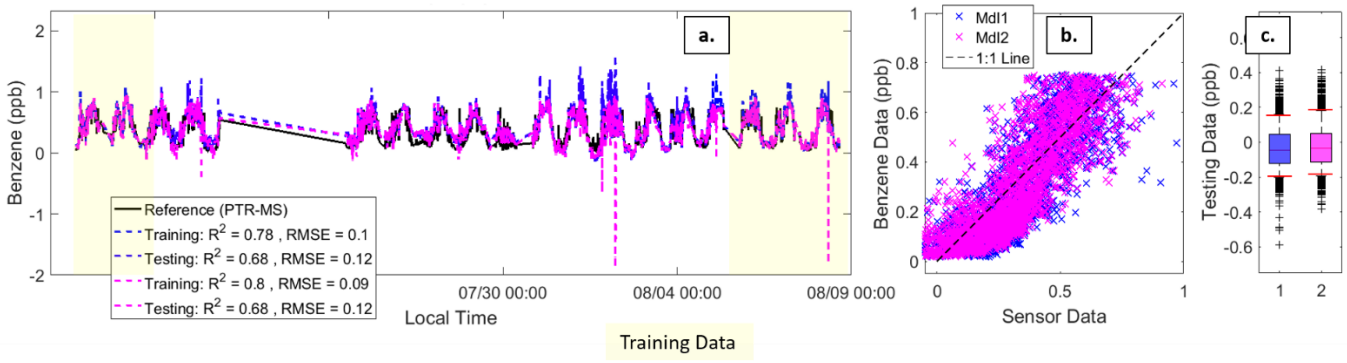



c.

