Supporting Material

Evaluation of traffic exhaust contributions to ambient carbonaceous submicron particulate matter in an urban roadside environment in Hong Kong

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I. Additional Tables

Table S1 – Regression statistics of two and three factor multiple linear regression analysis of HOA and EC mass concentrations as functions of gasoline, diesel, and LPG vehicle number counts

Regression Statistics		HOA, 3 Fac	HOA, 2 Fac		EC 3, Fac	EC, 2 Fac
R^2_{adj}	Total	0.90	0.86		0.92	0.92
P-Value	Gasoline veh.	5.63E-03	1.53E-05		0.63	0.001506
	Diesel veh.	5.47E-03	1.77E-03		5.04E-09	6.41E-08
	LPG veh.	4.86E-02	N.A.		3.39E-03	N.A.
Variable coeff.	Gasoline veh.	1.10E-02	1.40E-02		2.12E-03	1.12E-02
	Diesel veh.	7.05E-03	8.33E-03		1.91E-02	1.82E-02
	LPG veh.	6.17E-03	N.A.		1.06E-02	N.A.

II. Additional Figures
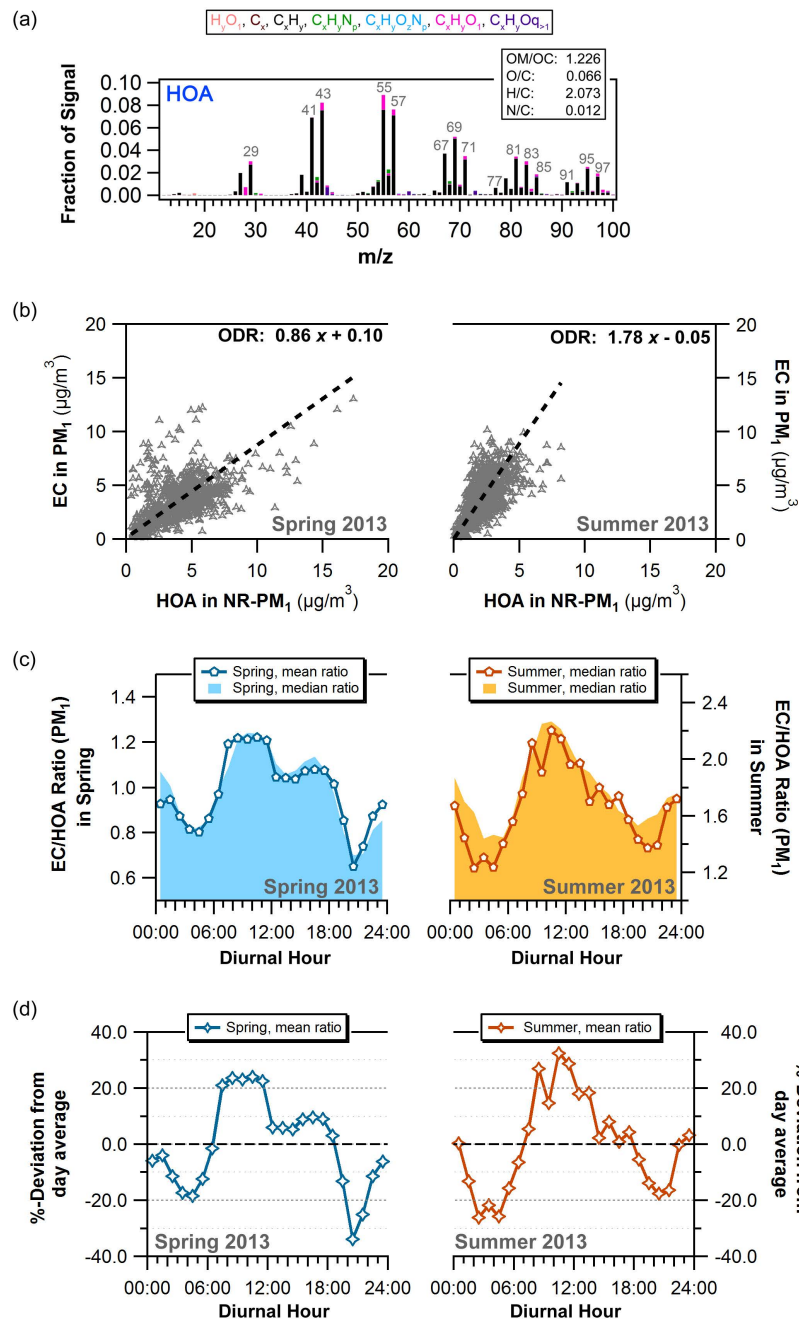
Figure S1

(a) Mass spectrum and elemental characteristics of HOA (Lee et al., 2015)

