Supplemental Material for:

Pilot study of the vertical variations in outdoor pollutant concentrations and environmental conditions along the height of a tall building

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1. Materials and Methods

1.1. Measurement Approach

In considering how to conduct the planned outdoor measurements, the following field measurement approaches were identified as possible pathways in early discussions with the building engineers and ownership representatives in order to balance equipment costs, accuracy, and practicality: (1) multiple instruments measuring simultaneously on multiple floors; or (2) one set of mobile instruments to scan the height of a building, via (a) a pulley system or similar technology to lower and raise an instrument platform or (b) using a drone or other aerial vehicle to lower and raise a (likely much smaller) instrument platform. Both options 2a and 2b were deemed impractical for the purposes of this work, as neither approach would allow for longer-term measurements (i.e., one week at a time) but would be limited to short-term measurements (i.e., on the order of a few hours at most). Additionally, neither approach would allow for actual simultaneous measurements, meaning that a true comparison of matched, simultaneous, time-stamped data could never really be made (i.e., only repeated scans of the building height would be achievable). Therefore, option 1 was chosen as the most realistic approach from the standpoints of both data quality and practicality.

However, option 1 also has its own limitations. For example, air quality monitors that are formally designated as federal reference or federal equivalent methods (i.e., FRM or FEM) to most accurately measure PM or O_3 or NO_x concentrations are often at least $10,000 USD and thus prohibitively expensive for simultaneous measurements in five locations. Therefore, to be able to establish a finer vertical resolution in matched time-resolved pollutant measurements, we decided to evaluate a number of more cost effective air quality monitors on the market that we know have been used successfully in other recent projects to meet similar goals for several of the pollutants that we know are generally considered most important from for human health [1].

Taking these constraints into consideration, the instruments described in Section 2.1 of the main text were used to monitor approximately simultaneously on each floor. All five sets of instruments were placed in the top drawer in five identical rolling tool carts with uninterruptible power supplies (UPS) installed in the bottom drawer. The top drawer of each rolling tool cart was modified to include a small exhaust fan in one side and 12 small air intake holes drilled on the opposite side to continuously draw the outdoor air flow in through the top drawer (Figure S1).

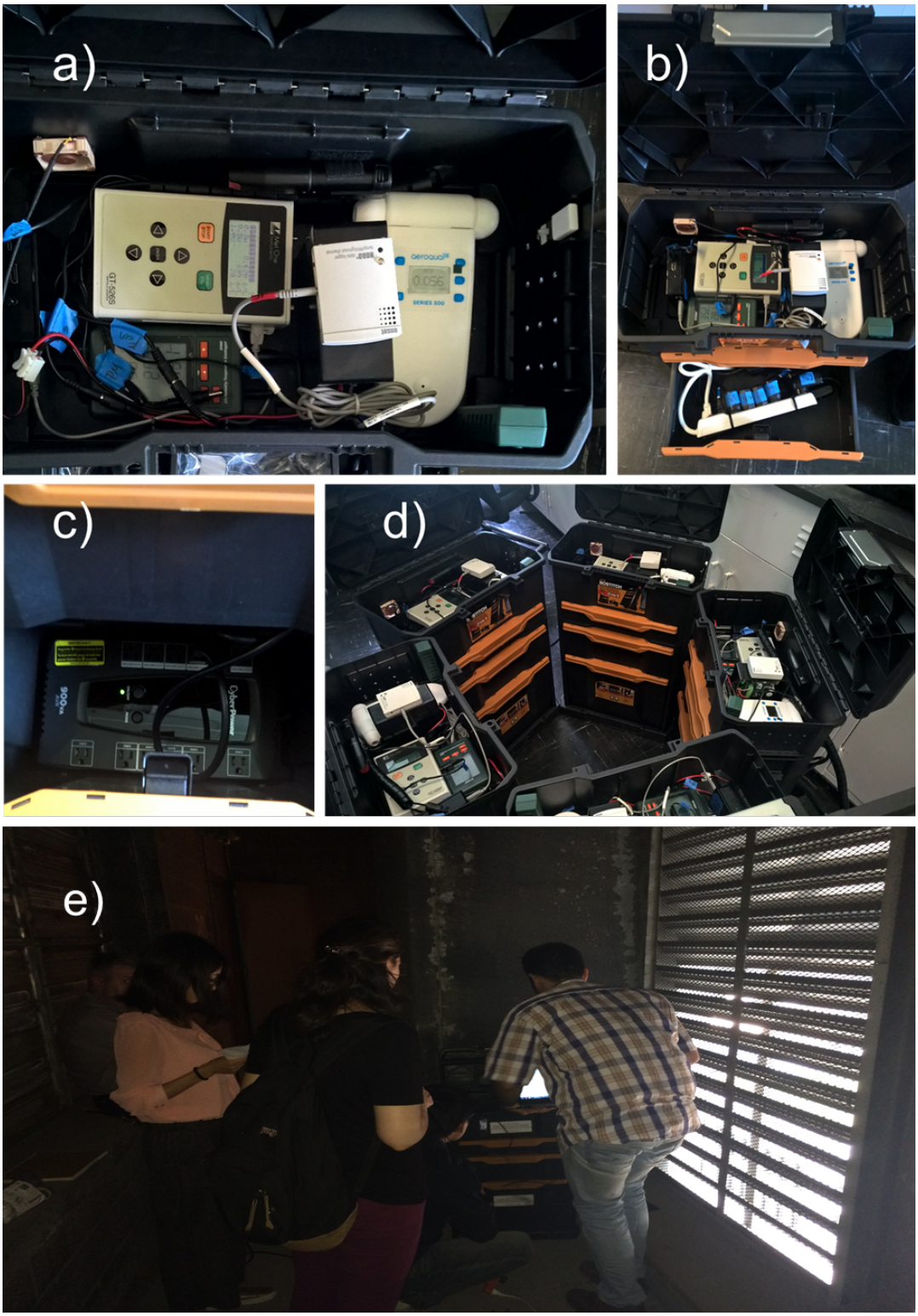

Figure S1. Five rolling tool carts with instrumentation: (a) top drawer includes the MetOne GT-526S OPCs, Aeroqual SM50 OEM ozone monitors, Extech SD800 CO_2 monitors, Aeroqual S500 NO_2 monitors, LASCAR CO loggers, and Onset U12-013 HOBO 2-Channel Temperature/Relative Humidity data loggers along with a small exhaust fan and air intake holes, (b) instrument power supplies connected in the middle drawer, (c) uninterruptible power supplies (UPS) installed in the bottom drawer, (d) all five rolling tool carts aligned for a 24-hour co-location test, and (e) the measurement location in one outdoor air intake.

1.2. Instrument Calibration

Because multiple versions of each instrument were used to measure each parameter on each of the five floors simultaneously, instrument calibration was conducted with a combination of approaches either before or after the field measurements occurred. One of two types of calibrations was performed for each instrument: (1) co-locations against factory-calibrated research-grade instruments, and (2) co-locations against each other. The former calibration approach allows an instrument to provide a reasonably accurate measure of the absolute value of the parameter in question, while the latter calibration approach allows an instrument to provide a reasonably accurate measure of the relative value of the parameter (e.g., using one of the five monitors as a reference for relative comparisons between data collected on each floor).

1.2.1. Temperature (T) and relative humidity (RH)

Given our prior experience demonstrating that the Onset HOBO U12 temperature and relative humidity data loggers compare extremely well against each other and do not experience significant drift issues [2], we did not conduct additional calibrations of the temperature and relative humidity loggers.

1.2.2. Particulate matter (PM)

MetOne GT-526S optical particle counters (OPCs) were calibrated via co-location approximately one week before the field measurements began. We chose one of the OPCs (i.e. Monitor ID: W12690, later located on the second floor in the field measurements) as the reference particle counter and calibrated the other monitors to it. Prior internal laboratory investigations with these monitors demonstrated very strong correlations with more expensive research grade equipment (e.g., $R^2 > 0.97$ with slopes near 1.0 when compared to data from a TSI Model 3330 Optical Particle Sizer, or OPS). The OPC calibration test was conducted by co-locating all monitors installed inside their rolling carts inside a room in the Built Environment Research Group Laboratory at Illinois Institute of Technology for a period of approximately 24 hours. The total number concentration of particles between 0.3 µm and 10 µm varied between ~4.4×10^7 #/m^3 and ~2.4×10^6 #/m^3 during the calibration period, providing a reasonably wide range of concentrations over which the calibration could be performed.

OPC co-location calibrations were first conducted for each of the five particle size bins for particles smaller than 10 µm, as well as the total particle number concentrations, with the monitor that was placed on the 2nd floor serving as an arbitrary reference (Figure S2).

