APPENDIX AVAILABLE ON THE HEI WEB SITE

Research Report 180

Characterizing Ultrafine Particles and Other Air Pollutants In and Around School Buses

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Appendix A. Supplemental Table and Figures

Note: Appendices available only on the Web have been reviewed solely for spelling, grammar, and cross-references to the main text. They have not been formatted or fully edited by HEI.

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This document was reviewed by the HEI Health Review Committee.

Table A1. Meteorological conditions for idling tests

Date	Wind direction (°)			Wind speed (m/s)			T (C˚)			RH (%)		
	Mean	SD	RSD	Mean	SD	RSD	Mean	SD	RSD	Mean	SD	RSD
8/30/2010	197	23	12%	3.6	1.4	39%	20.2	0.7	3%	68	3	4%
8/31/2010	205	30	15%	3.3	1.0	30%	22.5	0.6	3%	58	3	5%
9/1/2010	186	20	11%	2.7	0.9	33%	21.6	1.0	5%	68	5	7%
9/2/2010	179	15	8%	2.6	0.7	27%	21.8	1.0	5%	69	4	6%
9/3/2010	179	13	7%	2.5	0.8	32%	22.6	0.8	4%	65	3	5%
9/8/2010	202	28	14%	3.4	0.9	26%	18.2	0.4	2%	80	2	3%
9/9/2010	186	34	18%	2.9	0.9	31%	20.3	0.8	4%	69	3	4%
9/10/2010	201	26	13%	3.0	0.9	30%	20.5	0.5	2%	71	2	3%

*SD, standard deviation; RSD, relative standard deviation

Figure A.1. Comparison of the readings from co-located instruments for PNC, $PM_{2.5}$, CO_2, Temperature (T), and RH.