(b) Scatter plot of EC and HOA in PM_1 in spring and summer

(c) Diurnal variation of EC/HOA ratio (in PM_1), ratio based on mean concentrations as solid line and markers, ratio based on median concentrations as colored area

(d) Relative diurnal variation of EC/HOA ratio in PM_1 compared to daily average
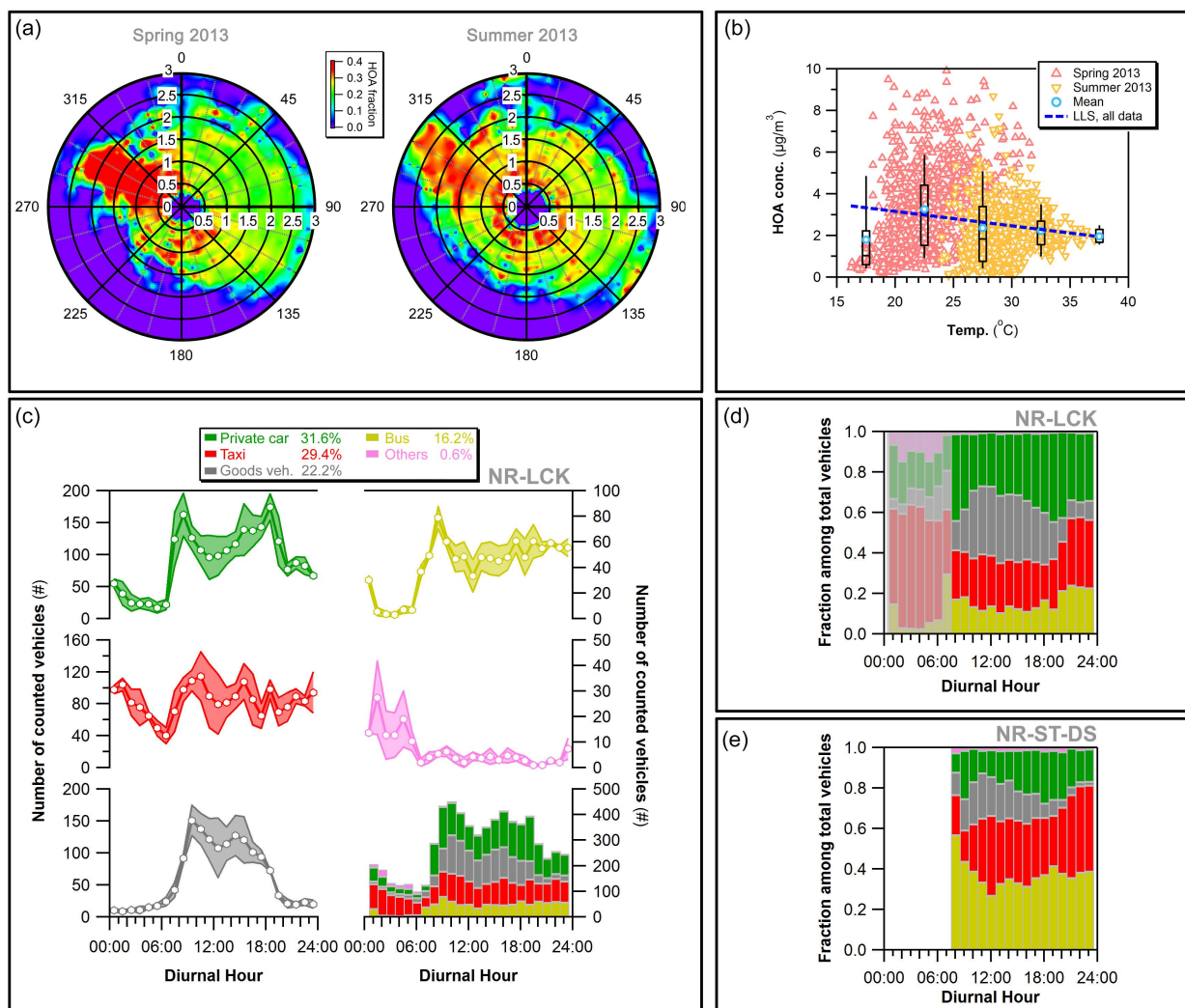
Figure S2

