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Supplement of

On the accuracy of aerosol photoacoustic spectrometer calibrations using absorption by ozone

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Ozone splitting variability

We evaluated the ozone splitting between the five PAS cells by calculating the relative cell resonant frequency shifts as oxygen was introduced into the particle-filtered air flow. Ozone splitting ratios were calculated for each PAS cell relative to the cavity ring-down spectrometer cell used for calibration. Computing the mean percentage standard deviation (“SD/mean (%)”) leads to 1.31%. These are summarised in Table S1.

Date	PAS 3 (514 nm)	PAS 2 (658 nm)	PAS 1 (405 nm)
27/06/17	0.98127877	1.280229364	1.01326201
29/06/17	0.977104377	1.275420875	1.029715762
16/08/17	0.986106287	1.254949635	1.074013158
17/08/17	0.981563674	1.272106521	0.99771987
22/08/17	0.976822304	1.269062815	0.990076825
23/08/17	0.975593668	1.258245383	0.980545968
24/08/17	0.97265892	1.269993165	0.989576547
25/08/17	0.977355977	1.265401265	0.984795692
mean	0.978560497	1.268176128	1.007463229
Standard deviation (SD)	0.003930175	0.00789432	0.029396436
SD/mean (%)	0.401628169	0.622494015	2.917866934

Table S1: Ozone splitting factors between the PAS cells.

Ozone calibration

Gradients and R^2 values for the ozone calibrations relating the CRDS extinction measurements to the PAS IA measurements are summarised in Table S2.

Date	Cell (PAS/CRDS)	Gradient	R^2
16/06/17	PAS 3/CRDS 1	0.06572597	0.999951464798
	PAS 2/CRDS 1	0.10646248	0.999911858193
	PAS 5/CRDS 2	0.02158948	0.999781003178
	PAS 4/CRDS 1	0.13887722	0.999942237089
	PAS 1/CRDS 2	0.01509787	0.999957948408
21/06/17	PAS 3/CRDS 1	0.06406261	0.999896086081
	PAS 2/CRDS 1	0.10381729	0.999825195701
	PAS 5/CRDS 2	0.01991732	0.999718259426
	PAS 4/CRDS 1	0.12926626	0.999876306904
	PAS 1/CRDS 2	0.01461538	0.99988572773
27/06/17	PAS 3/CRDS 1	0.06367616	0.99995071711
	PAS 2/CRDS 1	0.10458862	0.999912287716
	PAS 5/CRDS 2	0.02015712	0.999817749483
	PAS 4/CRDS 1	0.1303718	0.999960168815
	PAS 1/CRDS 2	0.01844026	0.999704588671

Table S2: Gradients and R^2 values for the PAS ozone calibrations using CRDS. Linear fits were forced through the origin.

Aerosol size distribution parameters

Table S3 summarises the fitting parameters for the bi-modal lognormal fitting functions used to model the aerosol size distributions. The fitting algorithm was fit over the range of particle diameters 71–532 nm.

SMPS Scan	Median diameter, mode 1 (nm)	Geometric standard deviation, mode 1	Number, mode 1 (cm ⁻³)	Median diameter, mode 2	Geometric standard deviation, mode 2	Number, mode 2 (cm ⁻³)
1.1	227.4	1.47	10516	61.0	1.77	443747
1.2	56.6	1.86	524819	265.4	1.40	5396
1.3	59.1	1.78	495003	217.2	1.50	12349
1.4	63.2	1.67	420630	175.8	1.57	26988
1.5	59.2	1.77	493117	209.2	1.51	13854
1.6	189.6	1.54	21007	62.0	1.70	446507
1.7	63.1	1.71	415337	187.4	1.54	20329
1.8	61.1	1.80	464751	230.9	1.45	9517
1.9	62.6	1.69	420167	172.0	1.58	28290
2.1	55.7	1.92	394786	315.3	1.14	332
2.2	65.0	1.87	274267	45.7	1.61	94234
2.3	51.5	1.87	400698	130.7	1.67	20549
2.4	57.7	1.90	370165	331.2	1.18	205
2.5	324.2	1.16	172	58.5	1.90	364995
2.6	164.4	1.54	10332	58.1	1.82	348790
3.1	47.6	2.00	536175	226.2	1.05	168
3.2	174.9	1.69	3771	54.9	1.89	422489
3.3	426.6	1.11	67	52.5	1.95	452573
3.4	54.8	1.89	424174	220.4	1.50	2930
3.5	56.7	1.94	378642	76.0	1.23	8912
3.6	53.8	1.95	425607	436.7	1.13	58
3.7	16.6	2.45	595425	60.8	1.90	279248
3.8	56.6	1.86	384091	185.1	1.56	6413
3.9	46.5	1.89	419385	103.3	1.76	50732
3.10	52.6	1.84	404854	136.7	1.66	21516
3.11	3.2	3.38	3548731	62.5	1.89	316931
3.12	56.6	1.94	416802	415.2	1.12	50
4.1	60.4	1.76	547102	171.6	1.62	32171
4.2	144.5	1.65	67235	65.6	1.62	405758
4.3	61.7	1.68	457914	142.7	1.68	64082
4.4	62.2	1.75	515408	181.3	1.57	29341
4.5	60.5	1.78	460871	156.3	1.65	42930
4.6	61.0	1.78	473121	167.1	1.62	36044
4.7	60.0	1.82	505946	176.5	1.61	26051
4.8	91.6	1.81	221689	65.0	1.49	180429
4.9	86.6	1.84	253135	64.2	1.47	162402
5.1	39.5	1.93	709101	144.1	1.70	33692
5.2	34.8	2.00	891413	153.4	1.66	28619
5.3	38.1	2.01	780081	168.1	1.63	19461

5.4	157.2	1.66	24113	36.5	2.01	826587
5.5	155.3	1.79	63248	36.1	1.90	796385
5.6	80.6	1.91	173207	53.5	1.53	260927
5.7	111.7	1.80	81678	47.6	1.68	468677
5.8	102.3	1.80	108711	52.7	1.57	344556
5.9	75.0	1.94	198931	46.2	1.58	353242
5.10	68.5	1.96	247761	55.9	1.46	186920
5.11	54.7	1.48	189252	71.3	1.93	215115
5.12	104.9	1.87	83391	36.2	1.88	787018
6.1	54.7	1.48	189252	71.3	1.93	215115
6.2	104.9	1.87	83391	36.2	1.88	787018

Table S3: Fitting parameters for the polydisperse aerosol size distribution measurements. The ‘SMPS scan’ values within the first column represent the experimental dataset where 1.1–1.9 and 2.1–2.6 represent data collected on 16/06/17, 3.1–3.12 and 4.1–4.9 represent data collected on 21/06/17 and 5.1–5.12 and 6.1–6.2 represent data collected on 27/06/17.