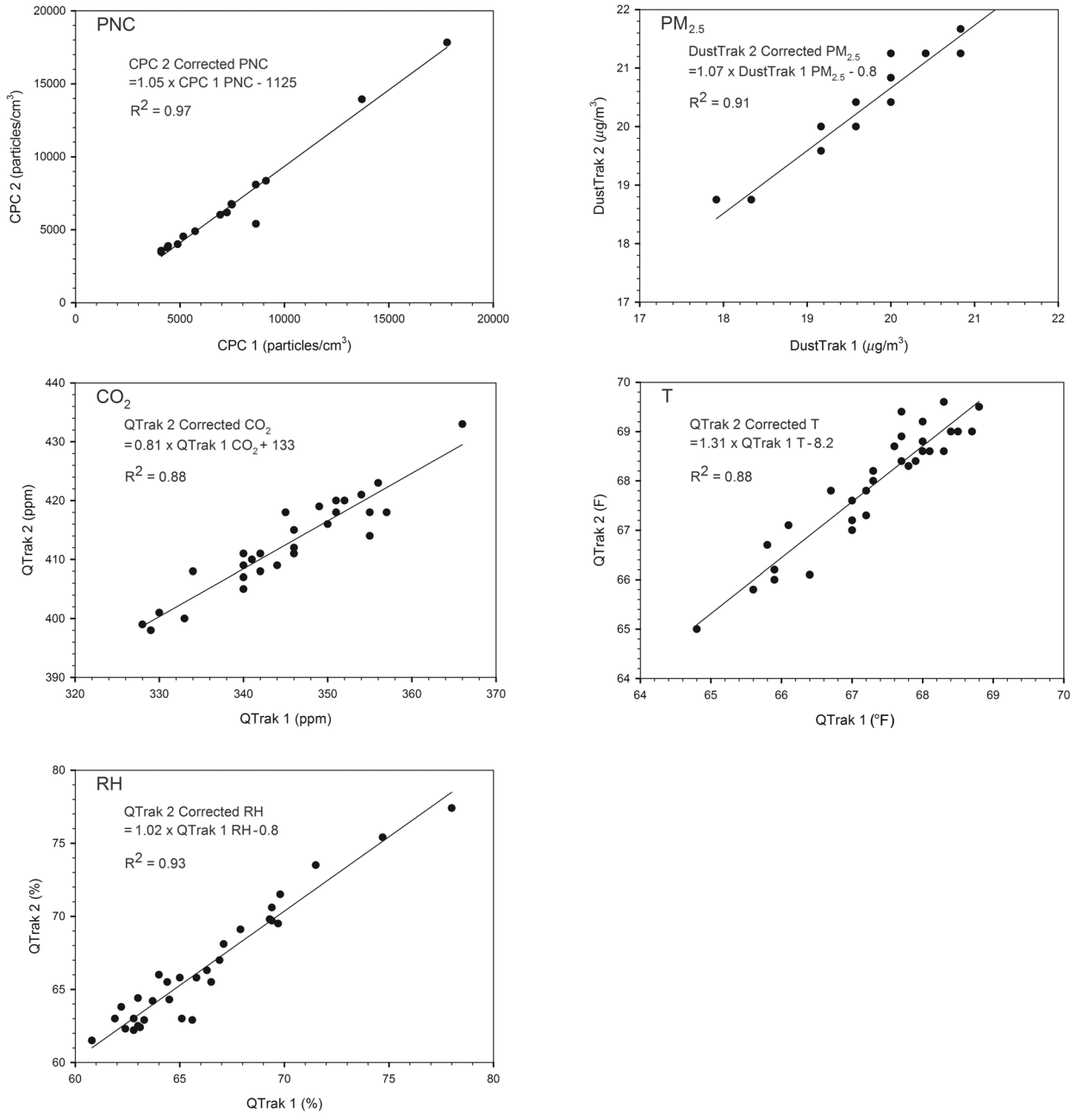

Figure A.2. Sampling site location for idling tests (courtesy of the U.S. Geological Survey).

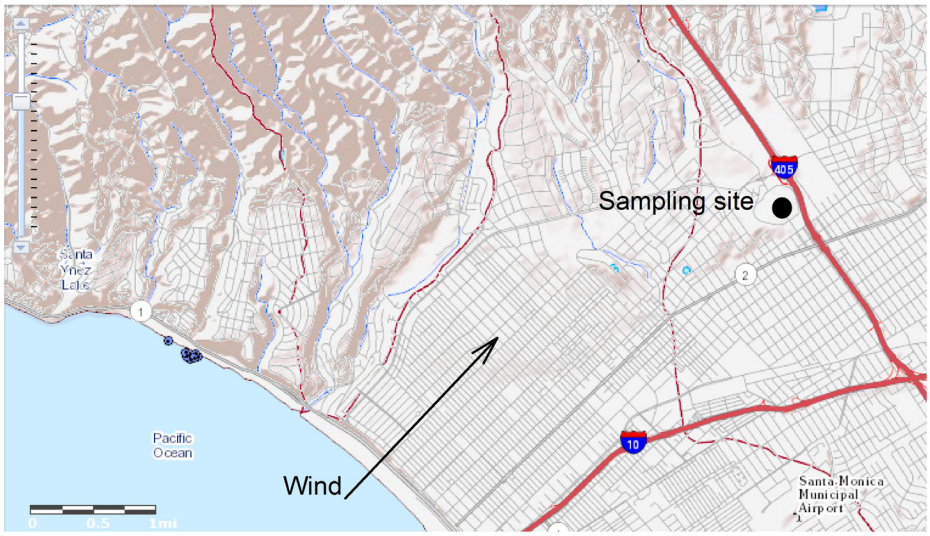

Figure A.3. Schematic layout of tested school buses and instruments for different scenarios. Open boxes refer to school bus bodies, gray areas indicate tailpipe emissions, and open circles with numbers represent the equipment for air pollutant measurements.