(a) Scatter plot of HOA mass concentration as a function of ambient temperature at the Mong Kok site; dark blue hashed line indicates linear least squares fit of all data. Box and whisker plots (10th, 25th, 75th, 90th percentile, median as line, mean as blue ring) for temperature bins from 15-40oC with bin widths of 5oC for all data

(b) Wind rose plots of fraction of HOA among total organics in NR-PM1 in Spring (left) and Summer (right)

(c) Diurnal variation of number of vehicles passing by the measurement site *(NR-LCK: junction of Nathan Road and Lai Chi Kok Road)* between 28 May and 31 May 2013, with average fraction of total counted vehicles ("vehicle mix") given in the legend box

(d) Diurnal variation of vehicle class fraction among total counted vehicles passing by the measurement site *(NR-LCK: junction of Nathan Road and Lai Chi Kok Road)* between 28 May and 31 May 2013

(e) Diurnal variation of vehicle class fraction among total counted vehicles at the closest major vehicle counting station (*NR-ST-DS: Nathan Road, between junction with Shantung Street and Dundas Street*), data based on Annual Traffic Census, 2013 (Transport Department, 2014)
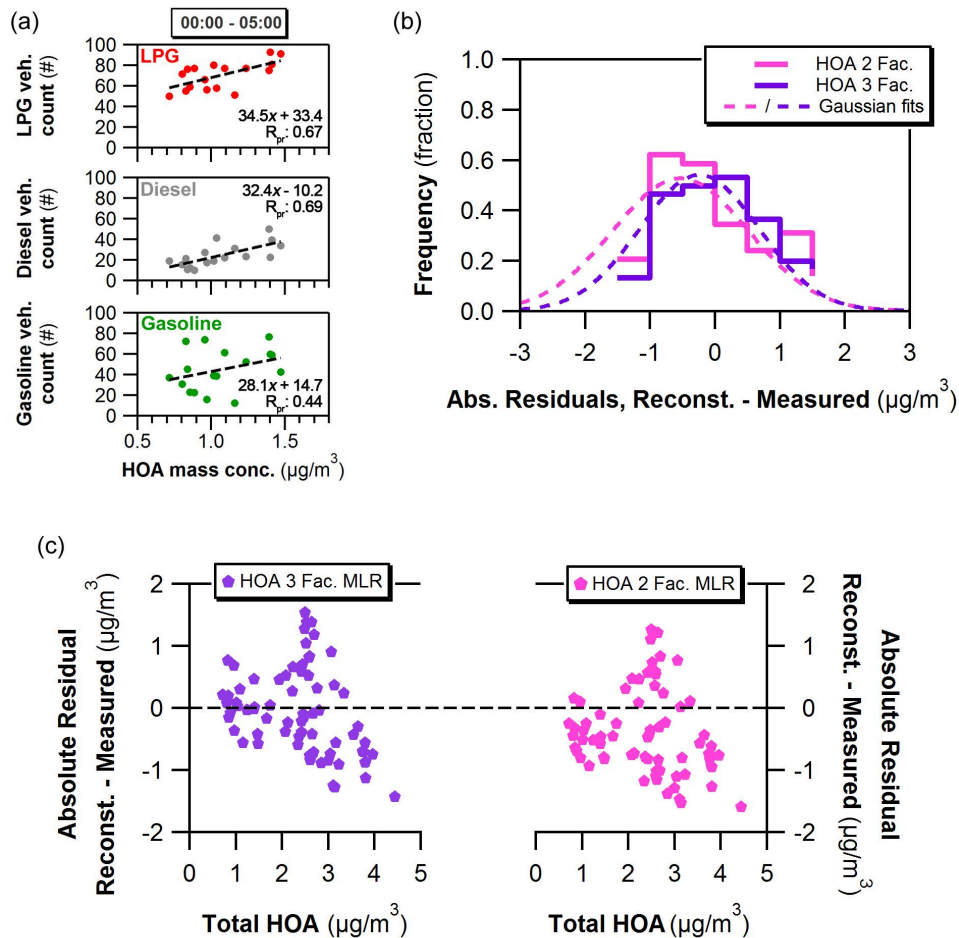
Figure S3

