Supplementary materials

Supplementary figures:

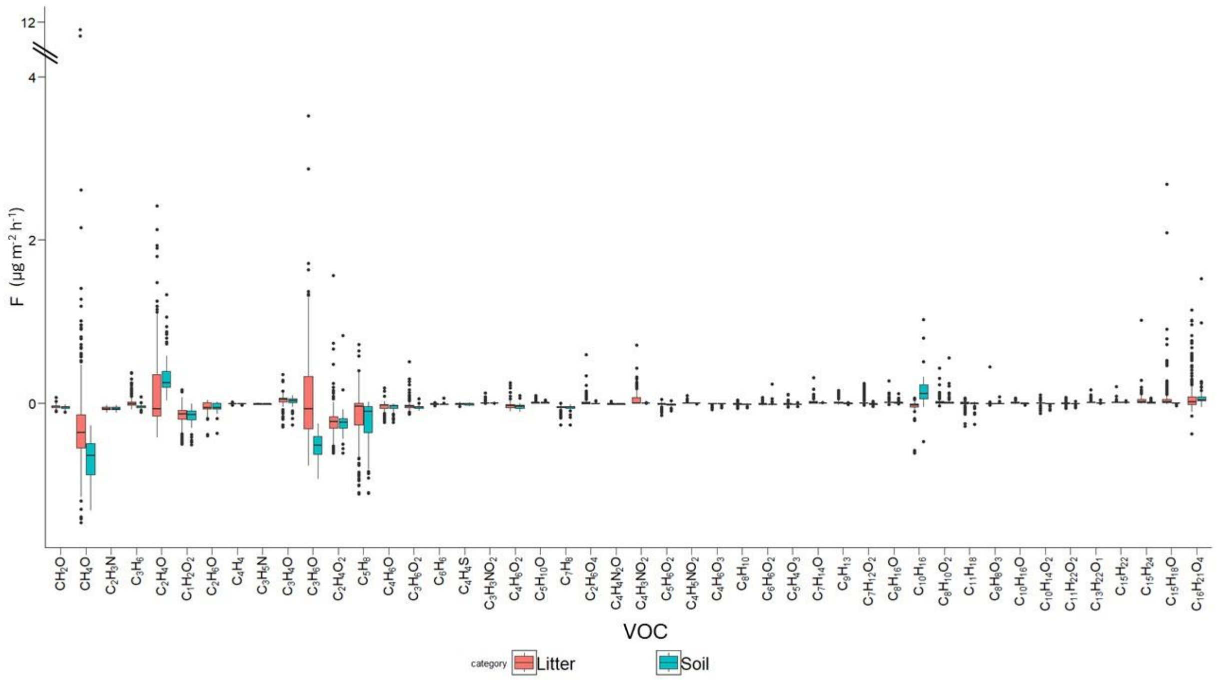

Figure S1. Most abundant compounds and their measured VOC fluxes (in μg m^{-2} h^{-1}) during the field campaign. The line that divides the box represents the median of measured fluxes, ends of the box indicate the upper (Q3) and lower (Q1) quartiles, up and down whiskers represent max and min values and outliers are represented by dots. VOC fluxes for this figure were obtained from the 24-h measurements of all replicates for both soil and the litters.