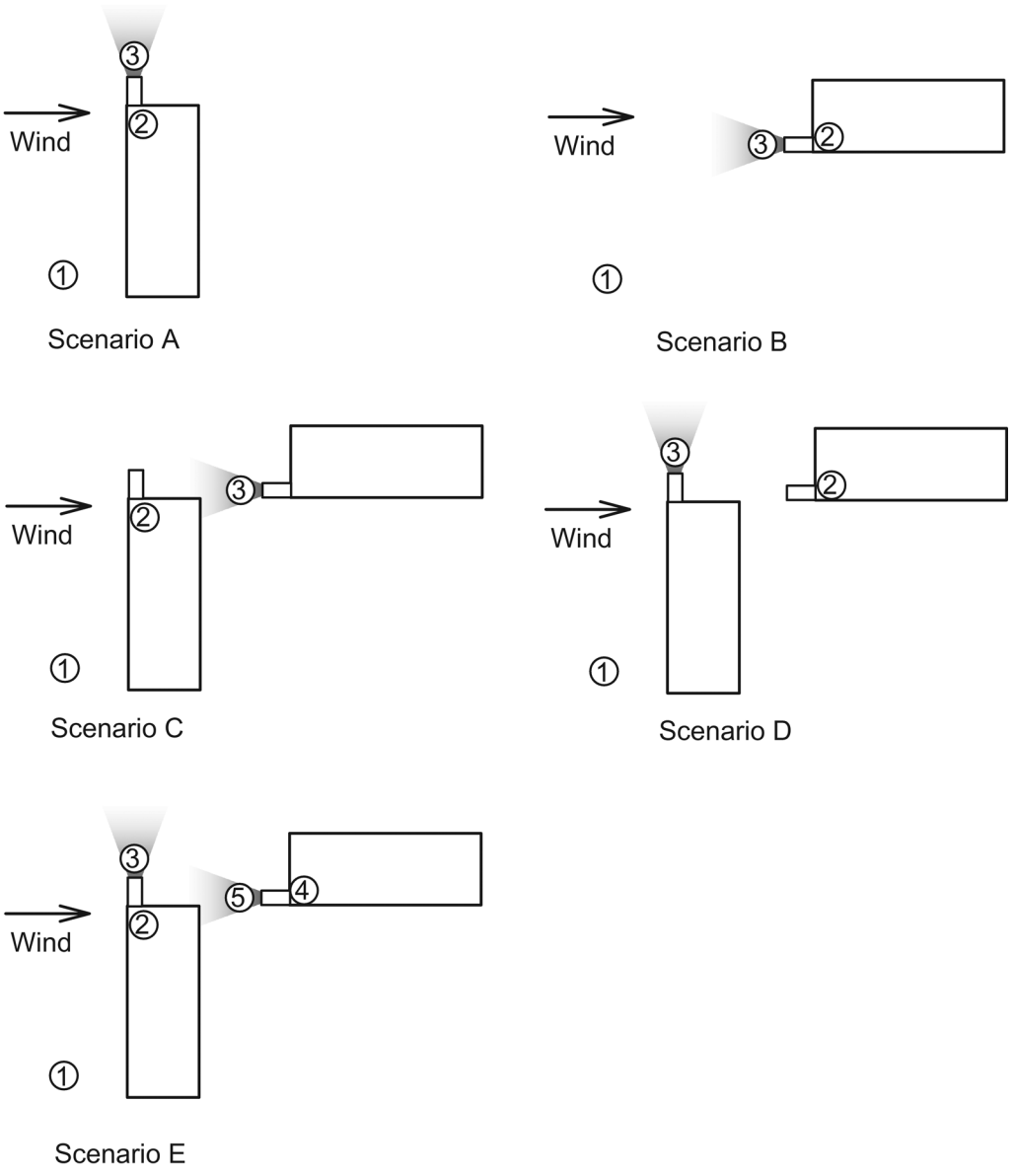

Figure A.4. Correlations between PNC and BC under different operating conditions. A: 1990 MY, closed windows; B: 2006 MY, closed windows; C: 1990 MY, open window; and D: 2006 MY, open window. Linear regression equations and R^2 are shown.