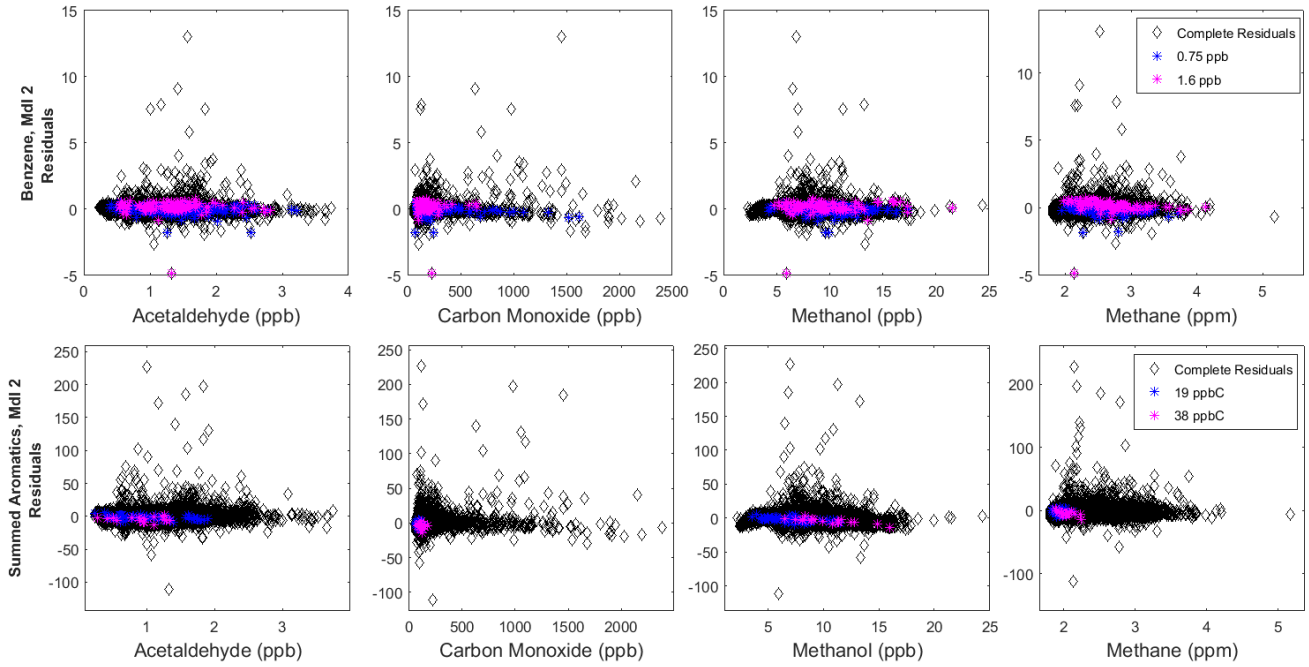


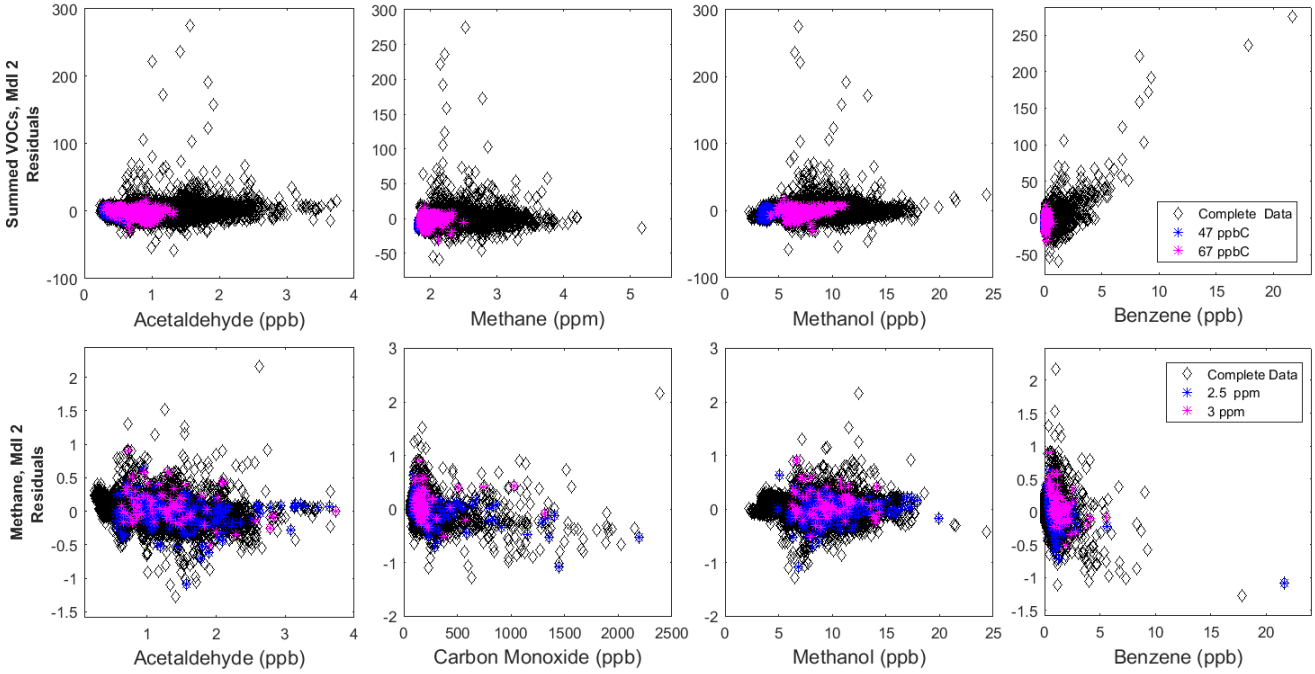

d.

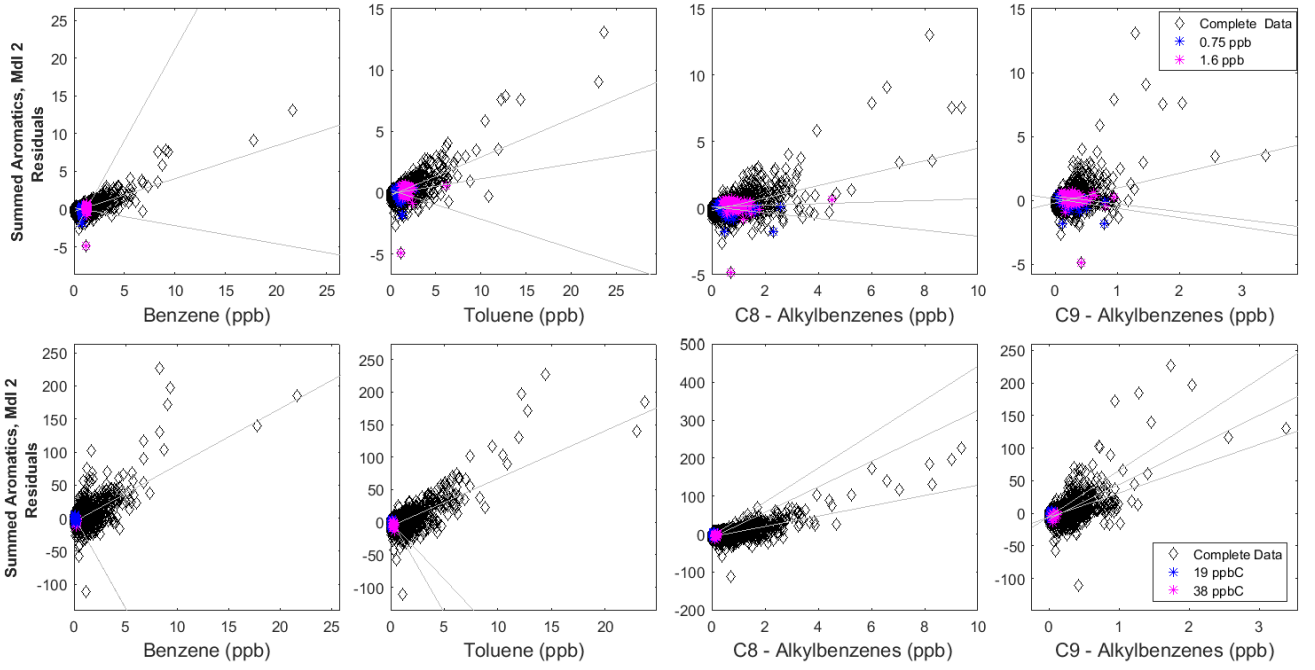
***Figure S3 – Linear regression analysis for benzene < 0.75 ppbV; these results are for the same analysis as was conducted in Section 3.1 .1 using benzene as the intended predictor and excluding all benzene concnetrations over 0.75 ppbV; note the whiskers indicted in red in the boxplots (panel c) represent the 95$^{th}$ percentile values for the residuals***