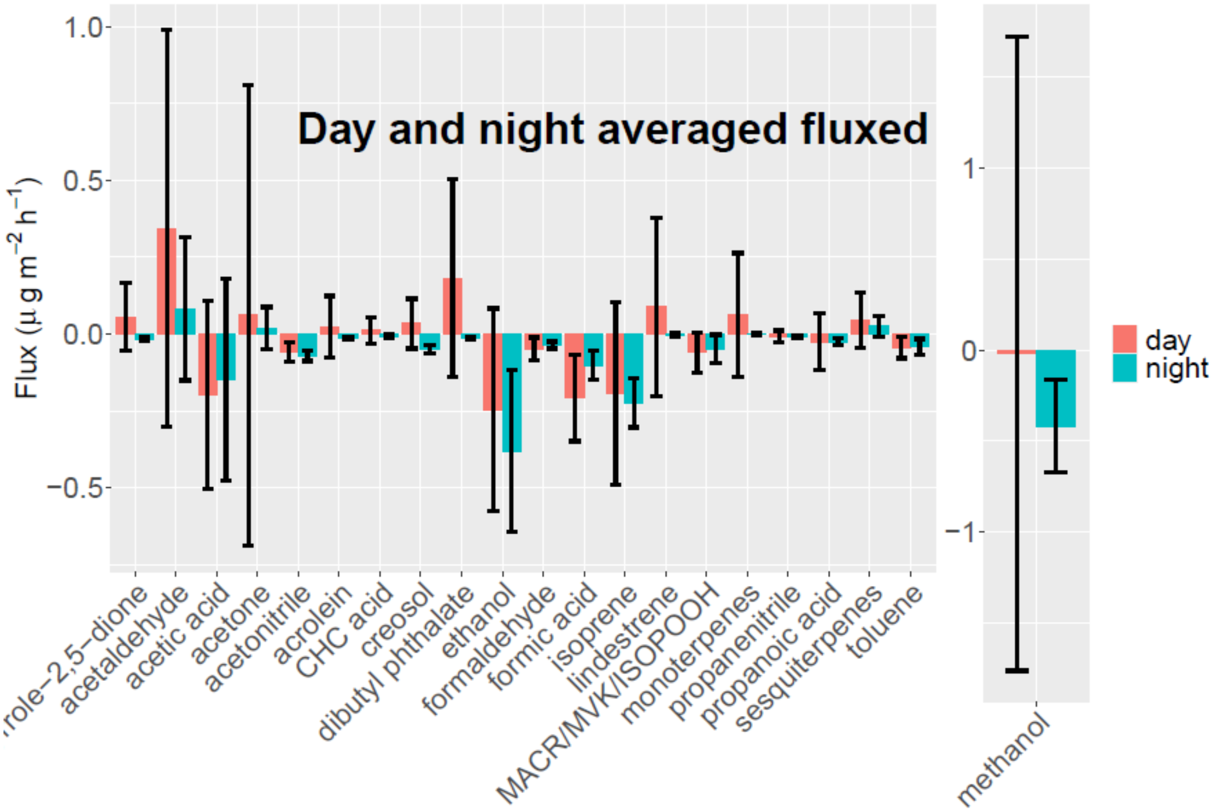

Figure S2. Averaged fluxes including bare soil and all litters and their standard deviation (black lines) separated by day and night data.

Supplementary tables:

Soil and litter humidity during the field campaign

Chamber	Sample	Date flux VOC (dd/mm)	Date weight (dd/mm/yyyy)	Day	Dry Mass (DM)(g) empty tube	Fresh Mass (FM) (g) tube+soil	FM (g) soil	DM (g) tube + soil	DM (g) soil	
Chamber 1 (bare soil)	Soil	23-24/05	24/5/2023	J1	9.84	17.15	7.31	13.64	3.52	
Chamber 2	Soil	23-24/05	24/5/2023	J1	9.87	19.94	10.06	16.29	3.64	
Chamber 3	Soil	23-24/05	24/5/2023	J1	9.89	22.34	12.44	17.56	4.77	
Chamber 4	Soil	23-24/05	24/5/2023	J1	9.89	25.03	15.14	20.21	4.82	
Chamber 5	Soil	23-24/05	24/5/2023	J1	9.93	23.54	13.61	18.61	4.94	
Chamber 1 (bare soil)	Soil	24-25/05	25/5/2023	J2	9.91	21.24	11.34	14.92	6.33	
Chamber 2	Soil	24-25/05	25/5/2023	J2	9.81	27.82	18.01	21.11	6.72	
Chamber 3	Soil	24-25/05	25/5/2023	J2	9.89	25.92	16.03	18.98	6.94	
Chamber 4	Soil	24-25/05	25/5/2023	J2	9.88	25.43	15.54	19.48	5.95	
Chamber 5	Soil	24-25/05	25/5/2023	J2	9.94	25.62	15.67	19.39	6.22	
Chamber 1 (bare soil)	Soil	25-26/05	26/5/2023	J3	9.87	22.75	12.87	16.48	6.26	
Chamber 2	Soil	25-26/05	26/5/2023	J3	9.82	27.46	17.64	21.98	5.48	
Chamber 3	Soil	25-26/05	26/5/2023	J3	9.83	26.12	16.29	18.95	7.17	
Chamber 4	Soil	25-26/05	26/5/2023	J3	9.91	28.31	18.41	21.51	6.81	
Chamber 5	Soil	25-26/05	26/5/2023	J3	9.73	24.64	14.91	19.04	5.59	