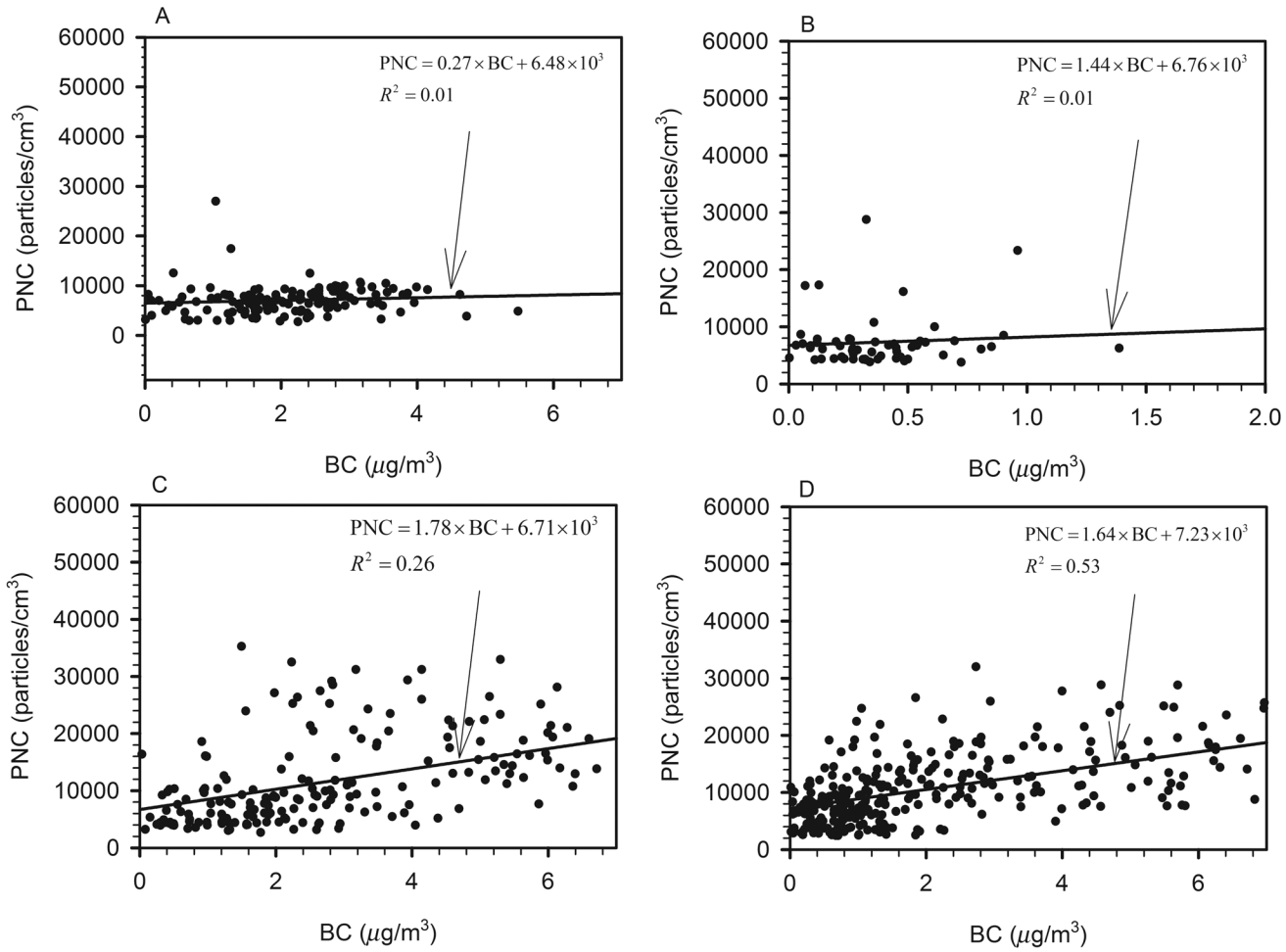

Figure A.5. Correlations between driving speeds and in-cabin PNC, $PM_{2.5}$, BC, and CO under window-open conditions. Error bars indicate one standard deviation. Linear regression equations and R^2 are shown.

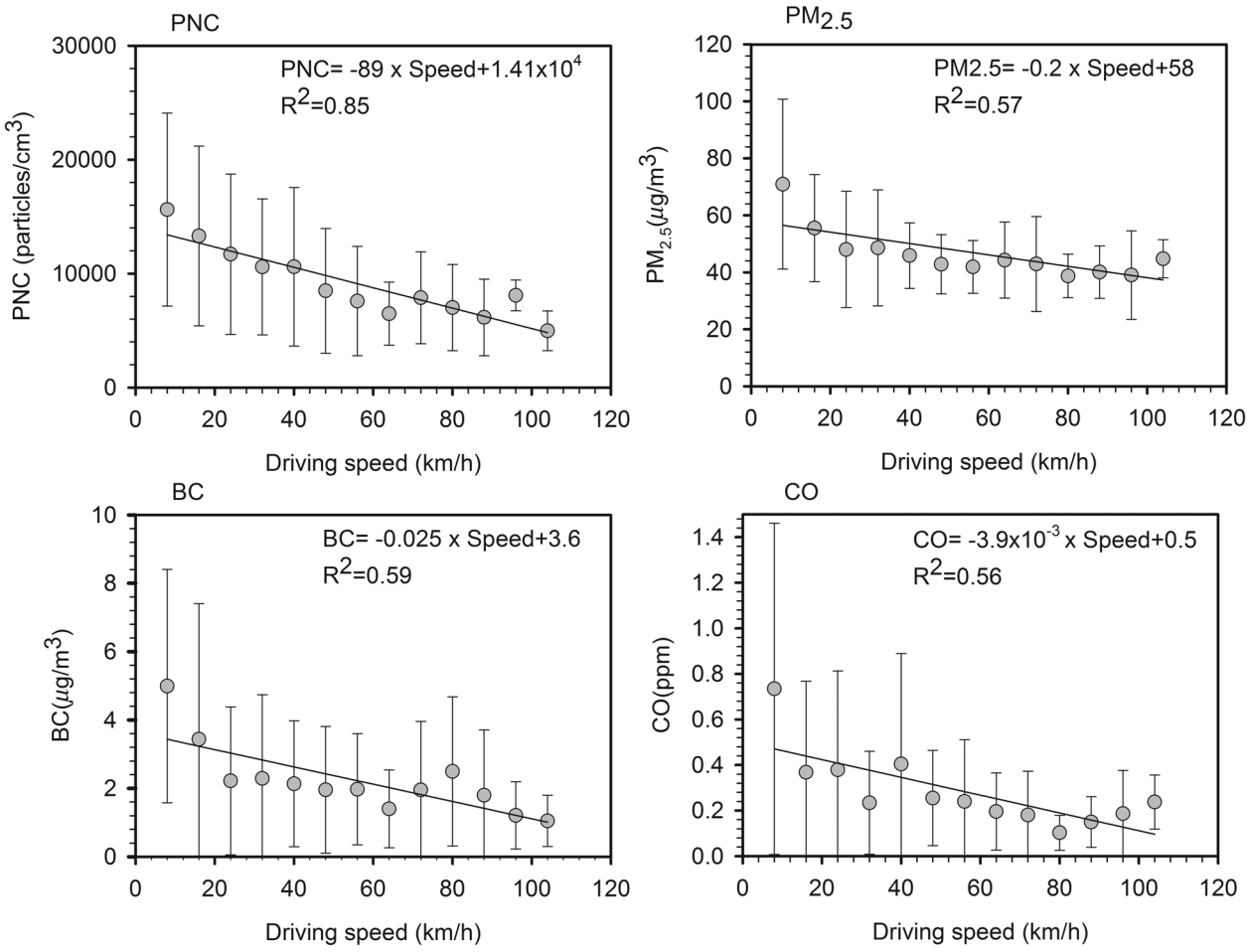

Figure A.6. Typical time-series plots of PNC for: A: one bus run consisting of (1) rural route, (2) bus transfer station, (3) line-up with other school buses leaving the transfer station, (4) school parking lot, and (5) town route; and B: one starting-up/driving/idling period.