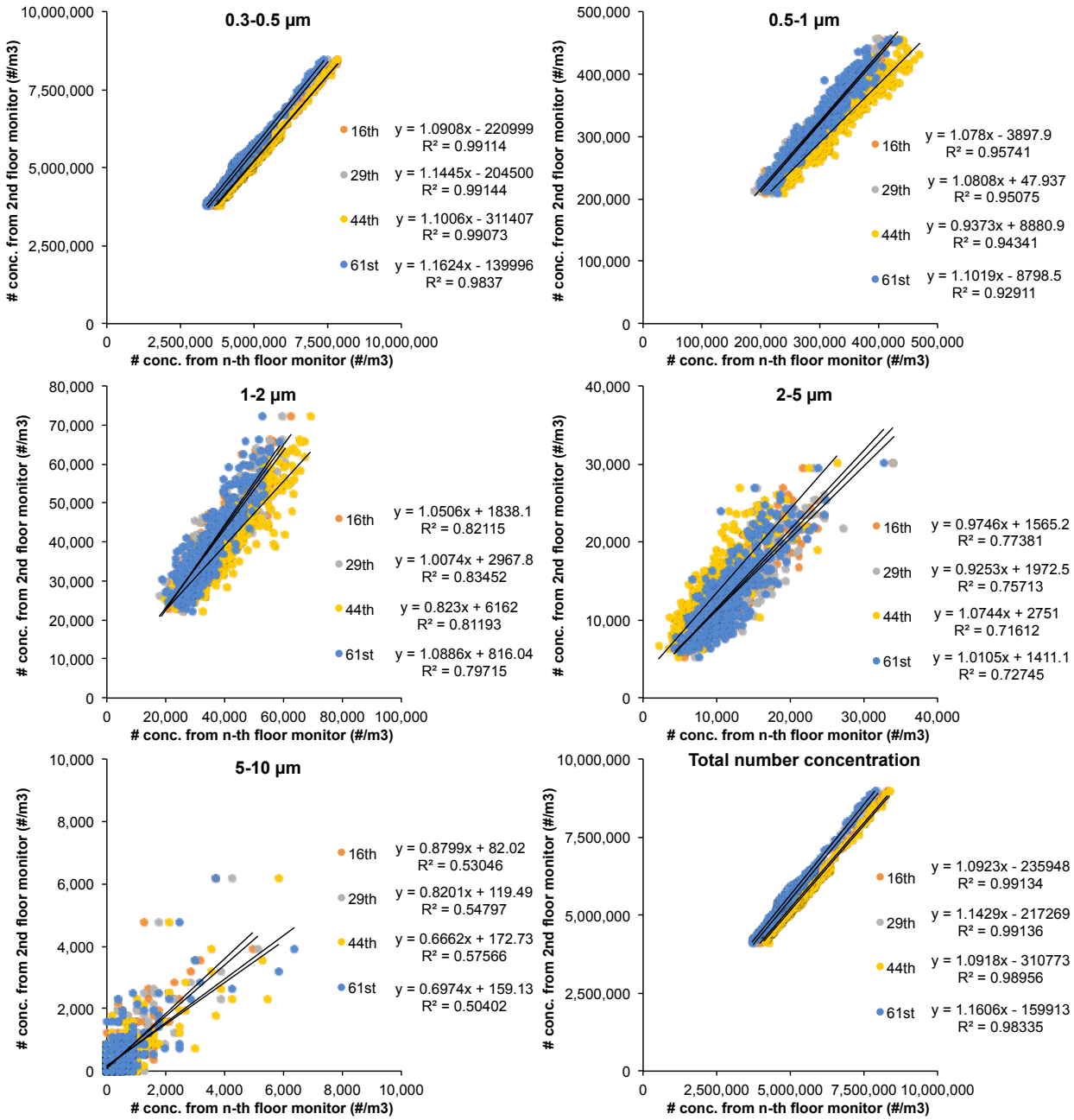

Figure S2. Linear regressions used to adjust the raw size-resolved OPC number concentrations from the n-th floor OPC to concentrations equivalent to those measured by the OPC installed on the 2nd floor based on the co-location calibration test data. Size bins include: 0.3-0.5 µm, 0.5-1 µm, 1-2 µm, 2-5 µm, 5-10 µm and total number concentrations.

Next, the mass concentrations of PM_1, $PM_{2.5}$, and PM_{10} were each approximated using a procedure described in the main text (assuming uniform density of 1.5 g/cm^3 as discussed in the main text). Figure S3, Figure S5, and Figure S7 compare raw and adjusted PM_1, $PM_{2.5}$, and PM_{10}, mass concentrations, respectively, for all five MetOne GT-526S OPCs, while Figure S4, Figure S6, and Figure S8 demonstrate the linear regressions fit to the calibration data from the OPCs that were later placed on 16th, 29th, 44th, and 61st floors compared to the one that was placed on the 2nd floor for PM_1, $PM_{2.5}$, and PM_{10} mass concentrations, respectively.

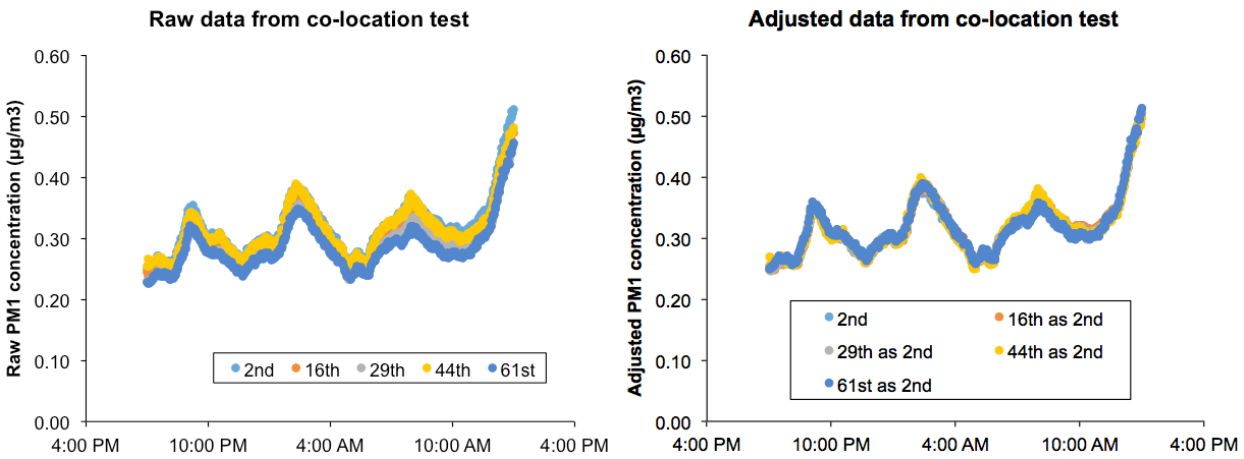

Figure S3. Raw and adjusted PM_1 concentrations from the co-location calibration test, estimated using the number concentration of particles between 0.3 µm and 1 µm measured by MetOne GT-526S optical particle counters (OPCs). Particle density is assumed to be 1.5 g/cm^3 for all sizes.

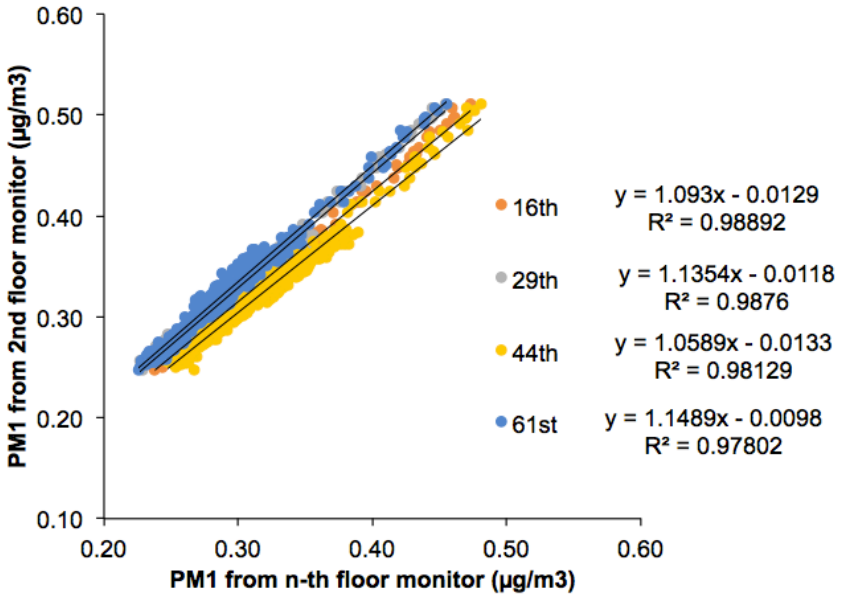

Figure S4. Linear regressions used to adjust the raw PM_1 concentrations from the n-th floor OPC to concentrations equivalent to those measured by the OPC installed on the 2nd floor based on the co-location calibration test data. Particle density is assumed to be 1.5 g/cm^3 for all sizes.

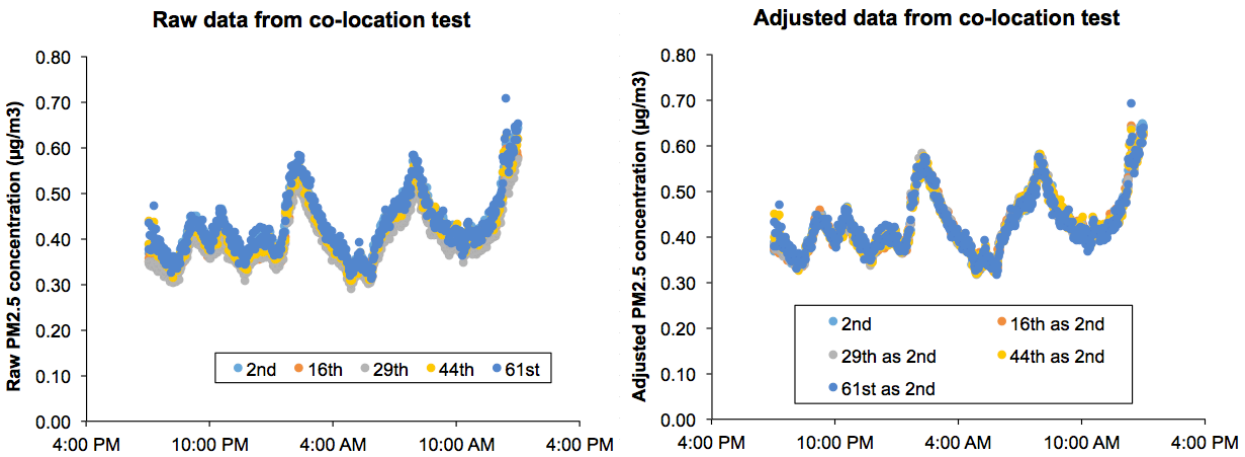

Figure S5. Raw and adjusted $PM_{2.5}$ concentrations from the co-location calibration test, estimated using the number concentration of particles between 0.3 µm and 2.5 µm measured by MetOne GT-526S optical particle counters (OPCs). Particle density is assumed to be 1.5 g/cm^3 for all sizes.