Chamber	Sample	Date flux VOC (dd/mm)	Date weight (dd/mm/yyyy)	Day	FM (g) litter	FM(g) aliquot	DM (g) aliquot	Litter humidity (%)	DM (g)	Dry masses (g m^{-2})
Chamber 2	Litter	23-24/05	24/5/2023	J1	8.88	7.99	6.68	16.43	7.42	110.7
Chamber 3	Litter		24/5/2023	J1	16.69	7.99	6.66	16.79	13.88	205.9
Chamber 4	Litter		24/5/2023	J1	30.1	8.01	6.91	13.79	25.95	387.3
Chamber 5	Litter		24/5/2023	J1	43.3	8.02	5.57	30.55	30.07	448.8
Chamber 2	Litter	24-25/05	25/5/2023	J2	7.10	7.09	4.24	40.22	4.25	63.4
Chamber 3	Litter		25/5/2023	J2	14.60	7.98	4.68	41.24	8.58	128.1
Chamber 4	Litter		25/5/2023	J2	31.70	8.08	6.66	17.57	26.13	390.0
Chamber 5	Litter		25/5/2023	J2	50.60	8.09	5.92	26.94	36.97	551.8

Chamber 2	Litter	25-26/05	26/5/2023	J3	8.00	3.60	3.08	14.41	6.85	102.3
Chamber 3	Litter		26/5/2023	J3	16.00	6.90	5.32	22.86	12.34	183.5
Chamber 4	Litter		26/5/2023	J3	32.00	8.00	6.33	20.94	25.30	377.6
Chamber 5	Litter		26/5/2023	J3	48.00	8.00	3.88	51.44	23.31	347.9

Table S1. Soil and litter fresh and dry masses (in g) and dry masses per area (g m^{-2}), humidity inside the chambers during the field campaign experiment.

m/z	Chemical formula (with H^+)	Name	Ambient Mean concentration ± std (ppbv) DAY 1	Ambient Mean concentration ± std (ppbv) DAY 2	Ambient Mean concentration ± std (ppbv) DAY 3
m/z 31.01694	$C_1H_3O_1$	formaldehyde	0.234 ± 0.09	0.239 ± 0.045	0.241 ± 0.073
m/z 33.03393	$C_1H_5O_1$	methanol	3.668 ± 1.714	2.22 ± 0.536	2.461 ± 1.11
m/z 42.03758	C_2H_4N	acetonitrile	0.126 ± 0.022	0.198 ± 0.019	0.19 ± 0.047
m/z 45.03087	C_2H_5O	acetaldehyde	0.743 ± 0.294	0.728 ± 0.124	0.694 ± 0.233
m/z 47.01352	CH_3O_2	formic acid	0.507 ± 0.208	0.549 ± 0.104	0.552 ± 0.255
m/z 47.04655	C_2H_7O	ethanol	1.281 ± 0.496	1.042 ± 0.173	0.073 ± 0.089
m/z 53.03925	C_4H_5	cyclobutadiene or butenyne	0.022 ± 0.011	0.026 ± 0.009	0.03 ± 0.011
m/z 56.04845	C_3H_6N	propanenitrile	0.031 ± 0.008	0.04 ± 0.008	0.032 ± 0.014
m/z 57.03024	C_3H_5O	acrolein	0.076 ± 0.16	0.006 ± 0.153	-0.018 ± 0.167
m/z 59.0493	C_3H_7O	acetone	1.339 ± 0.47	1.174 ± 0.206	1.103 ± 0.274
m/z 60.05095	C_3H_8O	acetamide (Sarkar et al., 2016)	0.057 ± 0.019	0.053 ± 0.009	0.051 ± 0.012
m/z 61.02929	$C_2H_5O_2$	acetic acid	0.683 ± 0.242	0.658 ± 0.102	0.602 ± 0.208
m/z 62.02913	CH_4NO_2	nitromethane (Inomata et al., 2014)	0.018 ± 0.005	0.015 ± 0.003	0.013 ± 0.004
m/z 69.06937	C_5H_9	isoprene	0.515 ± 0.413	0.223 ± 0.127	0.48 ± 0.476
m/z 71.04503	C_4H_7O	MACR/MVK/ISOPOOH	0.133 ± 0.103	0.073 ± 0.027	0.095 ± 0.071
m/z 75.04034	$C_3H_7O_2$	propanoic acid	0.142 ± 0.05	0.135 ± 0.021	0.128 ± 0.028
m/z 79.06013	C_6H_7	benzene	0.04 ± 0.009	0.032 ± 0.009	0.026 ± 0.008