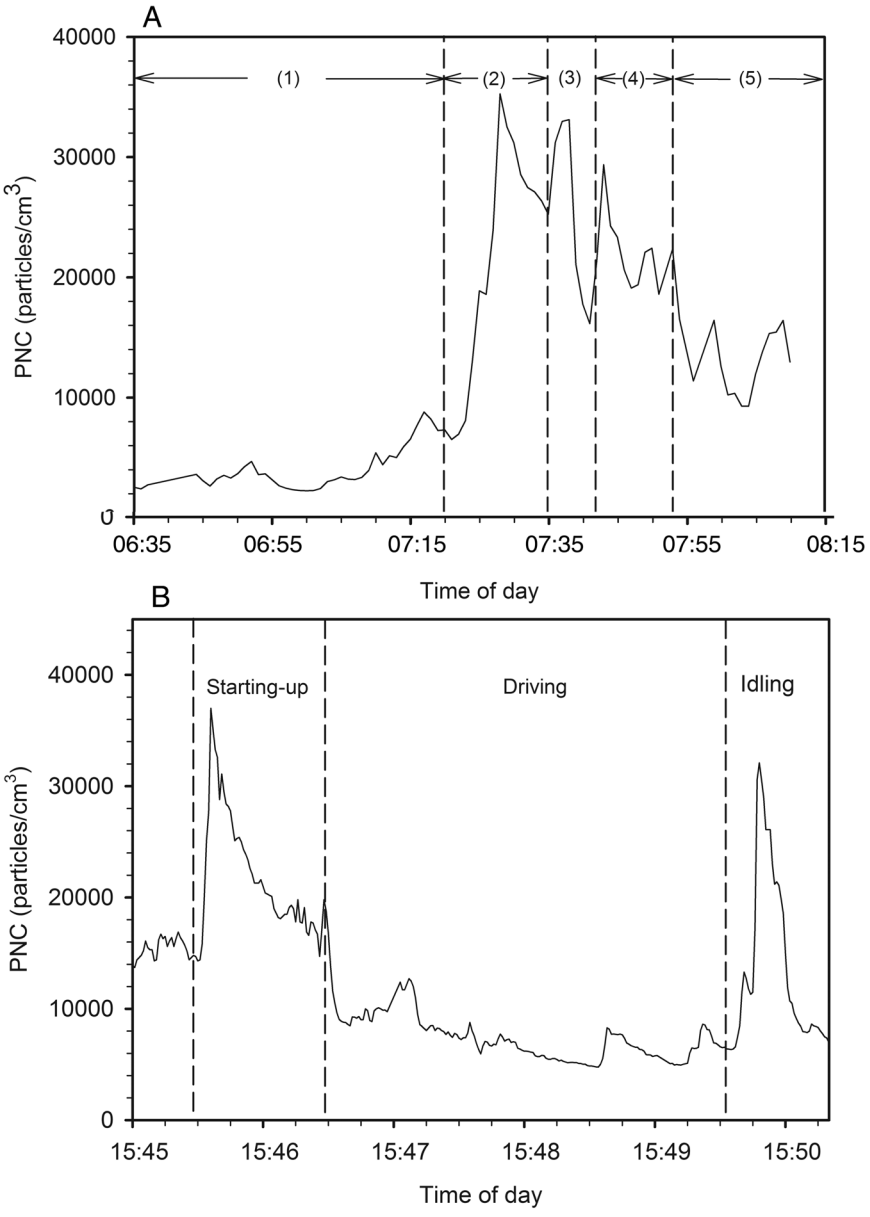

Figure A.7. Typical time series of PNCs in the upwind air, in-cabin air, and air close to the tailpipes under scenarios A and B with different window positions. Shaded boxes indicate the buses in which the measurements were shown. Rays indicate the buses of which the engines were turned on.