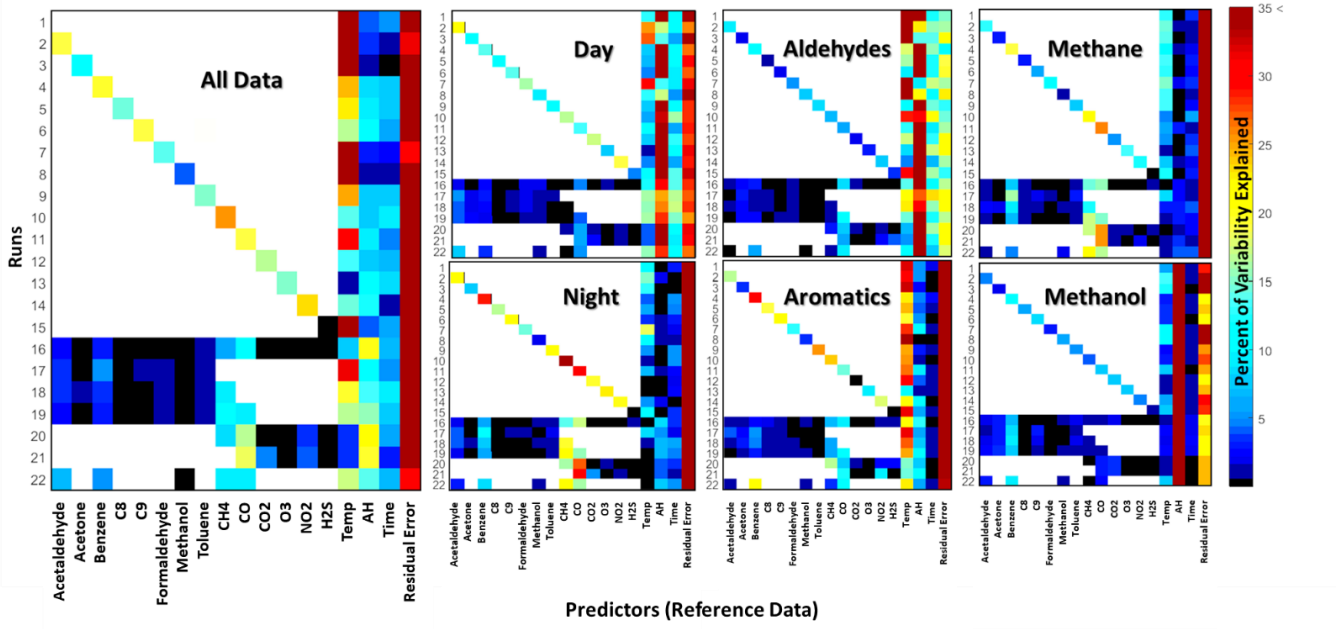

***Figures S4 – Additional residuals for models vs. target and non-target VOCs (Section 3.1.4); here the residuals are plotted against gases that are not the intended predictor in an effort to understand whether the estimates predicted by the calibration models are robust tot changing levels of other VOCs and potential confounders, again roughly the 75$^{th}$ and 95$^{th}$ percentile values are highlighted in blue and purple to see if an estimated concentration, held contest, remains stable as potential confounders change, these plots expand on those provided in the main text***