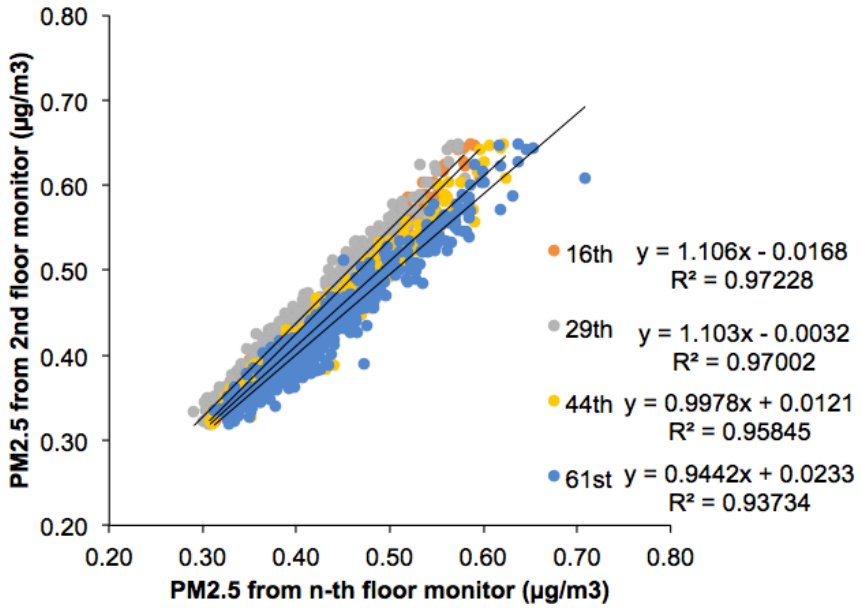

Figure S6. Linear regressions used to adjust the raw $PM_{2.5}$ concentrations from the n-th floor OPC to concentrations equivalent to those measured by the OPC installed on the 2nd floor based on the co-location calibration test data. Particle density is assumed to be 1.5 g/cm^3 for all sizes.

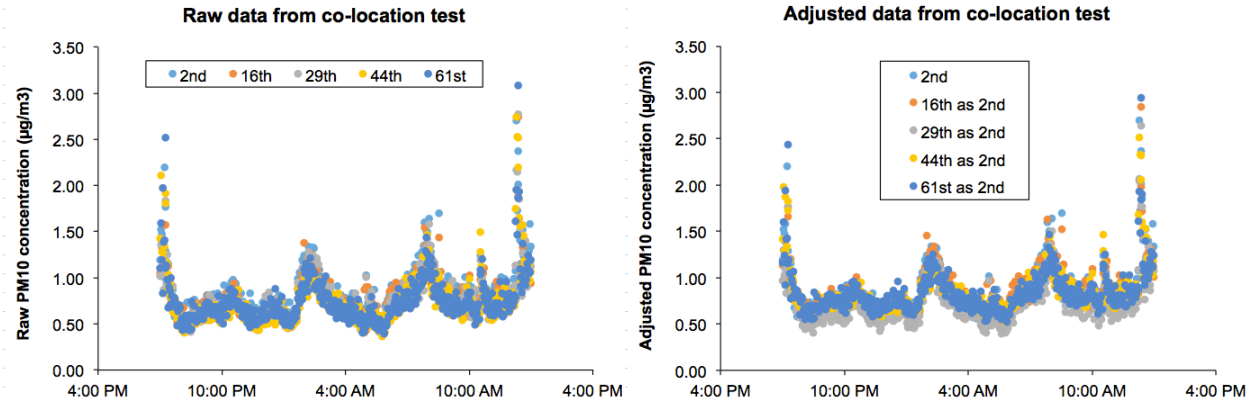

Figure S7. Raw and adjusted PM_{10} concentrations from the co-location calibration test, estimated using the number concentration of particles between 0.3 µm and 10.0 µm measured by MetOne GT-526S optical particle counters (OPCs). Particle density is assumed to be 1.5 g/cm^3 for all sizes.

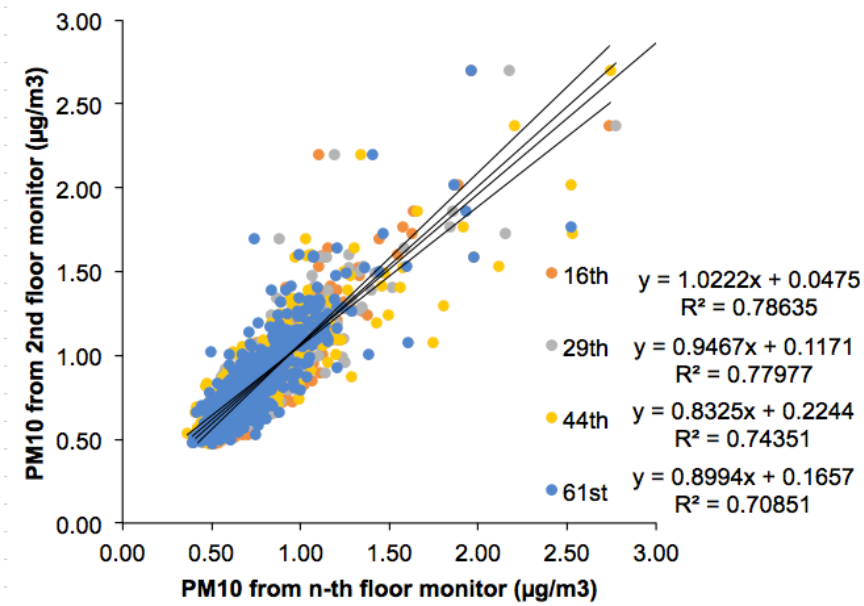

Figure S8. Linear regressions used to adjust the raw PM_{10} concentrations from the n-th floor OPC to concentrations equivalent to those measured by the OPC installed on the 2nd floor based on the co-location calibration test data. Particle density is assumed to be 1.5 g/cm^3 for all sizes.

1.2.3. Ozone (O_3)

Ozone co-location calibration tests were conducted inside a 3.6 m^3 stainless steel chamber located in the Built Environment Research Group Laboratory at Illinois Institute of Technology. A small mixing fan was operated to achieve well-mixed conditions inside the chamber. Filtered room air was supplied to the chamber using a small blower connected to a fibrous media filter impregnated with activated carbon to remove both particles and gases. The chamber exhausted directly to a powered fume hood.

Five Aeroqual SM50 OEM ozone monitors were calibrated using co-location measurements with a 2B Technologies Model 211 ozone monitor by placing them alongside each other in the

chamber. We considered the Model 211 monitor to be the reference against which other ozone measurements were compared [3,4]. The Model 211 monitor was calibrated beforehand using a 2B Technologies Model 306 ozone calibration source. Linear regressions were used to calibrate the SM50 ozone concentration data to the co-located Model 211 ozone concentration data. Data were recorded from each instrument at 10-second intervals for approximately one hour while the chamber ozone concentration was elevated using a UV ozone generator (CAP Model OZN-1) located on the floor of the chamber. Initial concentrations peaked around 530 ppb, but then were allowed to decay to more reasonable values in the range of that which would be expected in the field measurements (e.g., less than ~100 ppb). Because the response time of the SM50 monitors is reported by the manufacturer to be "> 60 seconds," the 10-second records of both the SM50 and Model 211 data were averaged into bins of 1-minute intervals for the linear regression. Only those data that fit a straight line on a log-linear concentration versus time scatter plot were used to avoid potential errors in readings and to ensure that reasonably well-mixed conditions had been achieved.

Figure S9 shows raw ozone concentration data for all five Aeroqual SM50 OEM ozone monitors during the injection and decay calibration test along with the same values measured by the 2B Technologies Model 211 ozone monitor, while Figure S10 demonstrates the calculated calibration factors for the SM50 ozone monitors compared to the 2B Technologies Model 211. Figure S11 shows the adjusted ozone concentration data from the five Aeroqual SM50 ozone monitors, calibrated via co-location to provide concentrations that are reasonably equivalent to the 2B Technologies Model 211 ozone monitor. It is noticeable that the SM50 ozone monitors have much higher practical limits of detection (LOD) than the Model 211 monitor, which means that for ozone concentrations below a certain value (which varies by sensor), they simply record a constant value near zero (i.e. 0.3 ppb, as shown in Figure S11). Therefore, we used the highest detection limit (approximately 30 ppb) of the SM50 ozone monitors to screen all field data, meaning that meaningful comparisons can only be made when outdoor concentrations are above the chosen LOD.