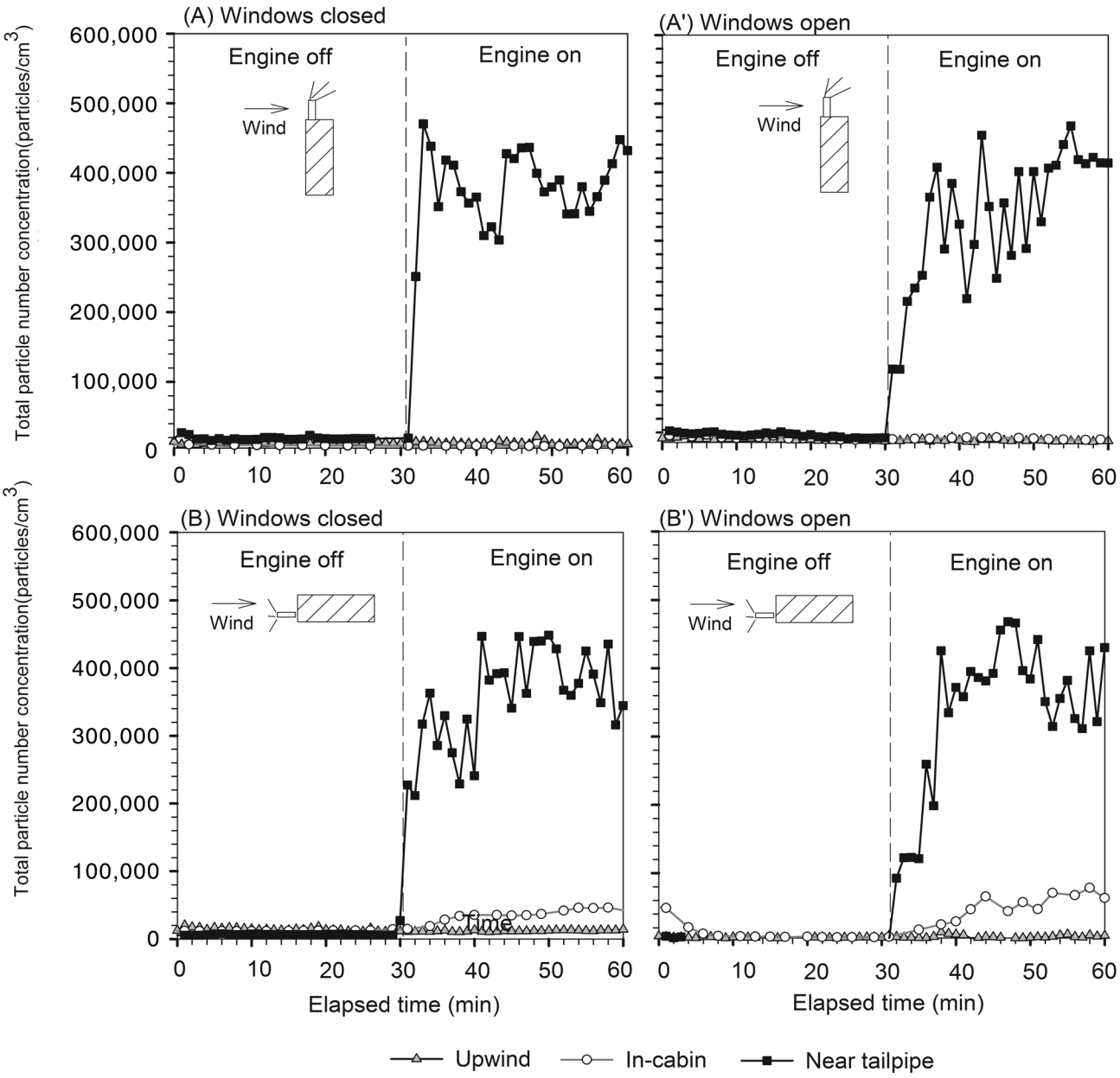

Figure A.8. Typical time series of PNCs in the upwind air, in-cabin air, and air close to the tailpipes under scenarios C and D with different window positions. Shaded boxes indicate the buses in which the measurements were shown. Rays indicate the buses of which the engines were turned on.