m/z 85.01845	C_4H_5S	thiophene	0.023 ± 0.019	0.026 ± 0.018	0.021 ± 0.015
m/z 85.06795	C_5H_9O	cyclopentanone (Mancuso et al., 2015)	0.032 ± 0.016	0.02 ± 0.007	0.016 ± 0.007
m/z 87.04397	$C_4H_7O_2$	2,3-butadione (Sarkar et al., 2016)	0.096 ± 0.041	0.099 ± 0.018	0.083 ± 0.034
m/z 87.08134	$C_5H_{11}O$	MBO	0.017 ± 0.007	0.01 ± 0.004	0.008 ± 0.004
m/z 93.07393	C_7H_9	toluene	0.094 ± 0.031	0.063 ± 0.019	0.052 ± 0.014
m/z 95.02947	$C_2H_7O_4$	dioxybismethanol (Meischner et al., 2022)	0.013 ± 0.01	0.021 ± 0.009	0.019 ± 0.011
m/z 97.03481	$C_4H_5N_2O$	-	0.022 ± 0.009	0.026 ± 0.005	0.024 ± 0.006
m/z 98.02441	$C_4H_4NO_2$	1H-pyrrole-2,5-dione	0.004 ± 0.001	0.004 ± 0.001	0.005 ± 0.002
m/z 99.05189	$C_5H_7O_2$	-	0.068 ± 0.036	0.042 ± 0.012	0.031 ± 0.012
m/z 101.0686	$C_5H_9O_2$	2,3-Pentanedione or acetyl acetone or 2-butenoic acid methyl ester	0.081 ± 0.041	0.022 ± 0.017	0.013 ± 0.01
m/z 107.0938	C_8H_{11}	xylenes	0.034 ± 0.014	0.022 ± 0.007	0.016 ± 0.005
m/z 111.0457	$C_6H_7O_2$	-	0.029 ± 0.008	0.033 ± 0.005	0.029 ± 0.005
m/z 113.0216	$C_5H_5O_3$	-	0.028 ± 0.012	0.029 ± 0.006	0.028 ± 0.01
m/z 115.0781	$C_6H_{11}O_2$	-	0.023 ± 0.011	0.014 ± 0.007	0.012 ± 0.006
m/z 116.0409	$C_4H_6NO_3$	3-Methyl-2,5-oxazolidine-dione	0.001 ± 0.002	0.002 ± 0.002	0.001 ± 0.002
m/z 129.098	$C_7H_{13}O_2$	cycloheaxanecarboxylic acid - CHC acid	0.025 ± 0.008	0.012 ± 0.004	0.009 ± 0.005

m/z 129.1315	$C_8H_{16}O$	octanal or octanone or 1-octen-3-ol, ...	0.007 ± 0.005	0.004 ± 0.003	0.003 ± 0.002
m/z 137.1397	$C_{10}H_{17}$	monoterpenes	0.065 ± 0.019	0.046 ± 0.029	0.058 ± 0.091
m/z 139.0844	$C_8H_{11}O_2$	p-creosol	0.011 ± 0.011	0.008 ± 0.008	0.005 ± 0.006
m/z 139.129	$C_{10}H_{19}$	-	0.025 ± 0.009	0.013 ± 0.004	0.009 ± 0.004
m/z 153.1204	$C_{10}H_{17}O$	oxygenated monoterpenes	0.02 ± 0.005	0.014 ± 0.004	0.01 ± 0.002
m/z 157.1471	$C_{10}H_{20}O$	-	0.029 ± 0.018	0.012 ± 0.003	0.007 ± 0.002
m/z 205.1848	$C_{15}H_{25}$	sesquiterpenes	0.012 ± 0.004	0.007 ± 0.003	0.008 ± 0.004
m/z 215.1319	$C_{15}H_{19}O$	lindestrene	0.007 ± 0.003	0.003 ± 0.001	0.003 ± 0.004
m/z 279.1614	$C_{16}H_{23}O_4$	dibutyl phthalate	0.013 ± 0.033	0.016 ± 0.01	0.025 ± 0.017

Table S2. Ambient mean concentrations ± std for most abundant VOC for each day of experiment.

