Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts.

Supplement for: Human occupant contribution to secondary aerosol mass in the indoor environment

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SI Text

CO_2^+ in the AMS

The aerosol phase CO_2^+ fragment in this work was separated from gas-phase contribution via standard methods of fragmentation table correction, including verification with filter data. Even with these standard practices, the aerosol CO_2^+ fragment is sensitive to changes in gas-phase CO_2. In this work, even with appropriate correction the CO_2^+ ion (gas and particle phase), aerosol-phase CO_2^+ showed a slightly negative slope with increasing gas-phase CO_2 of -4.6e-5 µg m^{-3} ppm^{-1}. This is equal to a 0.005 µg m^{-3} underestimate for CO_2^+ for every 100 ppm of CO_2 enhancement indoors, indicating that the gas phase contribution was very slightly over-corrected, but verifying that to the limit of sampling noise, gas-phase CO_2 did not contribute to this calculation of aerosol-phase CO_2^+. The additional errors inherent in this calculation have been discussed in depth elsewhere, but do not apply to any other fragment, and therefore the error in this fragment should be considered separately.

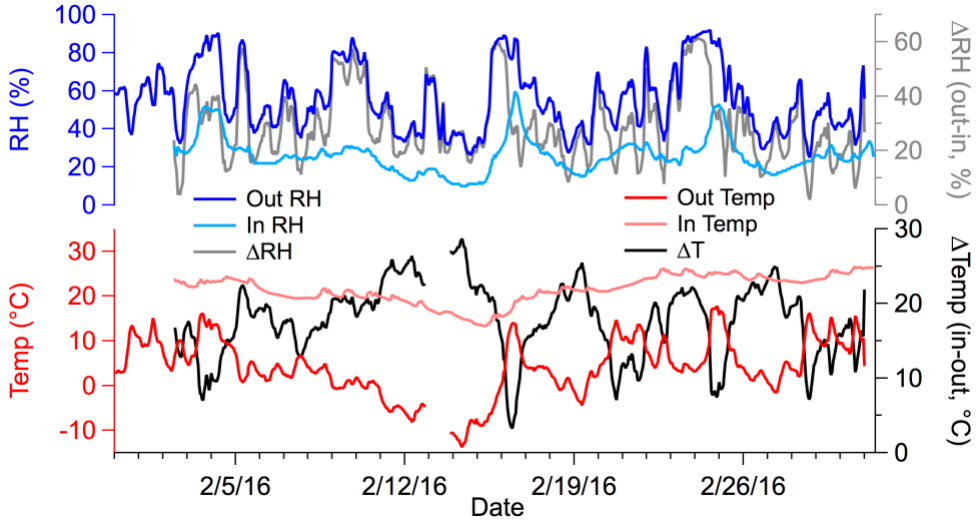

Figure S1. Temperature (reds) and relative humidity (blues) measured indoors (light) and outdoors (dark). Gradient values for temperature (black) and humidity (gray).

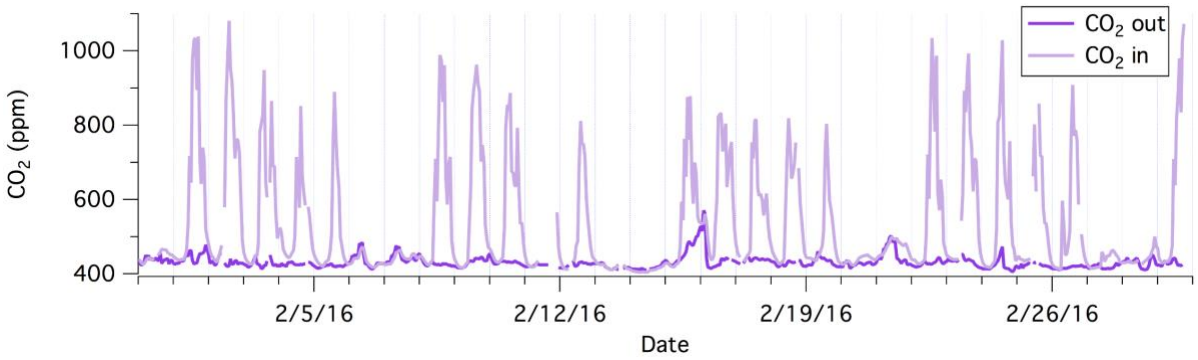

Figure S2. Full time series of CO_2 indoors (light) and outdoors (dark). Weekday and weekend patterns are apparent, as is the influence of outdoor CO_2 on non-occupied days.