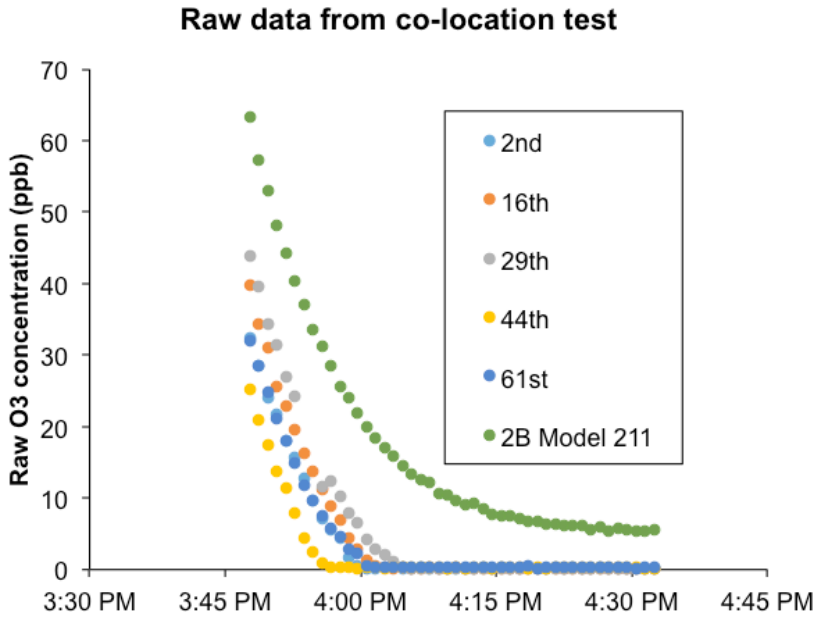

Figure S9. Ozone concentrations measured using a 2B Technologies Model 211 ozone monitor (reference) co-located with five Aeroqual SM50 ozone monitors during an injection and decay calibration test conducted in a 3.6 m^3 stainless steel chamber

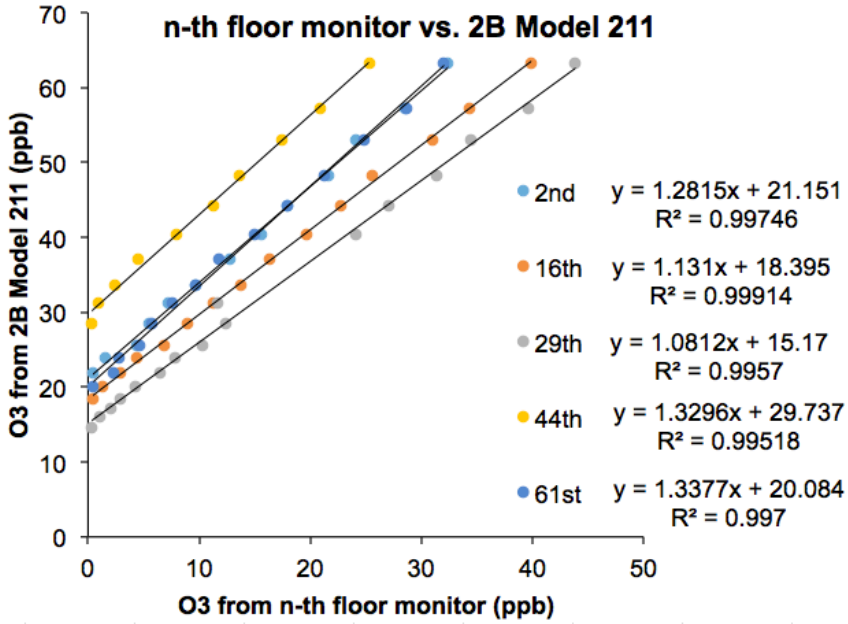

Figure S10. Linear regressions of five Aeroqual SM50 ozone monitors compared to a 2B Technologies Model 211 ozone monitor (reference) from co-location measurements inside a 3.6 m^3 stainless steel chamber

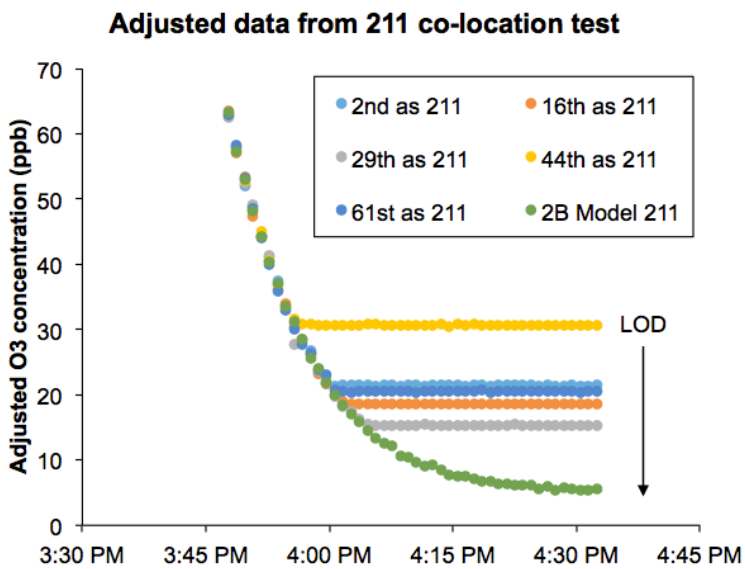

Figure S11. Adjusted ozone concentration data from the five Aeroqual SM50 ozone monitors, calibrated via co-location to provide concentrations that are equivalent to the 2B Technologies Model 211 ozone monitor. "LOD" refers to the "limit of detection" of each SM50 monitor. The highest LOD (approximately 30 ppb) was used to screen all field data (e.g., only field data above the highest LOD were used for comparisons).

1.2.4. Nitrogen dioxide (NO_2)

Similar to the ozone monitor calibration procedure, co-location experiments were conducted using five Aeroqual S500 data loggers with NO_2 sensor heads alongside a 2B Technologies Model 405 $NO/NO_2/NO_x$ monitor as the reference instrument. However, measurements were conducted in a residence rather than in a controlled chamber approximately one week after the field measurement test. All devices were positioned on a table in the dining room of a single-family residence (Figure S12), approximately 1 meter above the floor and approximately 4 meters away from a natural gas stove (NO_2 source) located in an adjacent kitchen area. To increase the concentration of NO_2 in the home, a gas stove was operated for approximately 20 minutes, and then the source was extinguished and NO_2 concentrations were allowed to decrease for approximately 1.5 hours afterward. Doors and windows were kept closed during the measurement period. An oscillating fan was installed on the countertop in the kitchen to achieve approximately well-mixed condition and the kitchen and dining room areas were kept unoccupied during testing to limit human interference. Data was logged from each instrument at 1-minute intervals. Co-location calibration factors were applied using linear regressions between the S500 instruments and the Model 405 instrument, as well as between four of the S500 instruments and an arbitrary S500 reference instrument (i.e., the S500 monitor used on the 2nd floor of the building during the field measurement).

Figure S12. Co-location test setup for calibrating Aeroqual S500 and 2B Technologies Model 405 NO_2 monitors

Figure S13 shows NO_2 concentrations measured using a 2B Technologies Model 405 $NO/NO_2/NO_x$ monitor co-located with five Aeroqual S500 NO_2 monitors. The results demonstrate the Aeroqual S500 and 2B Technologies Model 405 NO_2 monitor readings have similar trends with varying offsets.

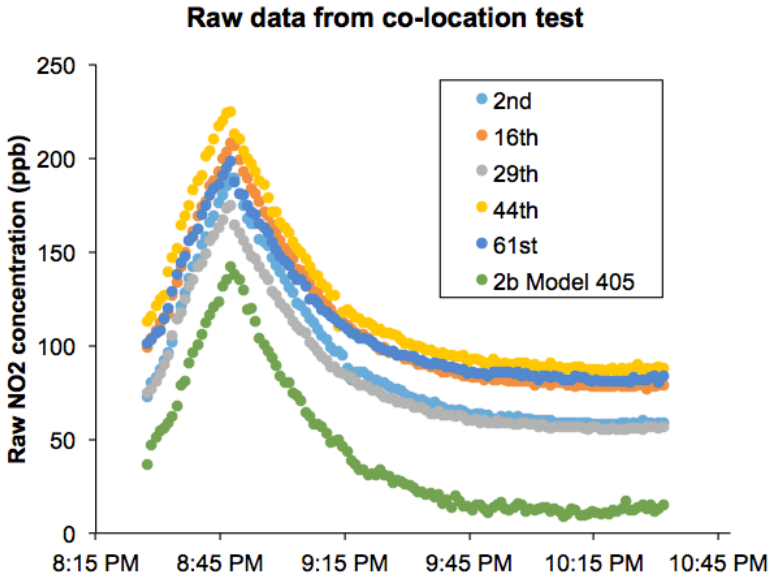

Figure S13. Nitrogen dioxide concentrations measured using a 2B Technologies Model 405 $NO/NO_2/NO_x$ monitor (reference) co-located with five Aeroqual S500 NO_2 monitors in the dining room of a residence while operating a natural gas stove for approximately 30 minutes followed by a ~1.5 hour decay period

Figure S14a and Figure S14b show linear regressions on the resulting data from co-location measurements in the dining room of a residence during and after a natural gas stove was operating from the five Aeroqual S500 NO_2 monitors (labeled according to which floor they were located during the field measurements) compared to (a) the 2B Technologies Model 405 $NO/NO_2/NO_x$ monitor (reference) and (b) to the one Aeroqual S500 monitor that was used on the 2nd floor of the building during the field measurement.