Component	**full concentration (ppb)**	**mass**	**k-rate (cm^3/s)**	**Sensitivity (cps/ppb) - frequency 25 kHz**	**mass concentration (ppb)**	**Transmission**
Benzene	110	79	1.93	316	103.03	0.672
Toluene	110	93	2.06	335	101.93	0.742
Chlorobenzene	110	113	2.48	420	78.13	0.826
Ethylbenzene	110	107	2.18	393	100.81	0.803
O-xylene	110	107			100.81	
M-xylene	110	107			100.81	
P-xylene	110	107			100.81	
Styrene	98	105	2.16	384	89.83	0.794
1,2,4-Trimethylbenzene	110	121	2.29	453	99.71	0.855
1,3,5-Trimethylbenzene	110	121			99.71	
1,2-Dichlorobenzene	110	147	2.21	485	59.40	0.938
1,3-Dichlorobenzene	100	147			54.00	
1,4-Dichlorobenzene	110	147			59.40	
1,2,4-Trichlorobenzene	100	181	2.18	381	40.81	1

Table S3. Composition of calibration bottle with the respective concentration (ppb), mass (m/z), k-rate, sensitivity and transmission.

				Mean ± std (μg m^{-2} h^{-1}) for different litter mass scenarii				
m/z	Chemical formula (with H^+)	Name	k (10^{-9} cm^3 s^{-1})	Bare Soil	Low (< 120 g m^{-2})	Medium (120 g m^{-2} ≤ M < 300 g m^{-2})	Medium-High (300 g m^{-2} ≤ M < 400 g m^{-2})	High (> 400 g m^{-2})
m/z 31.01694	$C_1H_3O_1$	formaldehyde	3.169	-0.043 ± 0.046	-0.030 ± 0.035	-0.036 ± 0.039	-0.031 ± 0.038	-0.032 ± 0.035
m/z 33.03393	$C_1H_5O_1$	methanol	3.165	-0.566 ± 0.490	-0.292 ± 0.412	-0.220 ± 0.360	0.105 ± 1.790	-0.162 ± 0.379
m/z 42.03758	C_2H_4N	acetonitrile	3.789	-0.038 ± 0.040	-0.038 ± 0.040	-0.038 ± 0.039	-0.038 ± 0.040	-0.040 ± 0.042
m/z 45.03087	C_2H_5O	acetaldehyde	3.125	0.173 ± 0.206	0.002 ± 0.124	0.336 ± 0.181	-0.059 ± 0.181	-0.066 ± 0.084
m/z 47.01352	CH_3O_2	formic acid	2.353	-0.090 ± 0.104	-0.072 ± 0.091	-0.088 ± 0.101	-0.074 ± 0.094	-0.088 ± 0.103
m/z 47.04655	C_2H_7O	ethanol	3.131	-0.383 ± 0.468	-0.334 ± 0.402	-0.364 ± 0.465	-0.314 ± 0.452	-0.371 ± 0.469
m/z 53.03925	C_4H_5	cyclobutadiene or butenyne	1.658	-0.005 ± 0.005	-0.004 ± 0.005	-0.005 ± 0.005	-0.004 ± 0.005	-0.004 ± 0.004
m/z 56.04845	C_3H_6N	propanenitrile	3.791	-0.006 ± 0.006	-0.005 ± 0.006	-0.005 ± 0.006	-0.005 ± 0.006	-0.005 ± 0.006
m/z 57.03024	C_3H_5O	acrolein	3.117	0.005 ± 0.029	0.014 ± 0.037	0.006 ± 0.031	0.009 ± 0.038	0.012 ± 0.030
m/z 59.0493	C_3H_7O	acetone	3.122	-0.213 ± 0.215	-0.156 ± 0.73	-0.048 ± 0.084	0.082 ± 0.271	0.194 ± 0.251
m/z 60.05095	C_3H_8O	acetamide (Sarkar et al., 2016)	3.124	-0.008 ± 0.008	-0.006 ± 0.007	-0.003 ± 0.004	0.001 ± 0.010	0.006 ± 0.008
m/z 61.02929	$C_2H_5O_2$	acetic acid	2.349	-0.098 ± 0.118	-0.066 ± 0.126	-0.112 ± 0.120	-0.111 ± 0.121	-0.061 ± 0.091
m/z 62.02913	CH_4NO_2	nitromethane (Inomata et al., 2014)	3.755	-0.002 ± 0.002	-0.001 ± 0.002	-0.002 ± 0.002	-0.002 ± 0.002	-0.001 ± 0.001
m/z 69.06937	C_5H_9	isoprene	1.838	-0.075 ± 0.116	-0.034 ± 0.096	-0.056 ± 0.094	-0.054 ± 0.118	-0.025 ± 0.086

