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A portable dual-smog-chamber system for atmospheric aerosol field studies

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Table S1: List of performed experiments

Exp.	Date	Type	Added components	Initial Concentrations	Comments
1	11/5/14	Blank/contamination	Clean air		Initial characterization experiments. Study of possible contamination due to leaks and/or due to components different than those added.
2	5/11/14	Blank/contamination	Clean air, AS seeds	15 μg m^{-3} AS	
3	13/11/14	Blank/contamination	Clean air		
4	19/11/14	Blank/contamination	Clean air, a-pinene, O_3	10 ppb APin 110 ppb O_3	
5	20/11/14	Blank/contamination	Clean air		
6	28/1/15	Blank/contamination	Clean air, AS seeds	10 μg m^{-3} AS	
7	29/3/15	Blank/contamination	Clean air, AS seeds, O_3, a-pinene	10 μg m^{-3} AS 60 ppb O_3 10 ppb APin	
8	4/5/15	Blank/contamination	Clean air		
9	9/6/15	J_{NO2} measurement	NO, O_3	190 ppb NO_2 66 ppb O_3	J_{NO2} measurement
10	14/10/15	Field test (Patras)	Ambient air	1μg m^{-3} PM_1	Initial field deployment for system evaluation
11	15/10/15	Field test (Patras)	Zero air, seeds	15 μg m^{-3} AS	
12	16/10/15	Field test (Patras)	Ambient air, a-pinene	1 μg m^{-3} PM_1 20 ppb APin	
13	28/5/16	Field test/FAME16[a]	Zero air, AS seeds	10 μg m^{-3} AS	Campaign deployment for system evaluation
14	30/5/16	Field test/FAME16[a]	Ambient air, HONO, AS seeds	0.75 μg m^{-3} PM_1 11 μg m^{-3} AS	
15	31/5/16	Field test/FAME16[a]	Ambient air, HONO, AS seeds	0.9 μg m^{-3} PM_1 30 μg m^{-3} AS	
16	1/6/16	Field test/FAME 16[a]	Ambient air, HONO, AS seeds	0.4 μg m^{-3} PM_1 20 μg m^{-3} AS	
17	24/2/17	Particle wall loss	Clean air, AS seeds	15 μg m^{-3} AS	Wall loss tests
18	28/2/17	Particle wall loss	Clean air, AS seeds	25 μg m^{-3} AS	
19	2/3/17	Particle wall loss	Clean air, AS seeds	50 μg m^{-3} AS	
20	13/3/17	Particle wall loss	Clean air, AS seeds	150 μg m^{-3} AS	
21	14/3/17	Particle wall loss	Clean air,	100 μg m^{-3} AS	

			AS seeds		
22	15/3/17	Particle wall loss	Clean air, AS seeds	150 μg m^{-3} AS	
23	28/3/17	Particle wall loss	Clean air, AS seeds	1500 μg m^{-3} AS	
24	31/3/17	Particle wall loss	Clean air, AS seeds	1500 μg m^{-3} AS	
25	11/4/17	Ambient sampling efficiency	Ambient air	1.2 μg m^{-3} PM_1	Sampling efficiency of pumps/tubing
26	13/4/17	Ambient sampling efficiency	Ambient air	0.6 μg m^{-3} PM_1	
27	14/4/17	Ambient sampling efficiency	Ambient air	1 μg m^{-3} PM_1	
28	25/4/17	Particle wall loss	Clean air, AS seeds	2000 μg m^{-3} AS	Wall loss tests
29	24/5/17	Particle wall loss	Clean air, AS seeds	15 μg m^{-3} AS	
30	25/5/17	Particle wall loss	Clean air, AS seeds	13 μg m^{-3} AS	
31	1/6/17	Ambient sampling efficiency	Ambient air	1.4 μg m^{-3} PM_1	Sampling efficiency characterization
32	12/6/17	Ambient sampling efficiency	Ambient air	4 μg m^{-3} PM_1	
33	16/6/17	Particle wall loss	Clean air, AS seeds	160 μg m^{-3} AS	
34	21/6/17	Particle wall loss	Clean air, AS seeds	70 μg m^{-3} AS RH= 35-85%	Wall losses under different RH conditions
35	22/6/17	Particle wall loss	Clean air, AS seeds	350 μg m^{-3} AS	
36	26/6/17	Pump contamination test	Clean air		Testing for potential VOC contamination
37	8/9/17	Ambient sampling efficiency	Ambient air	1.4 μg m^{-3} PM_1	
38	2/9/17	HONO blank	Clean air HONO	~100 ppb HONO	
39	4/10/17	J_{NO2} characterization	NO, O_3	470 ppb NO_2 15 ppb O_3	J_{NO2} = 0.03 min^{-1}
40	10/10/17	HONO blank	Clean air HONO	~100 ppb HONO	Testing for potential contamination during HONO injection and photolysis
41	16/10/17	HONO blank	Clean air HONO	~100 ppb HONO	
42	7/12/17	Ambient test	Ambient air	1.4 μg m^{-3} PM	Chamber similarity
43	16/12/17	RH increase blank	Clean air		Testing for potential contamination during water vapor injection to increase RH
44	23/4/18	Oxidation of ambient air, Pittsburgh, PA	Ambient air, HONO, AS	3.6 μg m^{-3} PM_1	Pilot study for system evaluation