(a) Scatter plot of number of counted gasoline, diesel and LPG powered vehicles against total HOA mass concentration during the low traffic hours (00:00 to 05:00)

(b) Frequency distribution of absolute residuals (in $\mu g/m^3$) and their Gaussian fits for the three factor and two factor MLR solutions

(c) Scatter plot of absolute residuals (in $\mu g/m^3$) of three factor and 2 two factor MLR solutions against total HOA mass concentrations
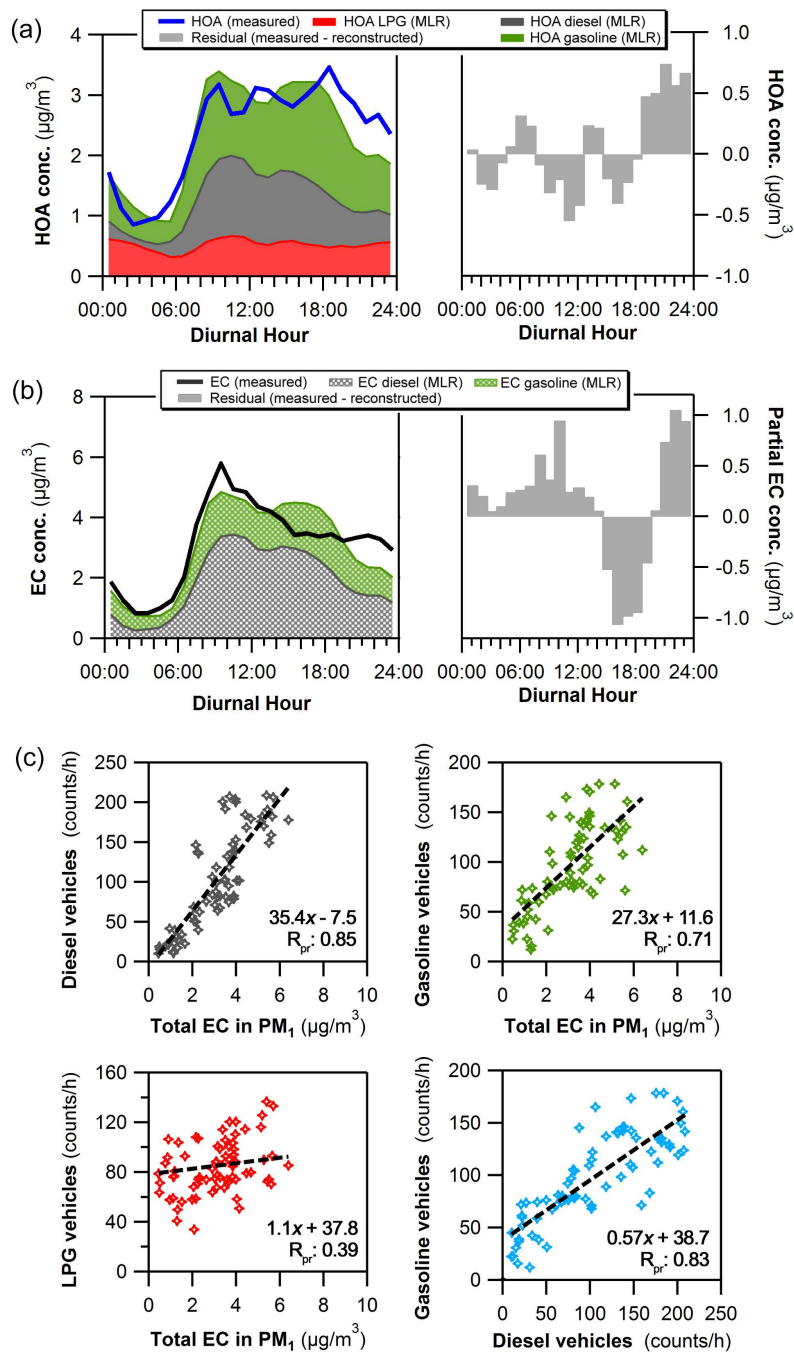
Figure S4