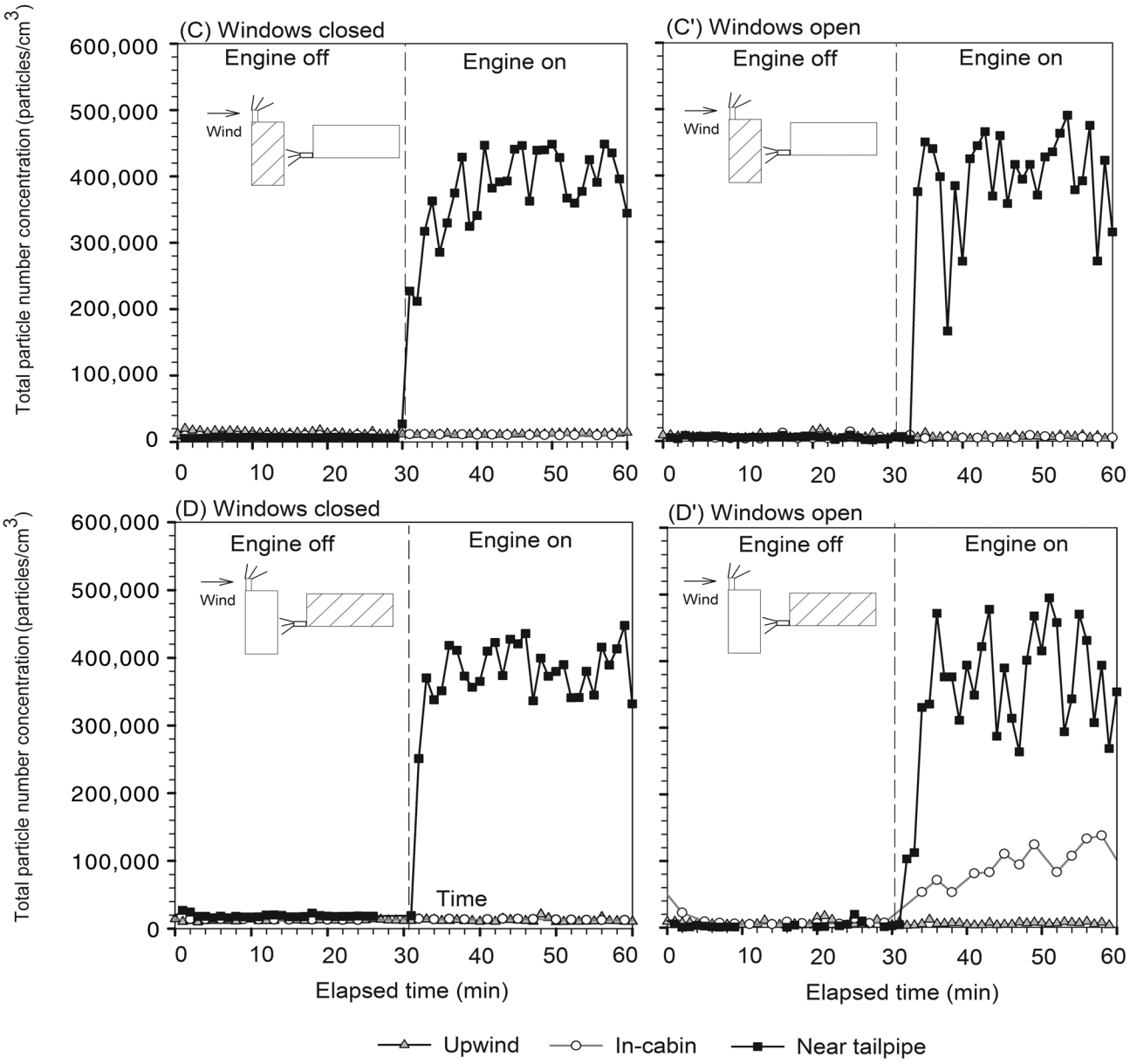

Figure A.9. Typical time series of PNCs in the upwind air, in-cabin air, and air close to the tailpipes under scenario E with different window positions. Shaded boxes indicate the buses in which the measurements were shown. Rays indicate the buses of which the engines were turned on.