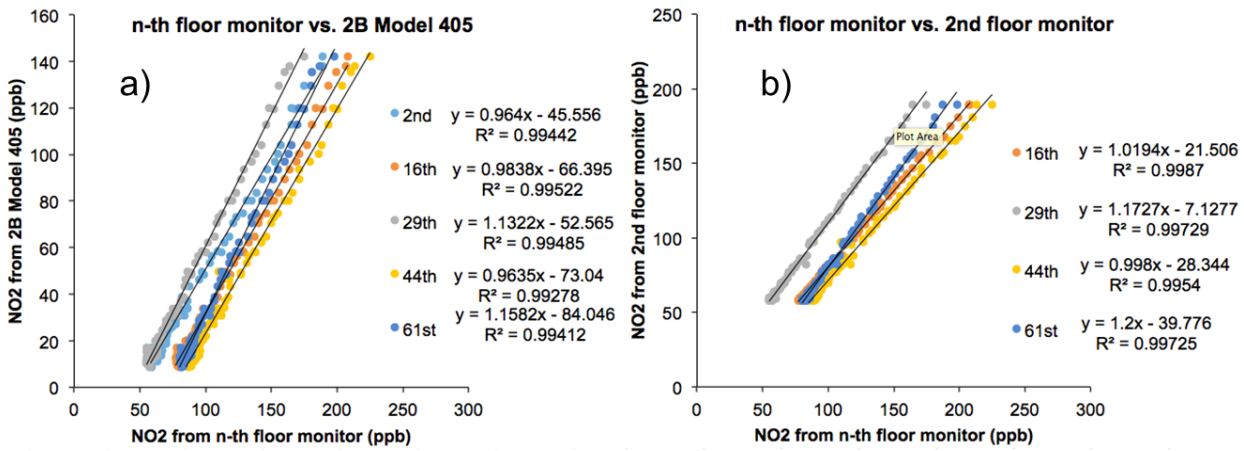

Figure S14. Linear regressions of five Aeroqual S500 NO_2 monitors from the co-location measurement compared to (a) the 2B Technologies Model 405 $NO/NO_2/NO_x$ monitor and (b) Aeroqual S500 monitor deployed on the 2nd floor of the building during the field measurement

Figure S15a shows the adjusted NO_2 concentration from the five Aeroqual S500 NO_2 monitors calibrated via co-location to provide concentrations that are considered equivalent to data from the 2B Technologies Model 405 NO_2 monitor, while Figure S15b shows the adjusted NO_2 concentration from four of the Aeroqual S500 monitors calibrated via co-location to provide concentrations that are considered equivalent to data from the Aeroqual S500 NO_2 monitor that was used on the 2nd floor of the building during the field measurements. Both of these are provided because, although the time-resolved NO_2 concentration profiles of all instruments show similar trends, there was an offset of approximately 50 ppb depending on whether the Model 405 or the 2nd floor Aeroqual S500 was used as the reference. Although we calibrated the raw data from the field measurements using both methods, the adjusted data using the calculated linear regressions from 405 co-location test yielded many negative values, which forced us to use the 2nd floor S500 monitor as the reference for adjusting the raw NO_2 data from the field measurement to make meaningful comparisons. This means that NO_2 data from the field measurements should not be taken as accurate on absolute terms, but can reasonably be used to compare relatively values between floors.

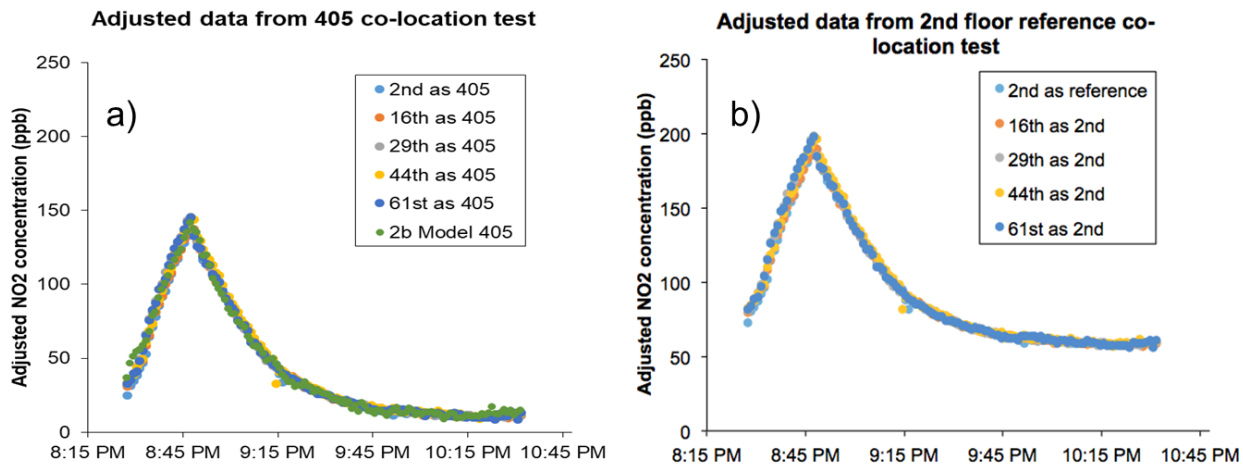

Figure S15. Adjusted NO_2 concentration data from the five Aeroqual S500 NO_2 monitors, calibrated via co-location to provide concentrations that are considered equivalent to (a) the 2B Technologies Model 405 NO_2 monitor and (b) the Aeroqual S500 NO_2 monitor that was used on the 2nd floor of the building during field measurements.

1.2.5. Carbon dioxide (CO_2)

CO_2 co-location calibration was conducted inside the same well-mixed 3.6 m^3 stainless steel chamber mentioned above. Five Extech SD800 CO_2 monitors were calibrated using co-location measurements by placing them alongside each other. CO_2 was injected from a cylinder through the activated carbon filter and the concentration reached to ~1000 ppm, and then concentrations were left for decay more than 1 hour. Figure S16 compares raw and adjusted data from the co-location test. The Extech SD800 CO_2 monitors used on 16th, 29th, 44th, and 61st floors were calibrated to provide concentrations that are equivalent to the Extech monitor that was used on the 2nd floor of the building during the field measurements. Figure S17 shows linear regressions on the data from the Extech SD800 CO_2 monitors with the 2nd floor CO_2 monitor as an arbitrary reference for consistency with the calibration of PM and NO_2 monitors.

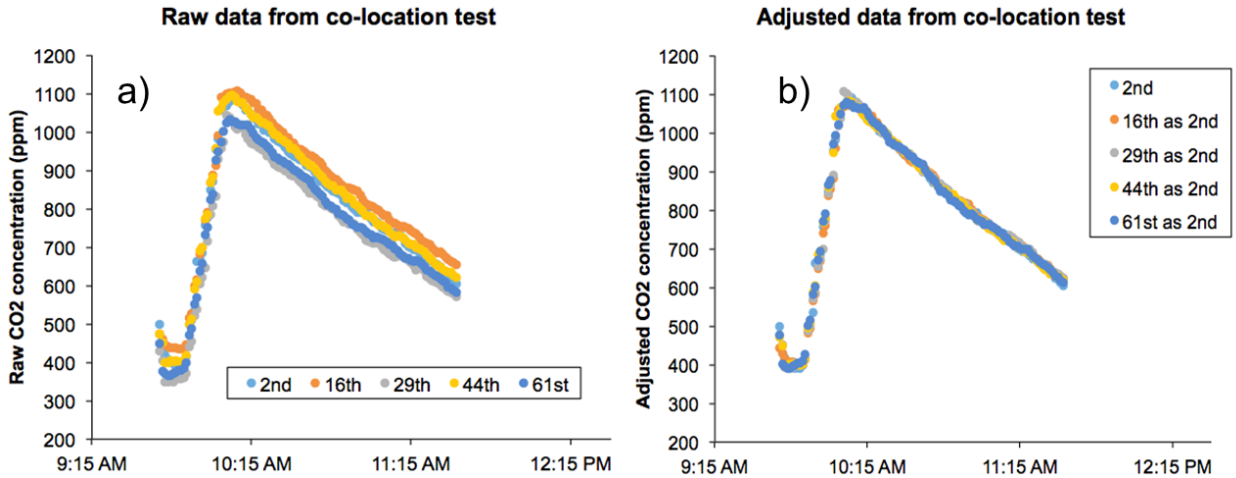

Figure S16. (a) Carbon dioxide concentrations measured using five Extech SD800 CO_2 monitors co-located in a 3.6 m^3 stainless steel chamber during an injection and decay calibration test and (b) adjusted CO_2 concentration data from the CO_2 monitors, calibrated via co-location to provide concentrations that are considered equivalent to the Extech monitor that was used on the 2nd floor during field measurements.

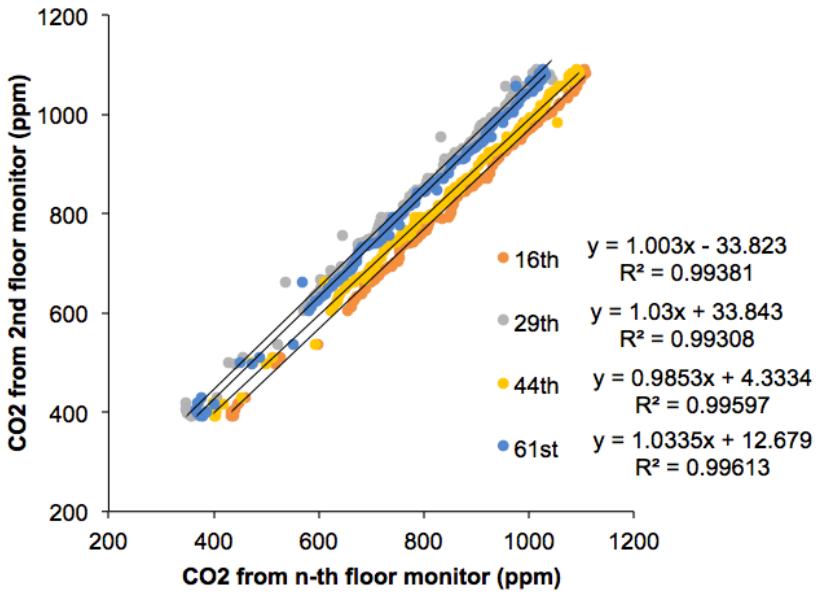

Figure S17. Linear regressions of data from the Extech SD800 CO_2 monitors from co-location measurements inside a 3.6 m^3 stainless steel chamber. The Extech SD800 monitor that was deployed on the 2nd floor of the building during field measurements was used as an arbitrary reference.