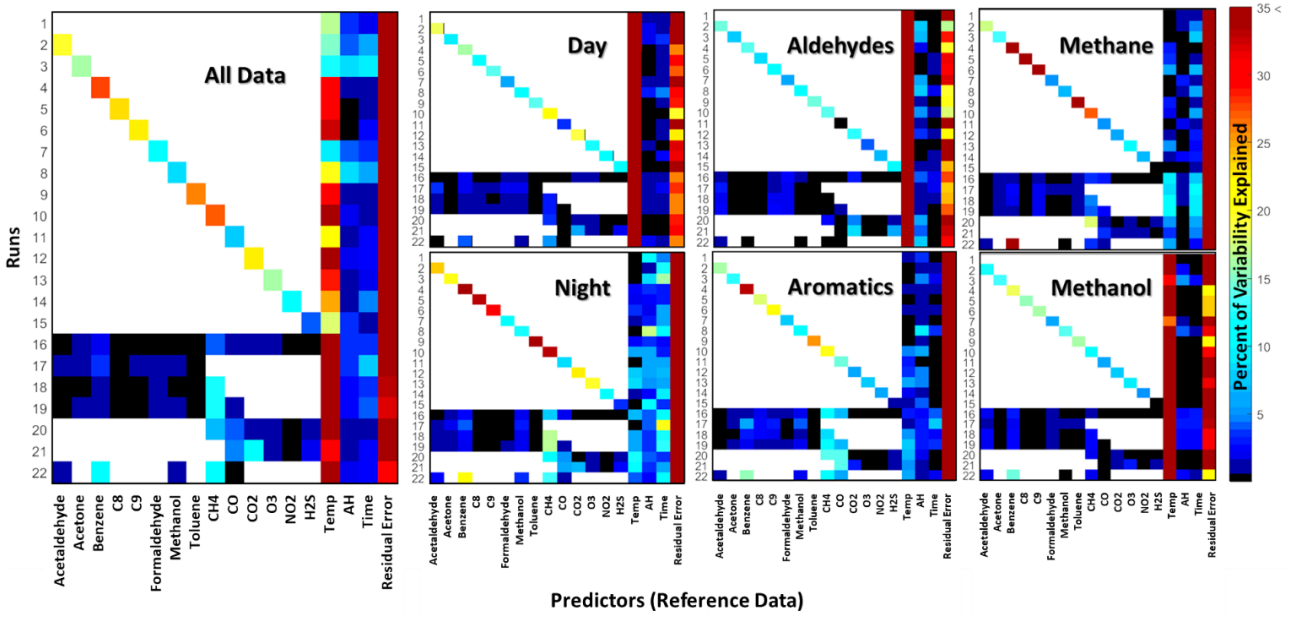



Summed VOCs, Mdl 2 Residuals
Acetaldehyde (ppb)
Methane (ppm)
Methanol (ppb)
Benzene (ppb)
Complete Data
47 ppbC
67 ppbC
Methane, Mdl 2 Residuals
Acetaldehyde (ppb)
Carbon Monoxide (ppb)
Methanol (ppb)
Benzene (ppb)
Complete Data
2.5 ppm
3 ppm


Summed Aromatics, Mdl 2 Residuals
Benzene (ppb)
Toluene (ppb)
C8 - Alkylbenzenes (ppb)
C9 - Alkylbenzenes (ppb)
Complete Data
0.75 ppb
1.6 ppb
Summed Aromatics, Mdl 2 Residuals
Benzene (ppb)
Toluene (ppb)
C8 - Alkylbenzenes (ppb)
C9 - Alkylbenzenes (ppb)
Complete Data
19 ppbC
38 ppbC

***Figures S5 – ANOVA results illustrating the percentage of variance in the sensor signal explained by various predictors for complete data and subsets of data (top – Figaro 2600, bottom – Figaro 2602) (Section 3.2); the colors indicate the percent of variability explained by a particular predictor (listed along the x-axis); the subsets of data (defined in Section 3.2) are the complete data, day-time data, night-time data, and selected periods with relatively higher amounts of specific VOCs or specific groups of VOCs (i.e., aldehydes, methane, aromatics, and methanol); a white square indicates that a predictor was not included in that particular run (runs are listed along the y-axis)***






***S6 – Illustration of selected periods of different relative compositions of difference VOCs and groups of VOCs; these are the subsets utilized for the analysis in Section 3.2 of the manuscript and shown above in Figure S5***