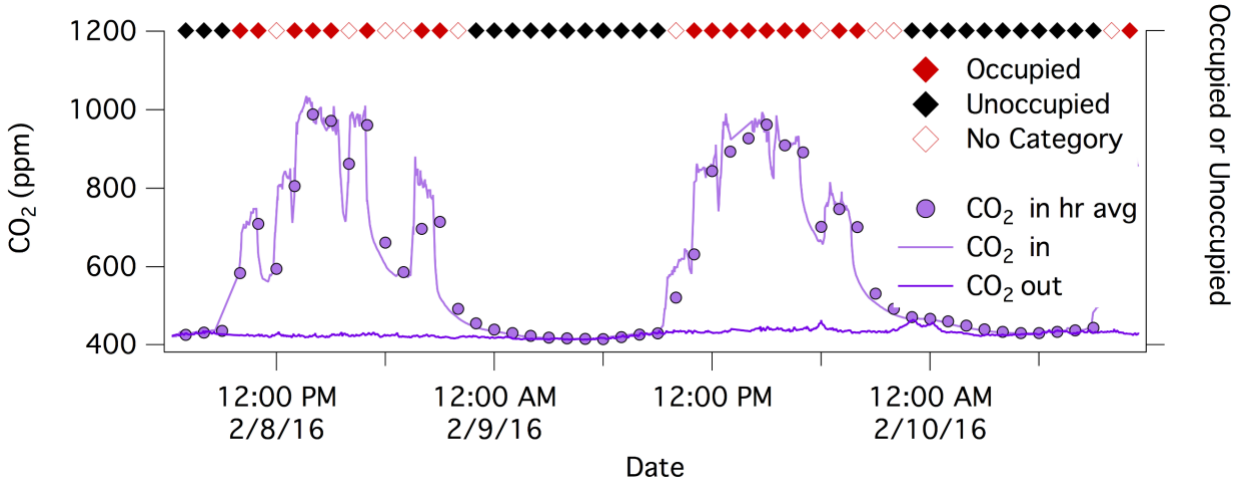

Figure S3. Example time series of 1-min (line) and 1-hr (dots) for indoor (light purple) CO_2. Outdoor CO_2 (1-min) in dark purple. Occupied, unoccupied, and no categorization noted at top.

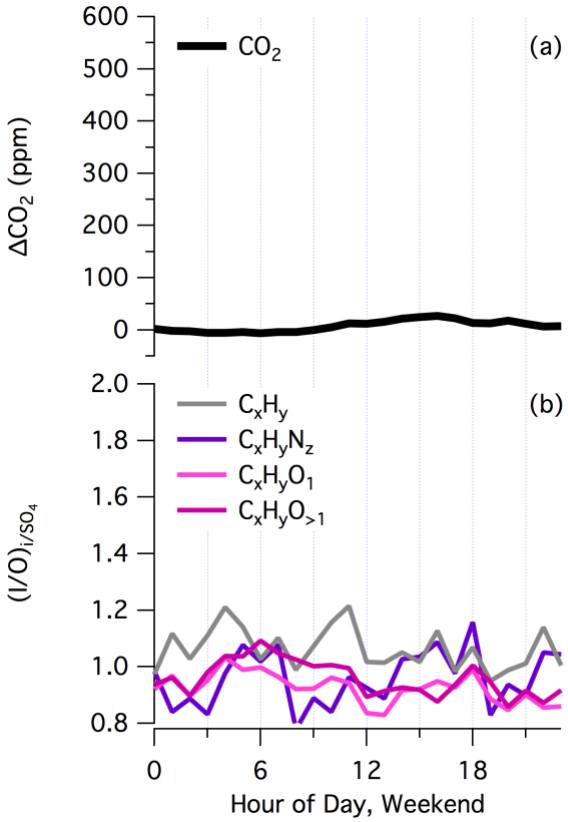

Figure S4. (a) Weekend (solid) diurnal pattern of CO_2 difference ($CO_{2,in}$-$CO_{2,out}$), and (b) the median weekend diurnal pattern of each ion fragment family $(I/O)_{i/SO4}$. Scale is such to match that of weekday values in Figure 1b.