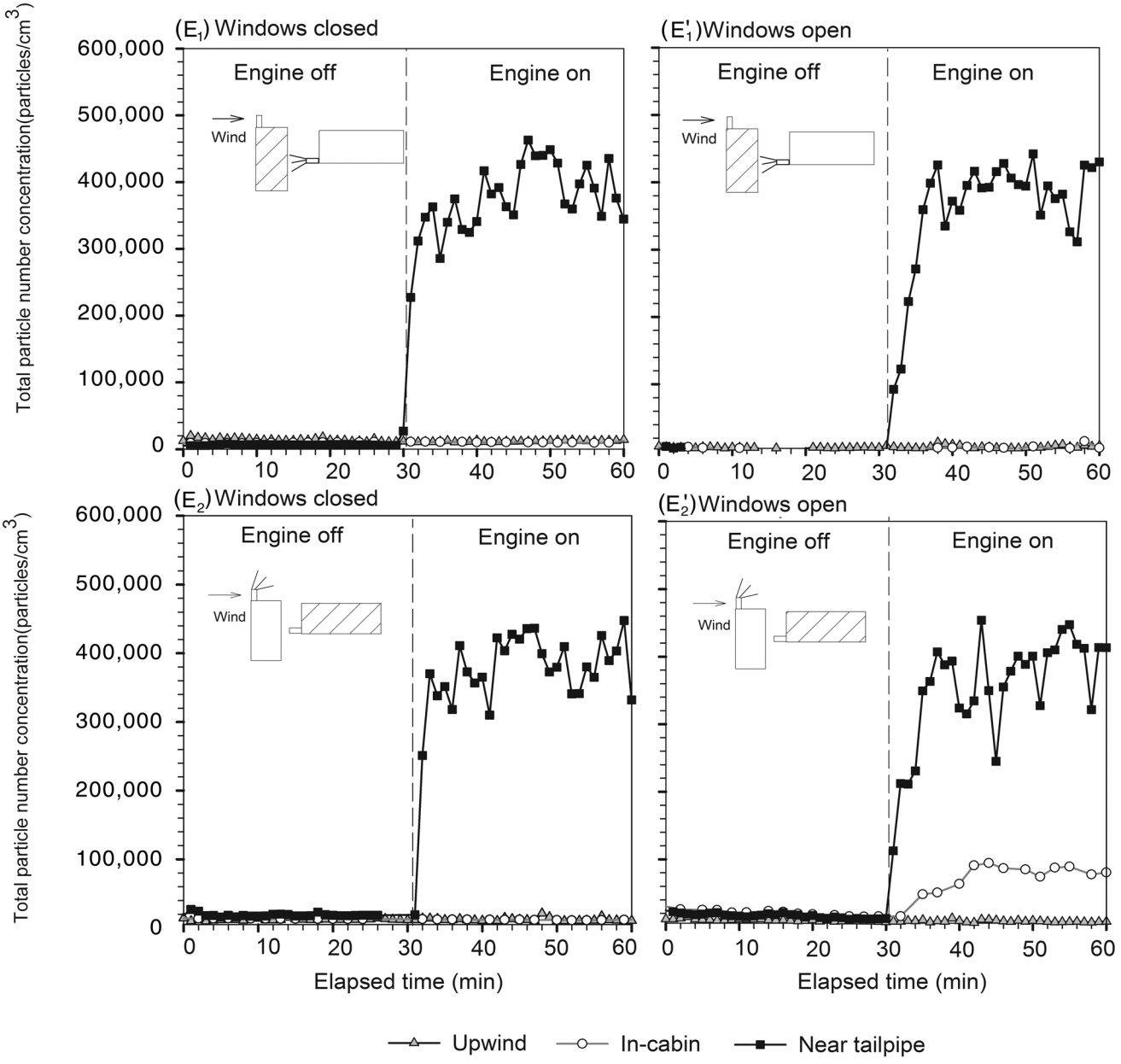

Figure A.10. Correlations between tailpipe and in-cabin concentrations of PNC and $PM_{2.5}$. Linear regression equations and R^2 are shown.

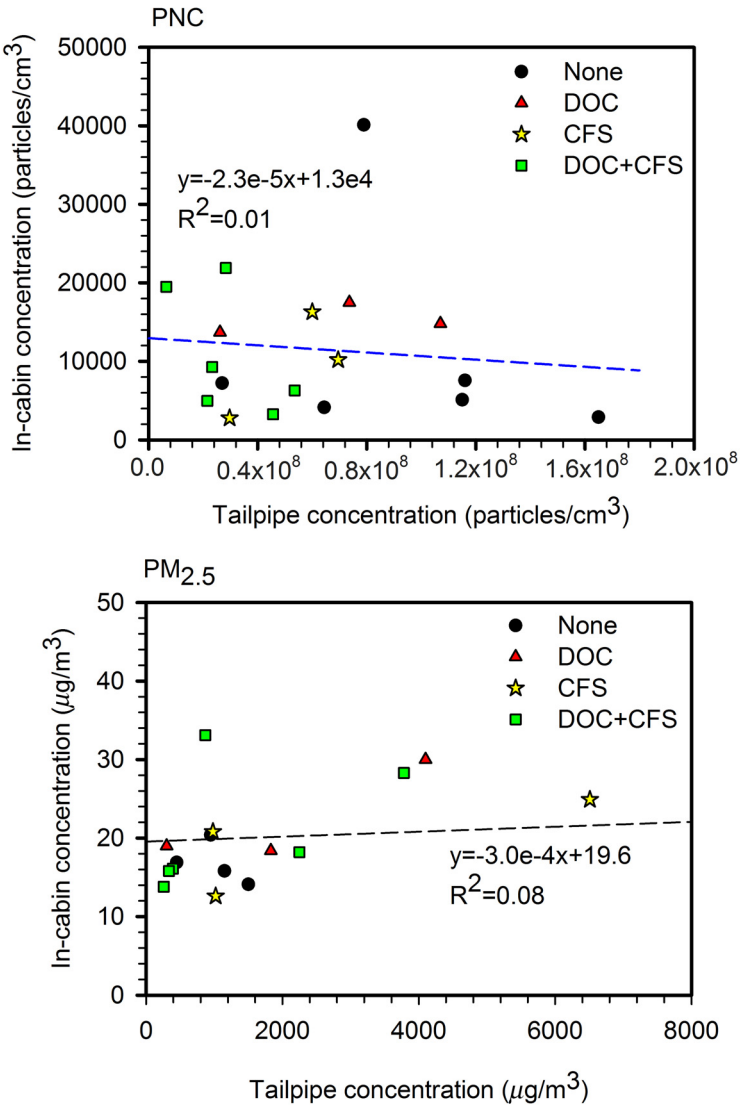

Figure A.11. Comparison of UFP deposition rates inside school bus vs. passenger car and residential apartment. UFP number concentration of the in-cabin air was measured by an SMPS (7.6–289 nm); only data in the size range of < 100 nm are presented and compared with previous studies.