    (a) Diurnal variation of engine-type resolved HOA concentrations as well as actual measured HOA (left), and diurnal variation of HOA residual as the difference between actual and reconstructed HOA (right)

    (b) Diurnal variation of engine -type resolved EC concentration as well as actual measured EC in PM_1 (left), and diurnal variation of EC residual as the difference between actual and reconstructed EC in PM_1 (right)

    (c) Scatter plots of vehicle counts (by engine type) against total EC in PM_1, and gasoline against diesel vehicle count
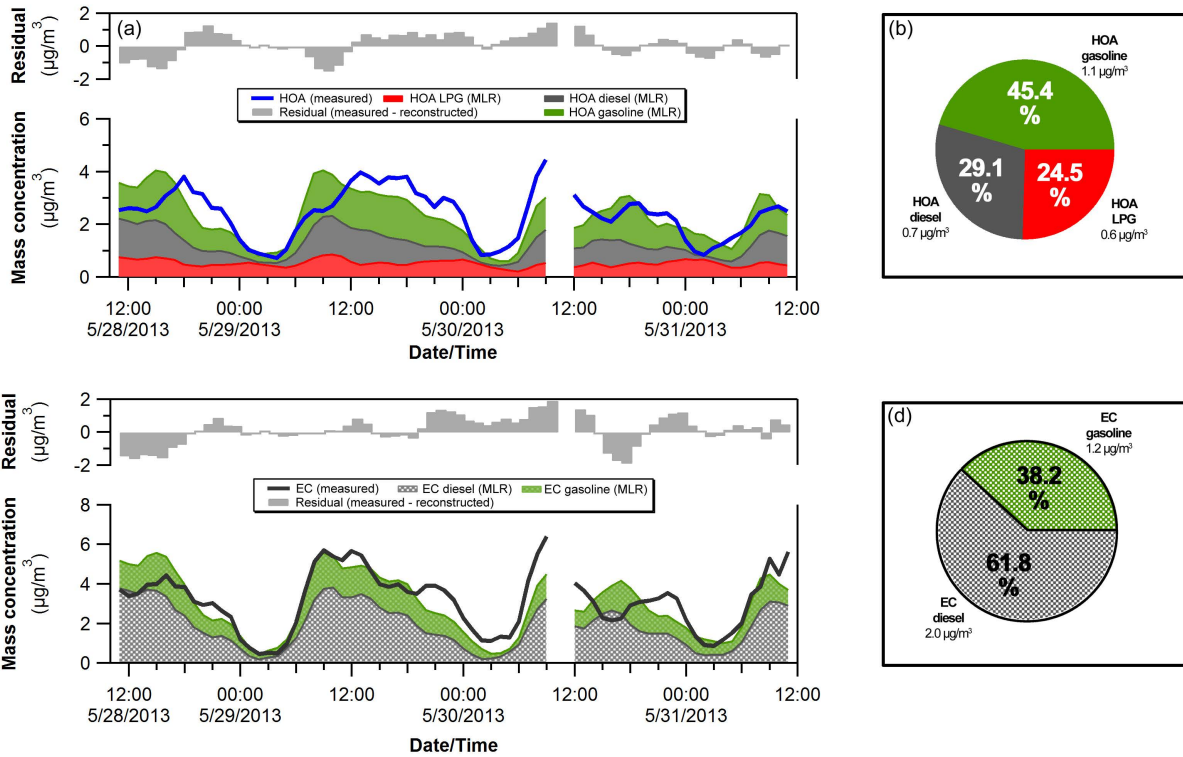
Figure S5