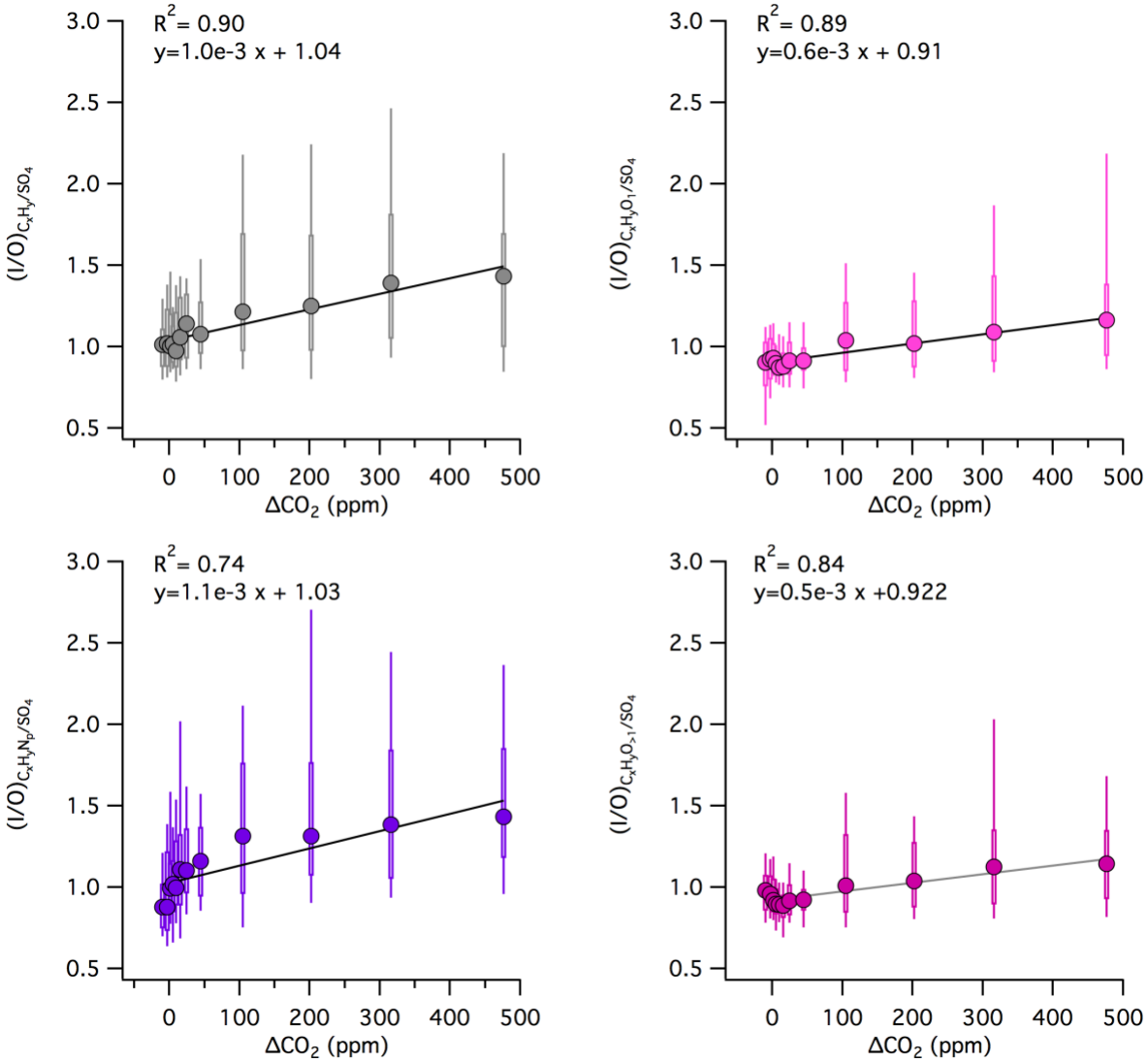

Figure S5. Regression of median $(I/O)_{i/SO4}$ binned by ΔCO_2 for each family.