			seeds		
45	15/219	HONO, NO_x, O_3	Clean air, O_3, RH<10% J_{NO2}=0.03 min^{-1}	145 ppb O_3	Interactions between NOx, O_3, and the walls
46	18/2/19	HONO, NO_x, O_3	Clean air, NO, d-butanol, RH<10% J_{NO2}=0.03 min^{-1}	15 ppb O_3	
47	19/2/19	HONO, NO_x, O_3	Clean air, O_3, RH 42%, J_{NO2}=0.03 min^{-1}	150 ppb O_3	
48	21/2/19	HONO, NO_x, O_3	Clean air, NO, d-butanol, RH=49% J_{NO2}=0.03 min^{-1}	12 ppb NO	
49	25/2/19	HONO, NO_x, O_3	Clean air, O_3, RH<10% J_{NO2}=0.11 min^{-1}	60 ppb O_3	
50	26/2/19	HONO, NO_x, O_3	Clean air, NO, d-butanol, RH<10% J_{NO2}=0.11 min^{-1}	26 ppb NO	
51	26/2/19	J_{NO2} characterization	NO, O_3	50 ppb NO_2 42 ppb O_3	Low UV J_{NO2} 0.03 min^{-1} Hi UV J_{NO2} 0.11 min^{-1}
52	27/2/19	HONO, NO_x, O_3	Clean air, NO, d-butanol, RH 56% J_{NO2}=0.11 min^{-1}	46 ppb NO	Effects of RH and UV on HONO off-gassing and OH production
53	28/2/19	HONO, NO_x, O_3	Clean air, RH 46% J_{NO2}=0.11 min^{-1}		
54	1/3/19	HONO, NO_x, O_3	Clean air, O_3, RH 47% J_{NO2}=0.11 min^{-1}	30 ppb O_3	
55	3/3/19	VOC wall losses	Clean air,	140 ppb Tol.	VOC losses

			Toluene		
56	3/3/19	VOC wall losses	Clean air, Toluene	80 ppb Tol.	
57	4/3/19	VOC wall losses	Clean air, a-pinene	180 ppb APin	
58	4/3/19	VOC wall losses	Clean air, a-pinene	150 ppb APin	

[a] FAME 16: Finokalia Aerosol Measurement Experiment 2016, Finokalia, Greece.