m/z 70.07176	C_4H_8N	-	3.834	-0.002 ± 0.003	-0.001 ± 0.003	-0.002 ± 0.003	-0.002 ± 0.003	-0.001 ± 0.002
m/z 71.04503	C_4H_7O	MACR/MVK/ISOPOOH	3.119	-0.019 ± 0.025	-0.012 ± 0.019	-0.016 ± 0.026	-0.015 ± 0.026	-0.015 ± 0.022
m/z 75.04034	$C_3H_7O_2$	propanoic acid	2.395	-0.002 ± 0.027	-0.014 ± 0.015	-0.020 ± 0.022	-0.006 ± 0.022	-0.017 ± 0.018
m/z 79.06013	C_6H_7	benzene	1.924	-0.004 ± 0.004	-0.004 ± 0.004	-0.004 ± 0.004	-0.004 ± 0.004	-0.005 ± 0.005
m/z 85.01845	C_4H_5S	thiophene	2.016	-0.003 ± 0.004	-0.003 ± 0.004	-0.003 ± 0.005	-0.003 ± 0.005	-0.004 ± 0.005
m/z 85.06795	C_5H_9O	cyclopentanone (Mancuso et al., 2015)	3.122	0.001 ± 0.004	-0.002 ± 0.003	-0.001 ± 0.006	0.001 ± 0.003	-4.375 10^{-4} ± 0.005
m/z 86.02312	$C_3H_4NO_2$	cyano acetic acid	3.813	-1.732 10^{-4} ± 2.774 10^{-4}	-1.734 10^{-4} ± 2.683 10^{-4}	5.366E-03± 0.008	2.036 10^{-4} ± 2.905 10^{-4}	-2.169 10^{-4} ± 3.028 10^{-4}
m/z 87.04397	$C_4H_7O_2$	2,3-butadione (Sarkar et al., 2016)	2.446	-0.005 ± 0.013	-0.013 ± 0.014	-0.011 ± 0.018	-0.008 ± 0.011	-0.013 ± 0.015
m/z 87.08134	$C_5H_{11}O$	MBO	3.124	0.001 ± 0.002	2.40 10^{-4} ± 0.001	0.002 ± 0.005	0.003 ± 0.005	0.001 ± 0.002
m/z 93.07393	C_7H_9	toluene	2.057	-0.014 ± 0.014	-0.012 ± 0.013	-0.011 ± 0.012	-0.013 ± 0.014	-0.013 ± 0.014
m/z 95.02947	$C_2H_7O_4$	dioxybismethanol (Meischner et al., 2022)	3.122	0.007 ± 0.016	-0.002 ± 0.003	-0.001 ± 0.004	0.005 ± 0.011	-0.002 ± 0.003
m/z 97.03481	$C_4H_5N_2O$	-	3.025	-0.002 ± 0.003	-0.003 ± 0.003	-0.003 ± 0.003	-0.003 ± 0.003	-0.003± 0.004