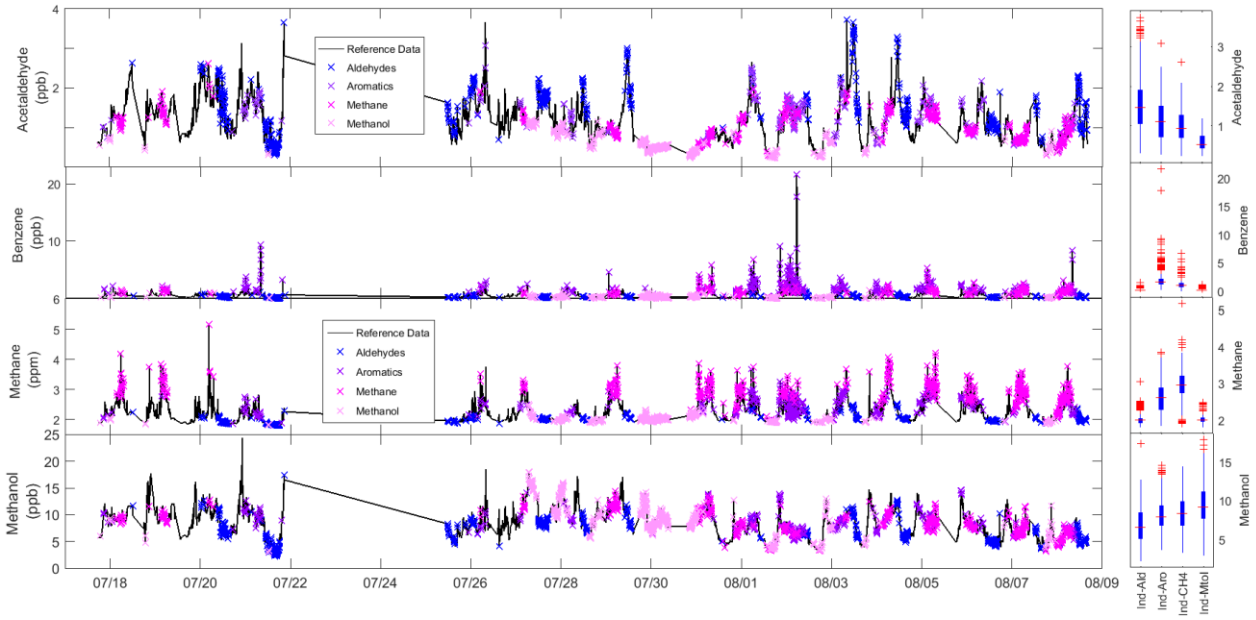
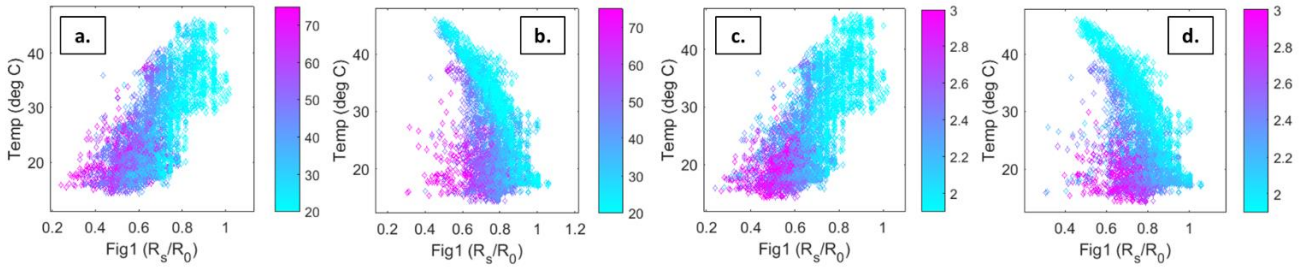
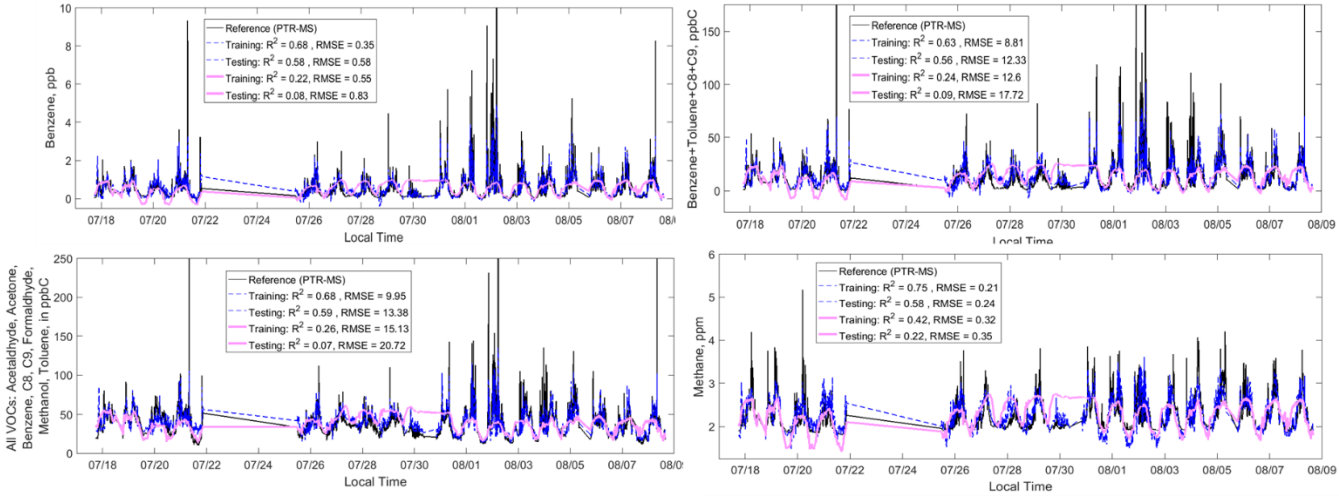


***Figure S7: Sensor signal vs. temperature and pollutant concentrations (Section 3.2); the sensor signals posted here are the normalized resistance values, not yet calibrated; the colors represent pollutant concentrations (in panels a and b summed VOCs in ppbC are shown, and in panels c and d methane is shown in ppmV)***