1. Chamber Artificial Light Spectrum

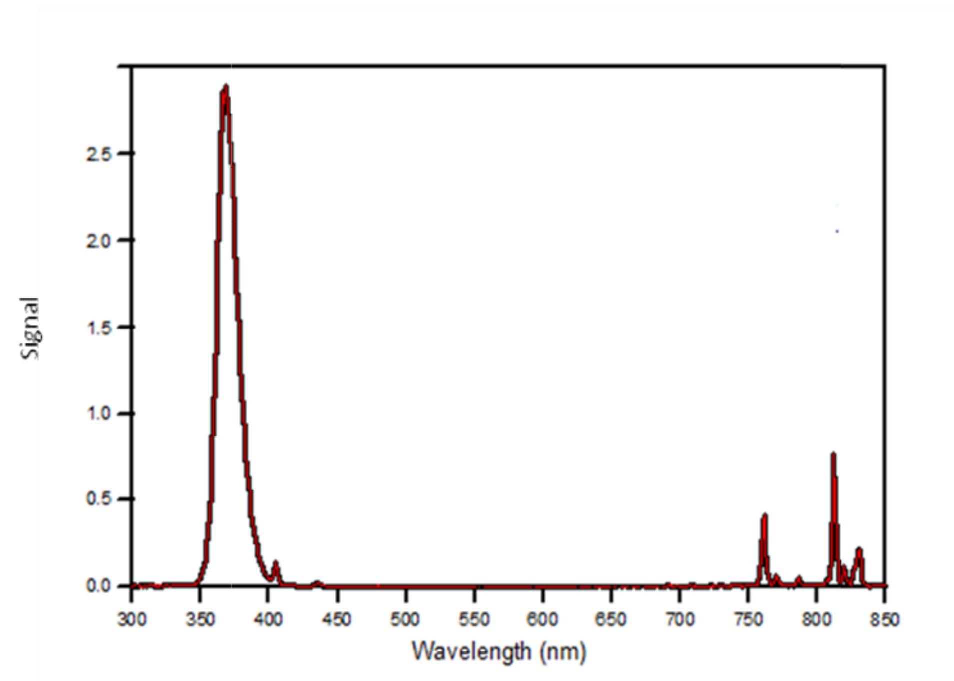

Figure S1. The artificial light spectrum of the dual smog chamber system.

2. Auxiliary mechanism for the dual smog chamber system

NO_x → Wall (NO_x)

- For dark chamber, low RH (<10%): Negligible (below detection limit)

- For J_{NO2}=0.03 min^{-1}, low RH (<10%): 2.8x10^{-6}- 4x10^{-6} s^{-1}
- For J_{NO2}=0.1 min^{-1}, low RH (<10%): Negligible (below detection limit)
- For dark chamber, medium RH (40-60%): Negligible (below detection limit)
- For J_{NO2}=0.03 min^{-1}, medium RH (40-60%): 0.8x10^{-6} - 7.4x10^{-6} s^{-1}
- For J_{NO2} =0.1 min^{-1}, medium RH (40-60%): 4.1x10^{-6} - 6.5x10^{-6} s^{-1}

O_3 → Wall (O_3)

- For dark chamber, low RH (<10%): 3.1x10^{-6} – 3.9x10^{-6} s^{-1}
- For J_{NO2}=0.03 min^{-1}, low RH (<10%): 2.5x10^{-6} – 4.4x10^{-6} s^{-1}
- For J_{NO2}=0.1 min^{-1}, low RH (<10%): 3.2x10^{-6} – 9.6x10^{-6} s^{-1}
- For dark chamber, medium RH (40-60%): 2.3x10^{-6} – 5.5x10^{-6} s^{-1}
- For J_{NO2} =0.03 min^{-1}, medium RH (40-60%): 11x10^{-6} – 16x10^{-6} s^{-1}
- For J_{NO2}=0.1 min^{-1}, medium RH (40-60%): 2.8x10^{-6} – 10x10^{-6} s^{-1}

Walls → OH (based on d-butanol decay)

- For J_{NO2}=0.03 min^{-1}, low RH (<10%): Below detection limit
- For J_{NO2}=0.1 min^{-1}, low RH (<10%): OH production=3.4x10^{3} - 7.9x10^{3} molecules cm^{-3} s^{-1}
- For J_{NO2}=0.03 min^{-1}, medium RH (40-60%): OH production=1.9x10^{4} - 2.2x10^{4} molecules cm^{-3} s^{-1}
- For J_{NO2}=0.1 min^{-1}, medium RH (40-60%): OH production=8x10^{3} – 5.5x10^{4} molecules cm^{-3} s^{-1}

Toluene →Wall (Toluene): Dark, Low RH (<10%): Below detection limit.

A-pinene→Wall (A-pinene): Dark, Low RH (<10%): Below detection limit.