2. Results

In each subsection below, time-series data from simultaneous measurements for each parameter are shown for all five floors. Reported measurements are not corrected for air temperature or density, as within the 300 m height of the test building, volume corrections are expected to be less than ~3%.

2.1. Temperature and humidity ratio

Figure S18 and Figure S19 show time-series temperature and humidity ratio measurements made during the field campaign, respectively.

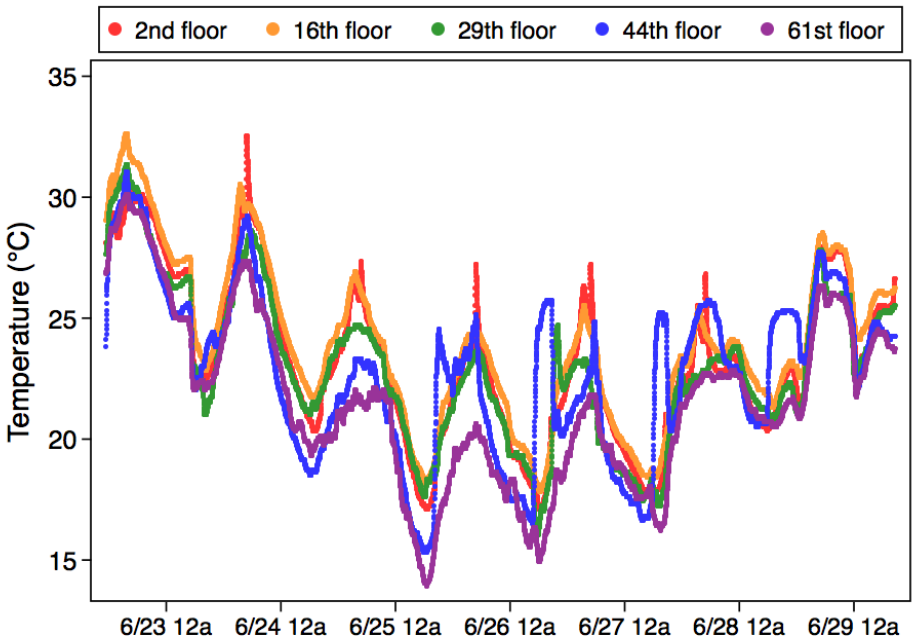

Figure S18. Time-series temperature data from the field measurements

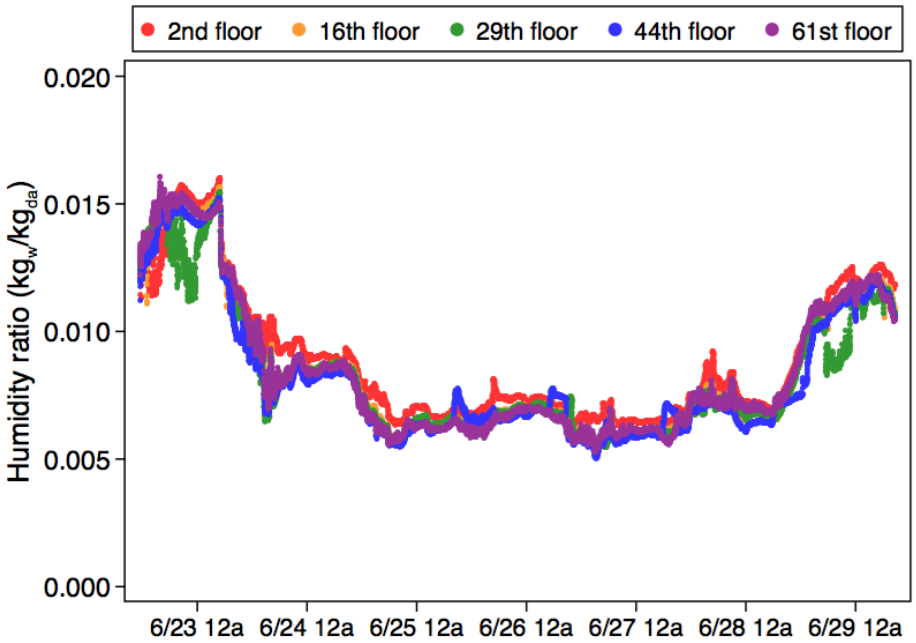

Figure S19. Time-series humidity ratio data from the field measurements

2.2. Particulate matter: Size-resolved number concentrations, PM_1, $PM_{2.5}$, and PM_{10}

Figure S20 shows time-series calibrated size-resolved particle concentrations measured during the field campaign using the OPCs. Each data point was adjusted to 2nd floor monitor equivalent values as an arbitrary reference following procedures described in Section 1.2.2.

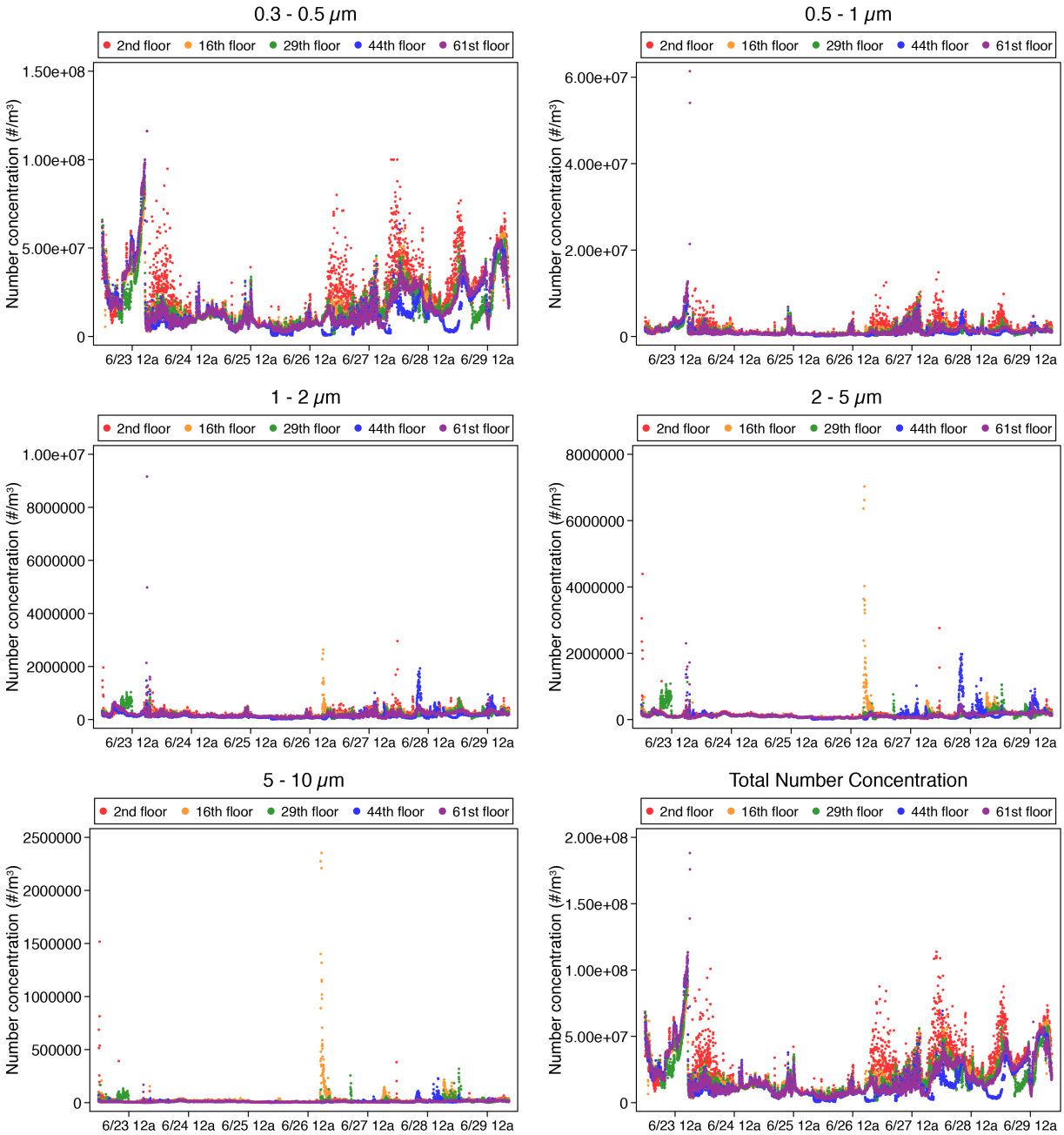

Figure S20. Time-series size-resolved OPC data from the field measurements. Bin sizes include: 0.3-0.5 µm, 0.5-1 µm, 1-2 µm, 2-5 µm, 5-10 µm, and total number concentrations (0.3-10 µm).

Figures S21, S22, and S23 show time-series estimates of PM_1, $PM_{2.5}$, and PM_{10} mass concentrations measured during the field campaign, respectively. Each data point was also adjusted to 2nd floor monitor equivalent values as an arbitrary reference following procedures described in Section 1.2.2.