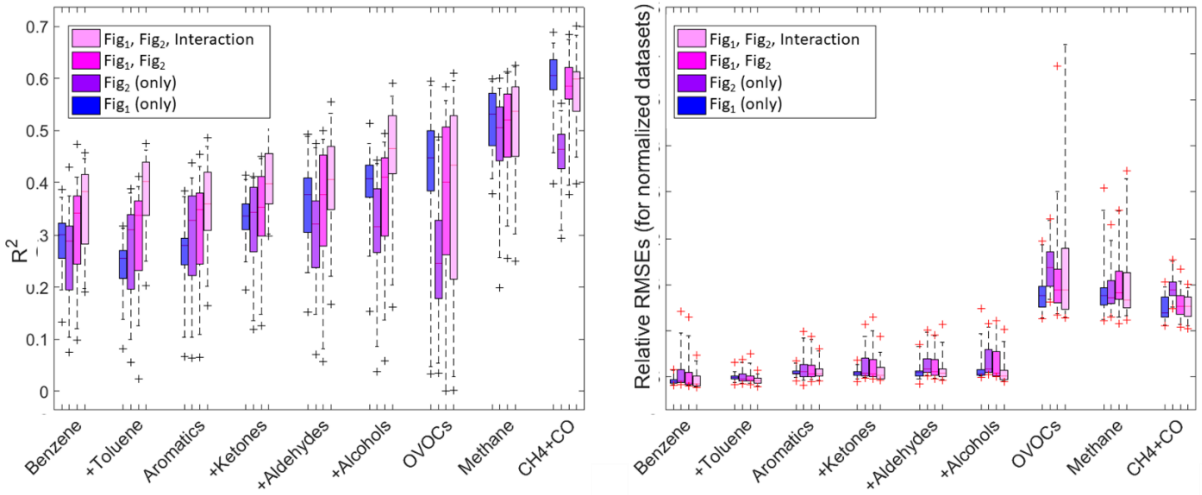



***Figures S8: Regression analysis results, excluding VOC sensor signals (Section 3.2); the data plotted in blue is from the original analysis conducted in Sections 3.1.1 – 3.1.3; the data plotted in purple is the same regression analysis, utilizing Model 1, with the sensor signal excluded leaving only environmental parameters and time as predictors***

(training data before 7/20 & after 8/5, remaining data is testing)



***Figures S9: Bootstrap analysis for sensor set in secondary U-Pod (Section 3.2); this analysis was conducted in the same with, with a major difference being that less data was available for this second U-Pod as a result of power issues***

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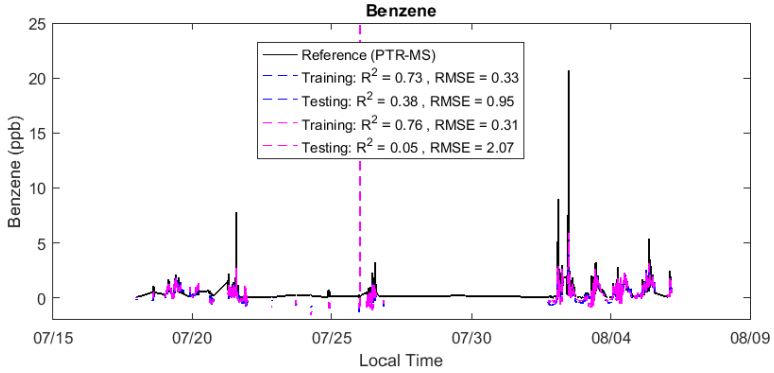
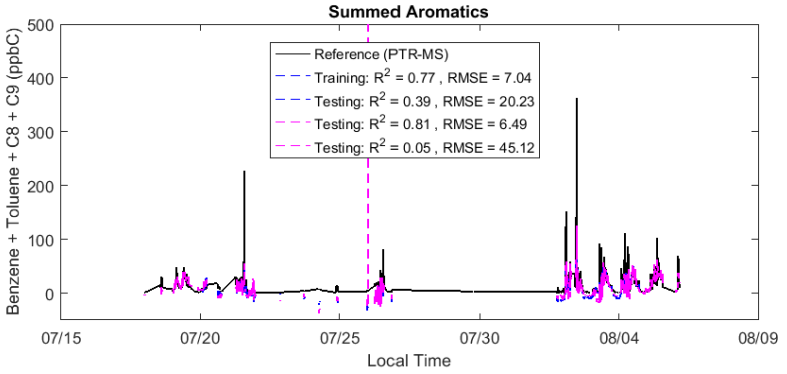
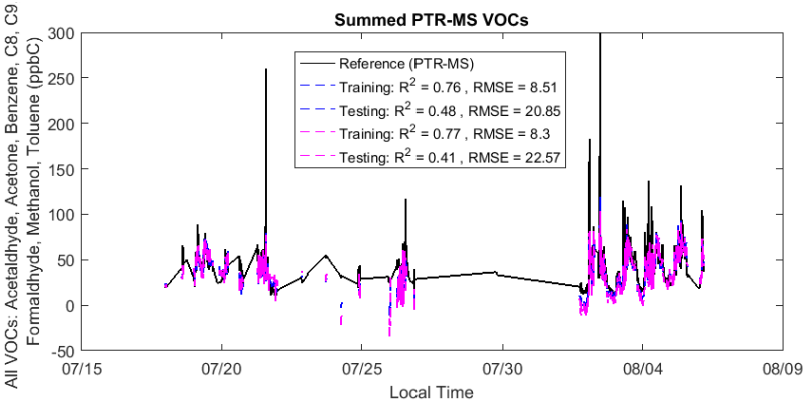
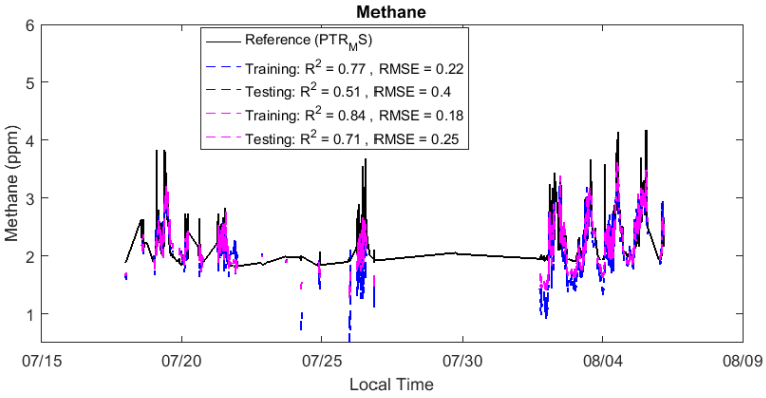
***Figures S10: Regression analysis results for sensor set in secondary U-Pod; these plots illustrate the results of the regression analysis for the secondary U-Pod as well as which data was available for analysis, given power failures that occurred for this second U-Pod*** (training data before 7/20 & after 8/5, remaining data is testing)