Table S1. Results of Standardized Regression Coefficient (SRC) analysis, for each species and parameter. Bolded values are the highest contributor (positive or negative).

Spec	C_xH_y	$C_xH_yO_1$	$C_xH_yO_{>1}$	$C_xH_yN_p$	NO_3
Δ Temp	0.13			0.13	
Δ RH					-0.19
Δ O_3	0.16	0.12	0.16	0.14	0.18
Δ CO_2	**0.28**	**0.23**	**0.25**	**0.35**	**-0.33**
Mult. R^2	0.14	0.08	0.10	0.18	0.17
Temp In	-0.19	-0.13	-0.28	-0.11	-0.44
Temp Out	-0.14			-0.38	**0.65**
RH In				0.26	-0.60
RH Out					-0.12
O_3 In	-0.20			-0.37	0.38
O_3 Out	**0.35**	0.13	0.18	**0.53**	-0.35
CO_2 In	0.25	**0.29**	**0.34**	0.21	
CO_2 Out					-0.15
Mult. R^2	0.19	0.11	0.20	0.27	0.36

Table S2. Percentile results and average, standard deviation of the sulfate-normalized I/O ratio, $(I/O)_{i/SO4}$, for each family, inorganic species, and PMF factor in each category.

Family	Type	10th Perc.	25th Perc.	50th Perc.	75th Perc.	90th Perc.	Avg.	Sdev.
C_xH_y	Weekend	0.83	0.92	1.03	1.20	1.31	1.07	0.26
	Unocc.	0.81	0.89	0.99	1.21	1.41	1.07	0.27
	Occ.	0.89	1.00	1.41	1.76	2.49	1.66	1.19
$C_xH_yO_1$	Weekend	0.70	0.83	0.91	1.00	1.08	0.95	0.59
	Unocc.	0.75	0.82	0.88	0.97	1.08	0.91	0.16
	Occ.	0.85	0.94	1.13	1.37	1.87	1.35	0.77
$C_xH_yO_{>1}$	Weekend	0.81	0.87	0.94	1.04	1.16	0.97	0.24
	Unocc.	0.76	0.83	0.89	0.96	1.07	0.91	0.16
	Occ.	0.81	0.94	1.16	1.37	1.74	1.29	0.66
$C_xH_yN_p$	Weekend	0.65	0.77	0.93	1.11	1.28	0.95	0.25
	Unocc.	0.80	0.91	1.09	1.30	1.59	1.16	0.39
	Occ.	0.93	1.09	1.50	1.92	2.48	1.64	0.74
NH_y	Weekend	0.16	0.29	0.37	0.44	0.57	0.38	0.16
	Unocc.	0.14	0.20	0.29	0.43	0.55	0.32	0.15
	Occ.	0.16	0.18	0.27	0.42	0.51	0.31	0.16
NO_z	Weekend	0.25	0.33	0.40	0.56	0.66	0.44	0.16
	Unocc.	0.17	0.24	0.35	0.50	0.63	0.38	0.17
	Occ.	0.14	0.18	0.27	0.38	0.49	0.30	0.15
Total Org.	Weekend	0.79	0.87	0.97	1.06	1.17	0.98	0.26
	Unocc.	0.79	0.85	0.94	1.05	1.15	0.97	0.19
	Occ.	0.83	0.96	1.28	1.61	2.08	1.45	0.89
OOA	Weekend	0.63	0.74	0.83	0.92	0.99	1.53	1.05
	Unocc.	0.60	0.69	0.77	0.85	0.93	1.35	0.80
	Occ.	0.61	0.72	0.88	0.98	1.19	1.69	1.01
COA	Weekend	0.84	0.97	1.17	1.44	1.81	0.82	0.17
	Unocc.	0.82	0.98	1.18	1.94	3.41	0.77	0.14
	Occ.	0.83	0.99	1.40	2.18	5.89	0.88	0.29
HOA	Weekend	0.74	0.95	1.22	1.73	2.67	1.28	0.56
	Unocc.	0.69	0.87	1.06	1.55	2.36	1.71	1.47
	Occ.	0.68	1.05	1.44	2.22	2.85	2.81	5.52

Table S3. Emission values for each family, and concentration increase values in one occupied hour.