(a) Time series of engine-type resolved HOA, actual measured HOA, as well as residuals as the difference between resolved HOA and measured HOA

(b) Average contribution of engine-type resolved HOA in total reconstructed HOA

(c) Time series of engine-type separated EC, actual measured EC, as well as residuals as the difference between resolved EC and measured EC in in PM_1

(d) Average contribution of engine-type separated EC in total reconstructed EC in PM_1
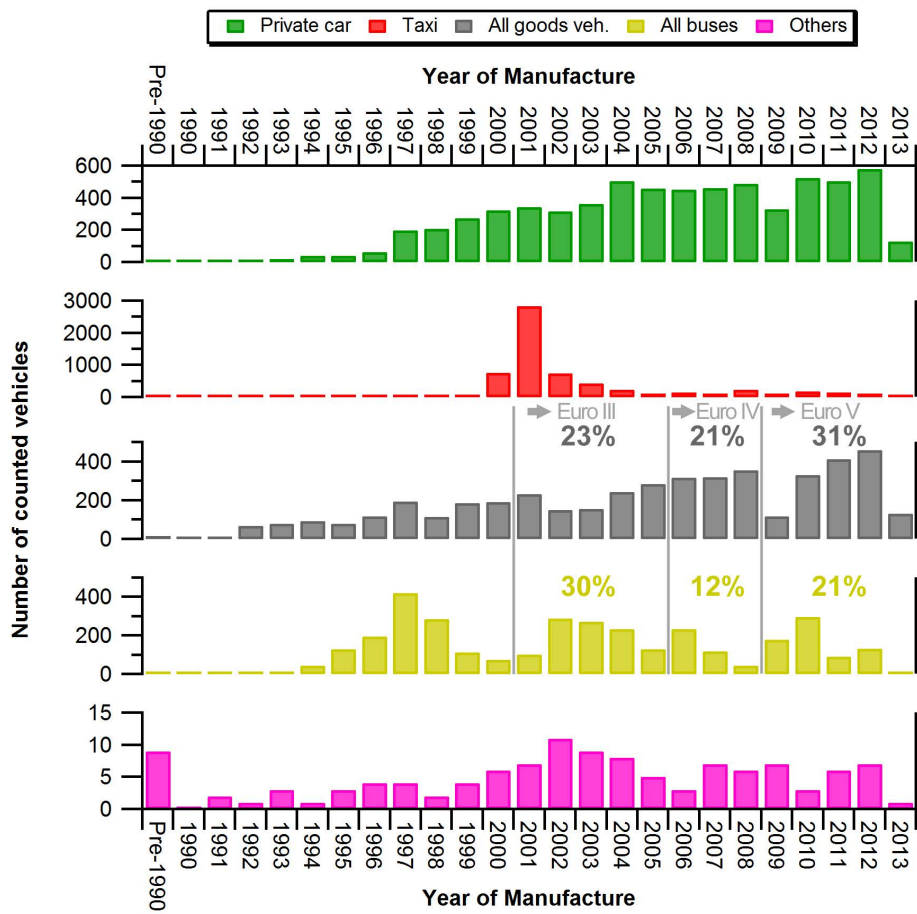
Figure S6

Distribution of year of manufacture of vehicles identified at the measurement site between 28 May 2013 and 31 May 2013. Vertical gray lines indicate the year of introduction of respective Euro emission standards for heavy diesel vehicles and percentage numbers indicate the fraction of vehicles within each bin.

References

Lee, B. P., Li, Y. J., Yu, J. Z., Louie, P. K. K., and Chan, C. K.: Characteristics of submicron particulate matter at the urban roadside in downtown Hong Kong—Overview of 4 months of continuous high-resolution aerosol mass spectrometer measurements, Journal of Geophysical Research: Atmospheres, 120, 7040-7058, 10.1002/2015JD023311, 2015.

Transport Department: The Annual Traffic Census 2013, HKSAR Government, Hong Kong, 2014.