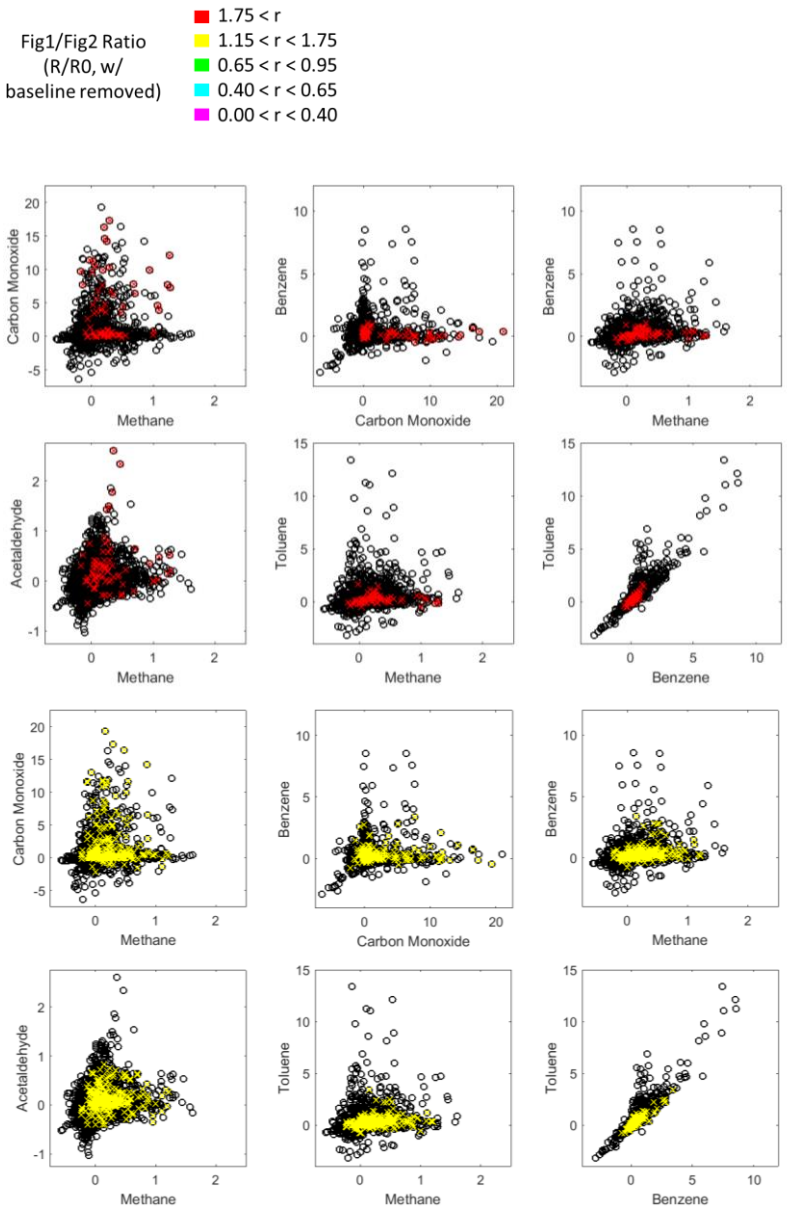

Summed Aromatics
Benzene + Toluene + C8 + C9 (ppbC)
Reference (PTR-MS)
Training: R2 = 0.77 , RMSE = 7.04
Testing: R2 = 0.39 , RMSE = 20.23
Testing: R2 = 0.81 , RMSE = 6.49
Testing: R2 = 0.05 , RMSE = 45.12
Local Time