		Inc. in concentration in one occupied hour (µg/m^3)				
	Emission (µg/β/h)	Perc 10th	Perc 25th	Perc 50th	Perc 75th	Perc 90th
C_xH_y	15.0	-0.09	0.08	0.25	0.49	0.69
$C_xH_yO_1$	1.7	-0.01	0.01	0.03	0.06	0.08
$C_xH_yO_{>1}$	0.8	-0.01	0.00	0.01	0.03	0.04
Total	**17.6**	**-0.11**	**0.09**	**0.29**	**0.57**	**0.81**

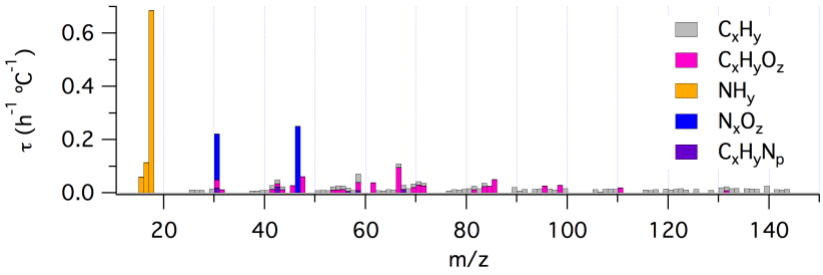

Figure S6. Temperature-based losses of each fragment, stacked to unit mass resolution. With one exception, all organic fragment losses are very small (<0.05 h^{-1} °C^{-1}), and inorganic fragments exhibit losses consistent with known volatility.

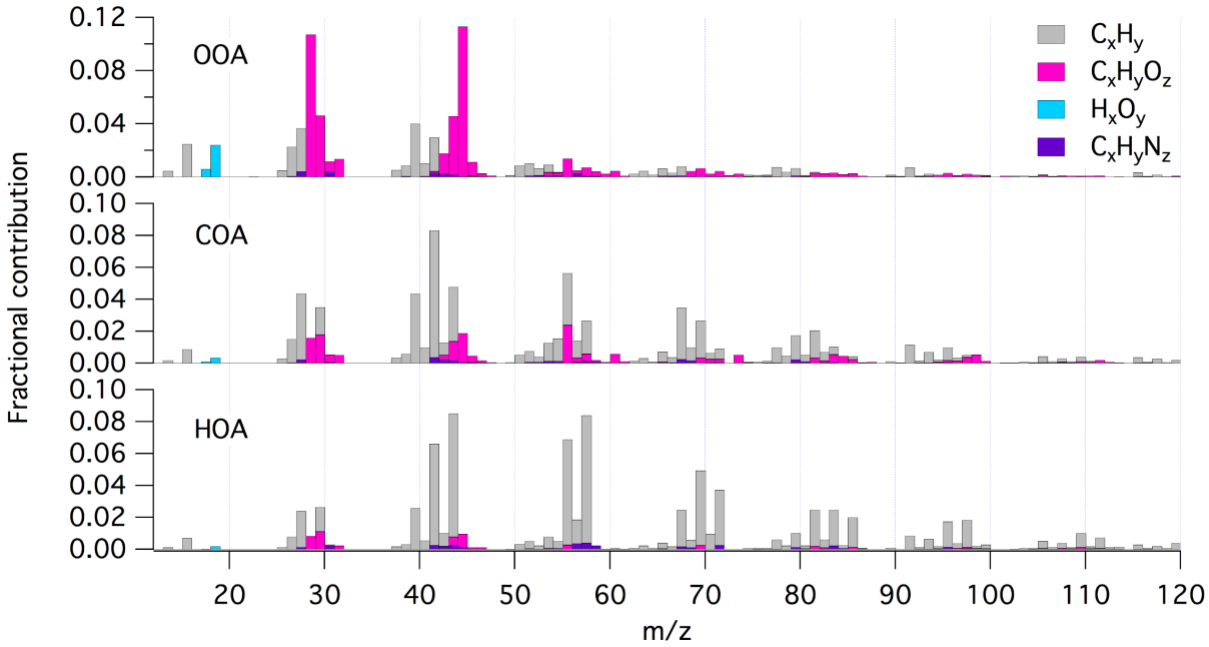

Figure S7. PMF mass spectra used for this work.