m/z 98.02441	$C_4H_4NO_2$	1H-pyrrole-2,5-dione	3.842	-4.702 10^{-4} ±0.001	-4.878 10^{-4} ±0.001	0.028 ± 0.004	0.017 ± 0.004	-4.840 10^{-4} ± 0.001
m/z 99.05189	$C_5H_7O_2$	-	2.507	-0.003 ± 0.005	-0.005 ± 0.007	-0.004 ± 0.006	-0.004 ± 0.007	-0.005 ± 0.007
m/z 100.0365	$C_4H_6NO_2$	-	3.851	-0.001 ± 0.001	-0.001 ± 0.001	0.003 ± 0.004	0.002± 0.003	-0.001± 0.001
m/z 101.0686	$C_5H_9O_2$	2,3-Pentanedione or acetyl acetone or 2-butenoic acid methyl ester	2.523	0.011 ± 0.021	0.001 ± 0.009	0.024 ± 0.041	0.012 ± 0.020	0.009 ± 0.020
m/z 103.0410	$C_4H_7O_3$	propylene Carbonate	3.111	-0.003 ± 0.003	-0.003 ± 0.003	-0.002 ± 0.003	-0.003 ± 0.003	-0.003 ± 0.003
m/z 107.0938	C_8H_{11}	xylenes	2.182	-0.002 ± 0.003	-0.003 ± 0.004	-0.003 ± 0.004	-0.003 ± 0.003	-0.004 ± 0.004
m/z 111.0457	$C_6H_7O_2$	-	2.572	-0.002 ± 0.003	-0.004 ± 0.004	-0.004 ± 0.004	-0.002 ± 0.004	-0.003 ± 0.004
m/z 113.0216	$C_5H_5O_3$	-	3.121	-0.002 ± 0.004	-0.004 ± 0.004	-0.004 ± 0.005	-0.003 ± 0.004	-0.004 ± 0.004
m/z 115.0781	$C_6H_{11}O_2$	-	2.605	7.974×10^{-4} ± 0.003	-8.437 10^{-4} ± 0.002	3.853 10^{-4} ± 0.002	0.003 ± 0.004	-2.147 10^{-4} ± 0.003
m/z 116.0409	$C_4H_6NO_3$	3-Methyl-2,5-oxazolidine-dione	3.101	-1.218 10^{-4} ± 3.445 10^{-4}	-2.168 10^{-4} ± 3.162 10^{-4}	0.008 ± 0.012	0.004 ± 0.005	-2.448 10^{-4} ± 3.125 10^{-4}
m/z 129.098	$C_7H_{13}O_2$	cycloheaxanecarboxylic acid - CHC acid	2.685	-4.928 10^{-4} ± 0.002	-6.588 10^{-4} ±0.002	0.008 ± 0.015	0.003 ± 0.005	-0.002 ± 0.003

m/z 129.1315	$C_8H_{16}O$	octanal or octanone or 1-octen-3-ol, ...	2.175	0.003 ± 0.004	0.002 ± 0.003	$6.275\ 10^{-4}$ ± 0.002	0.005 ± 0.008	0.002 ± 0.005
m/z 137.1397	$C_{10}H_{17}$	monoterpenes	2.433	-0.007 ± 0.016	-0.007 ± 0.015	-0.007 ± 0.016	-0.006 ± 0.015	0.026 ± 0.043
m/z 139.0844	$C_8H_{11}O_2$	p-creosol	2.741	0.007 ± 0.013	$-7.802\ 10^{-4}$ ± 0.002	$7.082\ 10^{-4}$ ± 0.002	0.003 ± 0.007	0.004 ± 0.014
m/z 139.129	$C_{10}H_{19}$	-	2.453	-0.002 ±0.002	$-5.206\ 10^{-4}$ ± 0.002	$3.961\ 10^{-4}$ ± 0.002	0.002 ± 0.003	-0.003 ± 0.003
m/z 153.1204	$C_{10}H_{17}O$	oxygenated monoterpenes	3.247	$-4.447\ 10^{-4}$ ± 0.002	$-5.383\ 10^{-4}$ ± 0.002	0.002 ± 0.002	0.003 ± 0.003	-0.002 ± 0.002
m/z 157.1471	$C_{10}H_{20}O$	-	3.946	0.003 ± 0.005	$2.378\ 10^{-4}$ ± 0.003	$-4.986\ 10^{-4}$ ± 0.004	0.001 ± 0.004	-0.002 ± 0.004
m/z 205.1848	$C_{15}H_{25}$	sesquiterpenes	2.909	$4.282\ 10^{-5}$ ± 0.002	0.002 ± 0.002	0.006 ± 0.016	0.007 ± 0.008	$6.952\ 10^{-4}$ ± 0.002
m/z 215.1319	$C_{15}H_{19}O$	lindestrene	3.493	0.002 ± 0.003	0.003 ± 0.007	0.025 ± 0.054	0.002 ± 0.004	$-5.369\ 10^{-4}$ ± $8.963\ 10^{-4}$
m/z 279.1614	$C_{16}H_{23}O_4$	dibutyl phthalate	3.805	-0.003 ± 0.005	0.007 ± 0.021	0.008 ± 0.017	0.013 ± 0.022	0.008 ± 0.021

Table S4. VOCs targeted in our study and mean fluxes ± std in each chamber with bare soil, and different amount of masses.