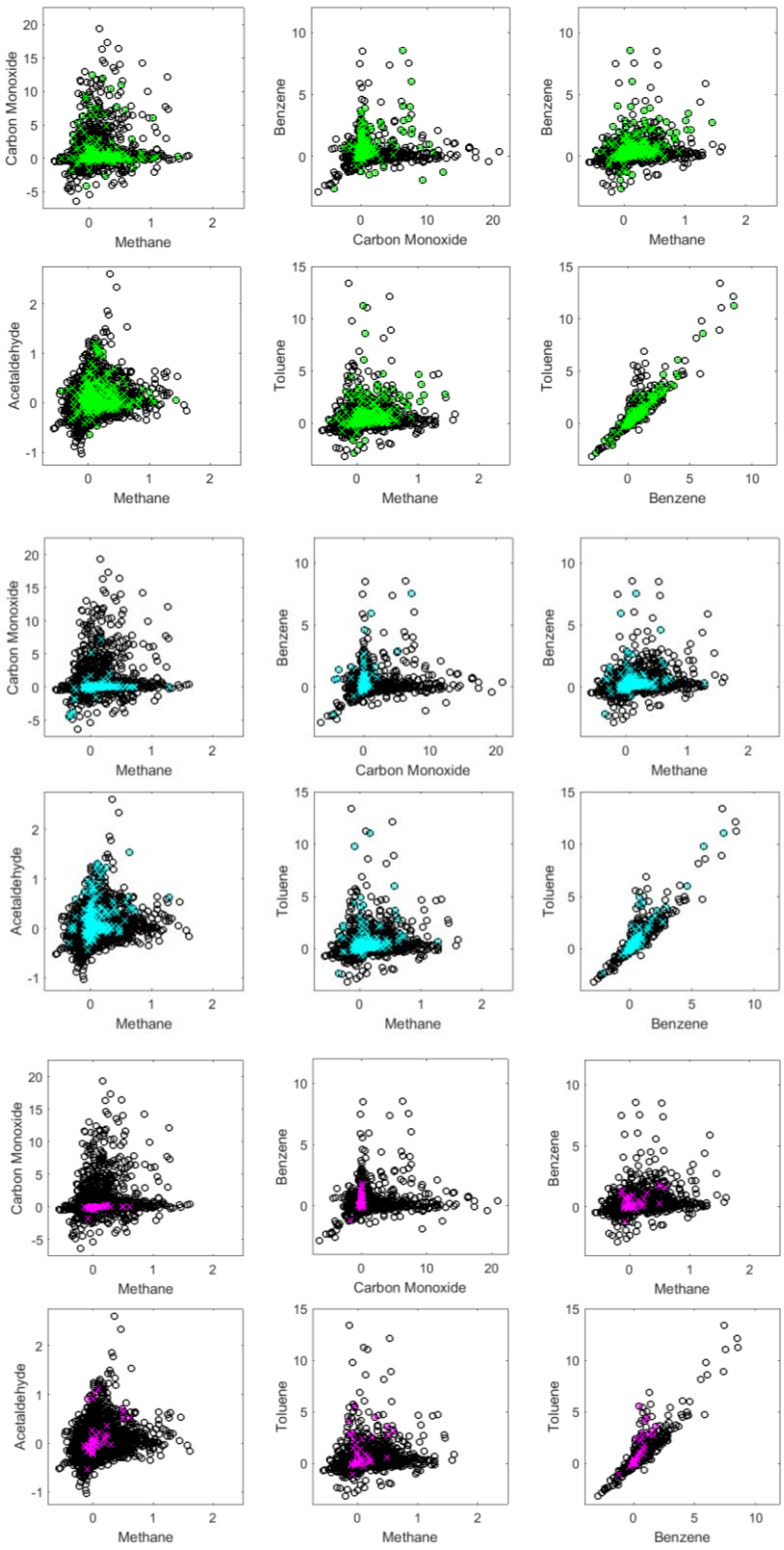

Summed PTR-MS VOCs
All VOCs: Acetaldhyde, Acetone, Benzene, C8, C9
Formaldhyde, Methanol, Toluene (ppbC)
Reference (PTR-MS)
Training: R2 = 0.76 , RMSE = 8.51
Testing: R2 = 0.48 , RMSE = 20.85
Training: R2 = 0.77 , RMSE = 8.3
Testing: R2 = 0.41 , RMSE = 22.57
Local Time


Methane
Methane (ppm)
Reference (PTRMS)
Training: R2 = 0.77 , RMSE = 0.22
Testing: R2 = 0.51 , RMSE = 0.4
Training: R2 = 0.84 , RMSE = 0.18
Testing: R2 = 0.71 , RMSE = 0.25
Local Time

5

***Figures S11: Complete sensor ratio plots (Section 3.3); in all the following plots baseline corrected data from the NATIVE Trailer reference instruments are plotted with colors to indicate where particular VOC sensor ratio fall***




Carbon Monoxide
Methane
Benzene
Carbon Monoxide
Benzene
Methane
Acetaldehyde
Methane
Toluene
Methane
Toluene
Benzene
Carbon Monoxide
Methane
Benzene
Carbon Monoxide
Benzene
Methane
Acetaldehyde
Methane
Toluene
Methane
Toluene
Benzene
Carbon Monoxide
Methane
Benzene
Carbon Monoxide
Benzene
Methane
Acetaldehyde
Methane
Toluene
Methane
Toluene
Benzene