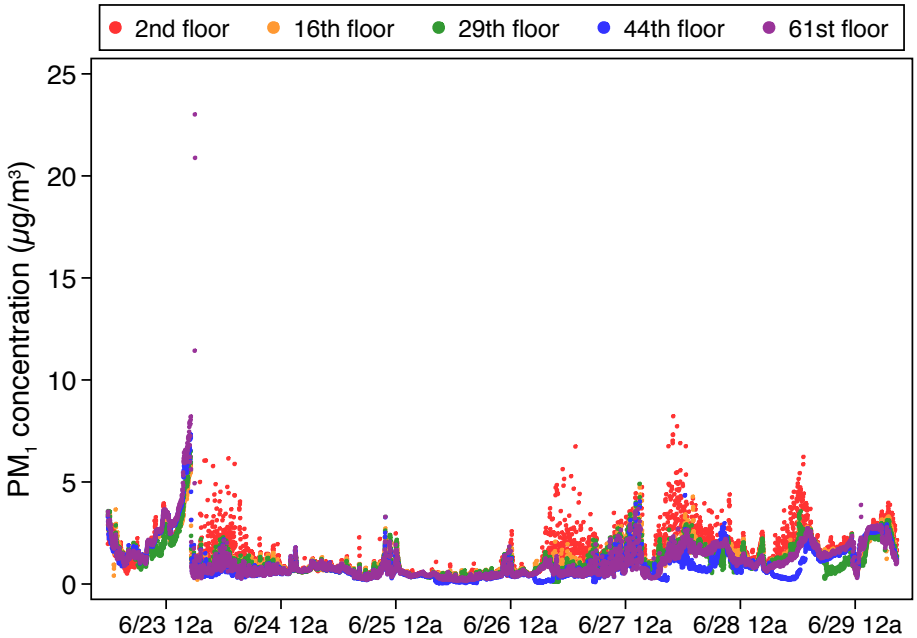

Figure S21. Time-series estimates of PM_1 mass concentrations from the field measurements. Particle density is assumed to be 1.5 g/cm^3 for all sizes.

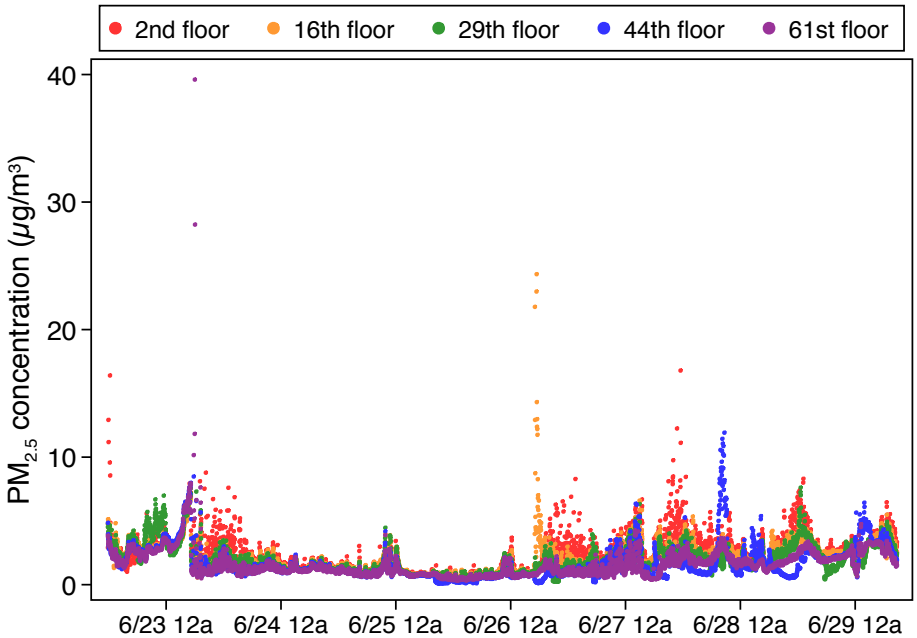

Figure S22. Time-series estimates of $PM_{2.5}$ mass concentrations from the field measurements. Particle density is assumed to be 1.5 g/cm^3 for all sizes.

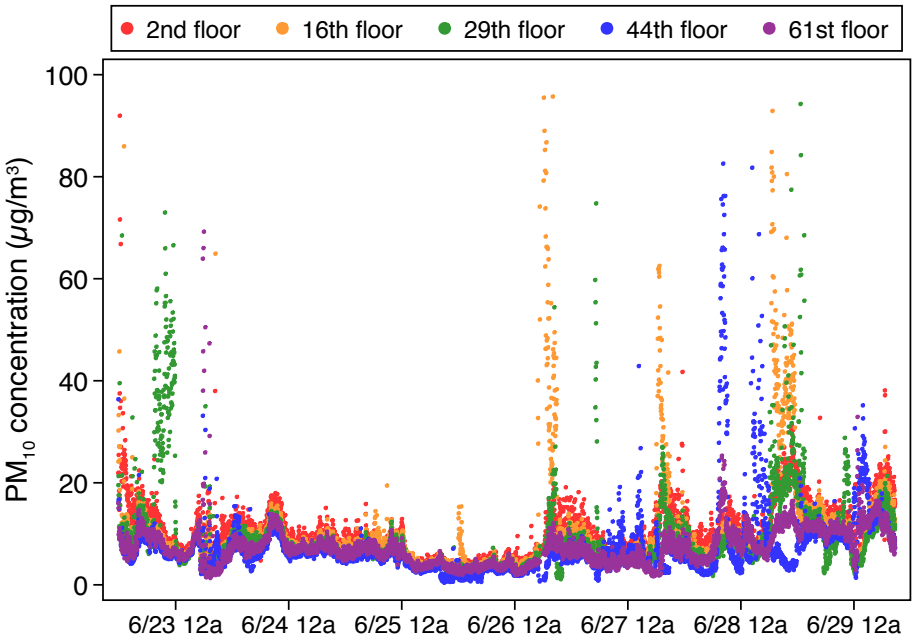

Figure S23. Time-series estimates of PM_{10} mass concentrations from the field measurements. Particle density is assumed to be 1.5 g/cm^3 for all sizes.

2.3. Gaseous pollutants: O_3, NO_2, and CO_2

Figure S24 shows time-series ozone concentrations measured during the field campaign. Each data point was adjusted to federal equivalent method reference instrument (2B Technologies Model 211) equivalent values following procedures described in Section 1.2.3. Only data above the highest measured LOD for the SM50 instruments (approximately 30 ppb) are shown, as varying LODs make it impossible to compare null values recorded at concentrations lower than ~30 ppb.

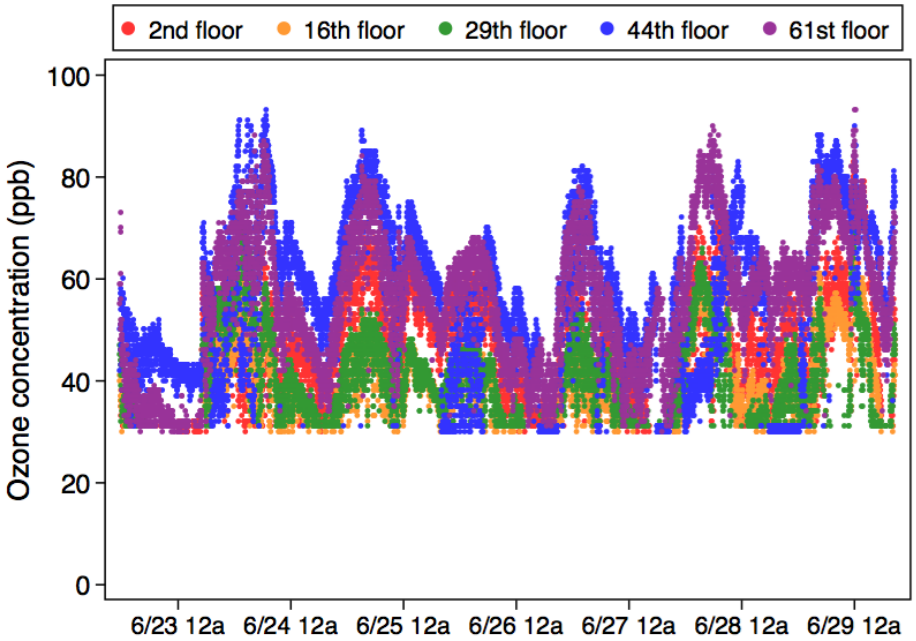

Figure 24. Time-series ozone data from the field measurements

Figure S25 shows time-series NO_2 concentrations measured during the field campaign. Each data point was adjusted to 2nd floor monitor equivalent values as an arbitrary reference following procedures described in Section 1.2.4.

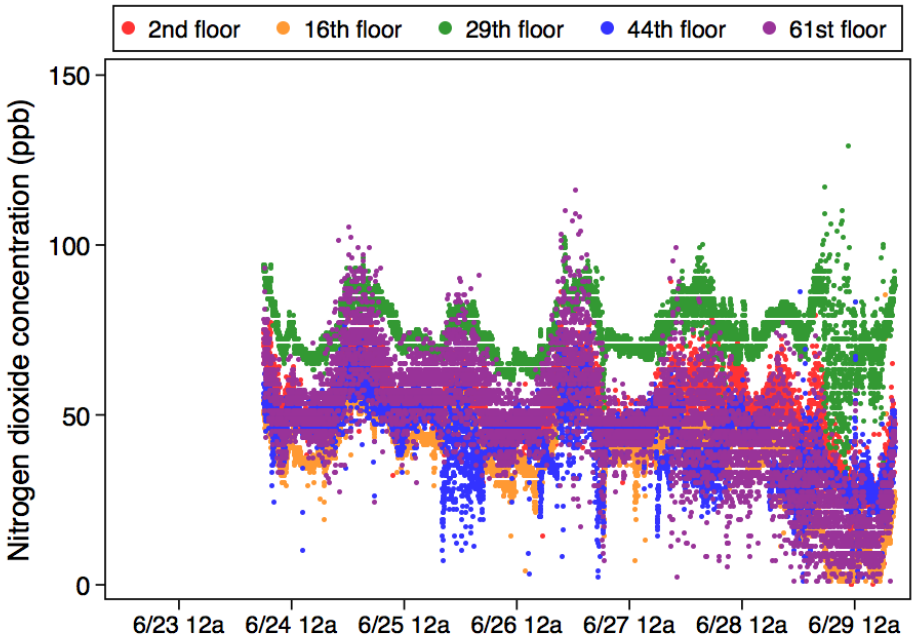

Figure 25. Time-series nitrogen dioxide data from the field measurements

Figure S26 shows time-series CO_2 concentrations measured during the field campaign. Each data point was adjusted to 2nd floor monitor equivalent values as an arbitrary reference following procedures described in Section 1.2.5.

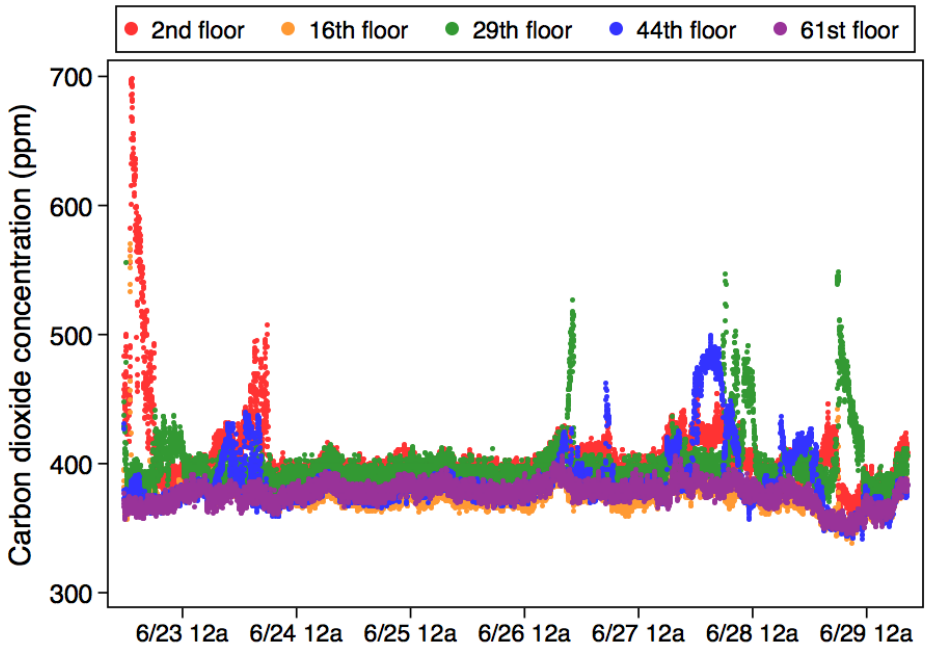

Figure 26. Time-series carbon dioxide data from the field measurements

Table S1 provides a statistical summary of the calibrated results from the field measurement campaign, including arithmetic means and standard deviations, medians, minimums, maximums, and 5%, 10%, 25%, 75%, 90%, and 95% percentile values for each measurement on each floor. Table S1 also calculates the relative difference in the arithmetic means of each measured parameter from each floor compared to the 2nd floor as the closest-to-ground-level reference.

Table 1. Summary statistics of the calibrated results from the field measurement campaign

	Floor	Mean	SD	Med.	Min	5%	10%	25%	75%	90%	95%	Max	Mean diff. vs. 2nd floor
Temp. (°C)	2nd	23.3	3.3	23.0	17.1	17.9	18.7	21.0	25.7	28.1	29.3	32.5	● N/A
	16th	24.0	3.3	23.7	17.8	18.6	19.4	21.9	26.0	28.7	30.3	32.6	▲ 2.8%
	29th	22.9	3.2	22.7	16.0	17.9	18.6	21.1	24.7	27.2	28.5	31.3	▼ -1.7%
	44th	22.8	3.4	23.0	15.3	16.9	17.6	20.6	25.2	27.0	28.8	31.0	▼ -2.3%
	61st	21.6	3.5	21.4	13.9	16.0	17.0	19.2	23.8	26.4	28.3	30.1	▼ -7.6%
RH (%)	2nd	49.1	9.2	47.8	30.6	35.0	38.1	42.4	55.0	62.2	67.0	74.6	● N/A
	16th	44.6	9.2	43.5	26.1	30.5	33.4	37.7	50.6	57.7	61.9	67.7	▼ -9.1%
	29th	46.4	9.3	45.1	28.6	32.5	35.2	40.0	52.3	58.5	65.4	71.9	▼ -5.5%
	44th	46.8	10.6	45.1	28.5	33.5	35.1	37.5	54.4	61.7	66.4	74.8	▼ -4.8%
	61st	51.5	9.7	50.2	31.4	37.0	39.9	43.7	58.7	64.4	69.6	77.3	▲ 4.8%
W (kg_w/kg_{da})	2nd	0.0089	0.0026	0.0077	0.0063	0.0064	0.0065	0.0069	0.0107	0.0126	0.0150	0.0160	● N/A
	16th	0.0085	0.0028	0.0071	0.0055	0.0059	0.0061	0.0064	0.0103	0.0133	0.0148	0.0156	▼ -5.2%
	29th	0.0082	0.0025	0.0071	0.0052	0.0058	0.0060	0.0064	0.0092	0.0123	0.0139	0.0154	▼ -7.9%
	44th	0.0082	0.0027	0.0071	0.0050	0.0057	0.0058	0.0063	0.0095	0.0128	0.0145	0.0152	▼ -8.0%
	61st	0.0085	0.0028	0.0072	0.0053	0.0058	0.0060	0.0063	0.0106	0.0135	0.0148	0.0160	▼ -5.1%
CO_2 (ppm)	2nd	404	30	398	360	381	387	392	408	423	436	698	● N/A
	16th	374	10	374	338	358	364	369	378	383	387	570	▼ -7.6%
	29th	398	20	393	369	380	383	388	402	413	435	555	▼ -1.5%
	44th	384	23	378	341	359	366	373	386	413	431	499	▼ -4.9%
	61st	376	9	378	345	358	364	372	382	386	389	405	▼ -6.9%
O_3 (ppb)	2nd	48	10	47	30	32	34	40	55	61	65	83	● N/A
	16th	42	8	41	30	32	33	36	47	54	57	65	▼ -11.9%
	29th	42	8	41	31	31	33	36	47	54	58	71	▼ -11.3%
	44th	55	15	55	30	31	31	43	67	77	81	122	▲ 16.0%
	61st	56	13	57	30	35	38	47	65	74	77	93	▲ 18.0%
PM_1 ($\mu g/m^3$)	2nd	1.5	0.9	1.5	0.3	0.4	0.4	0.8	2.1	2.7	3.2	4.9	● N/A
	16th	1.3	0.7	1.1	0.3	0.4	0.4	0.7	1.6	2.3	2.7	4.8	▼ -18.4%
	29th	1.2	0.7	0.9	0.2	0.3	0.4	0.7	1.5	2.1	2.5	5.3	▼ -24.8%
	44th	1.0	0.9	0.7	0.1	0.1	0.3	0.5	1.3	2.1	2.5	6.1	▼ -34.5%
	61st	1.2	0.9	0.9	0.2	0.3	0.4	0.6	1.6	2.2	2.8	6.7	▼ -23.7%
$PM_{2.5}$ ($\mu g/m^3$)	2nd	2.3	1.2	2.4	0.5	0.7	0.9	1.4	3.1	3.8	4.6	5.9	● N/A
	16th	2.1	1.1	2.0	0.5	0.7	0.8	1.3	2.8	3.4	3.8	8.2	▼ -10.4%
	29th	1.9	1.1	1.6	0.4	0.6	0.8	1.2	2.5	3.4	3.9	6.1	▼ -18.0%
	44th	1.6	1.2	1.3	0.2	0.3	0.6	0.9	2.1	3.0	3.7	8.2	▼ -30.3%
	61st	1.6	0.9	1.4	0.4	0.6	0.7	1.0	2.1	2.8	3.1	6.4	▼ -31.7%
PM_{10} ($\mu g/m^3$)	2nd	10.5	6.0	9.1	3.4	4.1	4.4	7.2	12.8	16.8	20.6	60.9	● N/A
	16th	12.3	24.6	8.1	3.2	3.8	4.2	6.0	10.7	16.1	34.4	301.1	▲ 15.8%
	29th	9.2	7.3	7.1	2.0	3.1	3.6	5.0	10.0	16.6	23.8	42.5	▼ -12.9%
	44th	7.2	6.0	6.1	0.9	1.9	2.7	4.1	8.5	11.0	14.0	53.4	▼ -32.4%
	61st	7.3	3.0	6.9	2.1	3.2	3.5	4.8	9.0	11.7	12.9	17.1	▼ -31.5%
NO_2 (ppb)	2nd	50	11	51	0	29	37	45	58	64	68	89	● N/A
	16th	38	13	40	1	7	18	34	45	52	55	85	▼ -25.3%
	29th	74	9	73	7	62	65	69	80	86	88	129	▲ 47.0%
	44th	43	11	45	1	24	28	35	50	55	60	86	▼ -15.1%
	61st	48	17	49	1	13	23	39	59	68	74	116	▼ -5.3%

3. Additional references

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