S1 Operation points of miniCAST generator and OCU

Table S1 provides the operation points used for both the miniCAST generator and the OCU. The overall C/O ratio is calculated as (Schnaiter et al., 2006)[1]

$$\mathrm{C/O} = 7.16\ \frac{f_\mathrm{f}}{f_\mathrm{air}} \quad \text{(S1)}$$

where f_f is the flow of propane fuel and the f_air the flow of air (oxidation air + mixing air).

Mass concentrations of α-pinene are regulated by indicating the setpoint for the PID response in mV. Those values are converted to molar ratio (ppm) using the results of the regular calibrations with a 100-ppm isobutylene–air mixture as well as the response factor for α-pinene reported by the manufacturer (0.34). From the molar ratio the mass concentration was calculated using the ideal gas law.

[1]Schnaiter, M., Gimmler, M., Llamas, I., Linke, C., Jäger, C., and Mutschke, H.: Strong spectral dependence of light absorption by organic carbon particles formed by propane combustion, Atmos. Chem. Phys., 6, 2981–2990, https://doi.org/10.5194/acp-6-2981-2006, 2006.

Table S1: Operation points of the miniCAST 5201 Type BC generator and the OCU used in this study.

miniCAST 5201 Type BC						
Operation point	**Propane (mL min^{-1})**	**Oxidation air (L min^{-1})**	**Mixing air (mL min^{-1})**	**Quench gas N_2 (L min^{-1})**	**Dilution air (L min^{-1})**	**Overall C/O ratio (-)**
1	60	1.1	350	7	10	0.296
0.1	60	1.3	220	7	10	0.283

OCU				
Setup	**Operation point**	***GMD*$_{mob}$ (nm)[1]**	**α-pinene mass concentration (mg/m^3)**	**α-pinene/eBC$_{PAX}$ mass ratio**
1	1 – uncoated	91.7±0.1	0	0
1	1 – coating 1	86.1±0.1	92	11
1	1 – coating 2	83.4±0.1	282	42
1	1 – coating 3	83.0±0.1	911	140
0.1	0.1 – uncoated	88.3±0.1	0	0
0.1	0.1 – coating 1	90.2±0.1	92	78
0.1	0.1 – coating 2	111 ±1	549	414
0.1	0.1 – coating 3	126±1	732	552

[1]The uncertainties for the GMD_{mob} correspond to one standard deviation of the mean (k=1; 68 % confidence interval; number of measurements n=29–35).

S2 Design of custom-made flow splitter

(a)

(b)

Figure S1: Picture of the custom-made flow splitter used in this study (a), which accommodates 19 equivalent sampling ports (b).

S3 Data tables

Table S2: b_{abs} at 532 nm measured by the instruments used in this study. The uncertainties correspond to one standard deviation of the mean (k=1; 68 % confidence interval; number of measurements n =100–180).

Operation point	R_{BC} (-)	$b_{abs,\,532}$ (Mm^{-1})					
		AE33 (550 nm)	MSPTI (532 nm)	PAX (870 nm)	MAAP (637 nm)	PAS (520 nm)	PTAAM (532 nm)
1 - uncoated	0.00±0.89	106.9±0.3	39.0±0.6	48.8±0.3	68.1±0.2	41.9±2.0	49.8±0.2
1 - coating 1	0.47±0.10	101.9±0.2	52.4±0.5	47.3±0.1	60.8±0.2	70.1±0.9	49.8±0.1
1 - coating 2	0.83±0.12	113.2±0.2	51.5±0.3	46.5±0.1	62.3±0.2	54.1±0.5	47.4±0.1
1 - coating 3	0.87±0.12	115.7±0.3	47.2±0.4	44.8±0.1	62.1±0.2	74.1±1.0	46.7±0.1
0.1 - uncoated	0.0±0.1	106.8±0.7	40.1±0.9	54.0±0.2	67.3±0.2	33.1±0.5	52.5±0.2
0.1 - coating 1	1.4±0.1	140.4±0.3	51.8±0.4	56.1±0.2	81.1±0.3	90.5±0.8	57.8±0.2
0.1 - coating 2	2.0±0.1	158.8±0.5	50.4±0.6	60.4±0.2	100±1	48.7±0.6	62.0±0.2
0.1 - coating 3	3.4±0.4	175.6±1.3	78.4±0.7	63.2±0.2	129±1	36.0±0.8	68.7±0.2

Table S3: E_{babs} at 532 nm calculated from the measurements taken by the instruments used in this study. The uncertainties correspond to one standard deviation of the mean (k=1; 68 % confidence interval; n=100–180).

Operation point	R_{BC} (-)	$E_{babs,\,532}$ (Mm^{-1})					
		AE33 (550 nn)	MSPTI (532 nm)	PAX (870 nm)	MAAP (637 nm)	PAS (520 nm)	PTAAM (532 nm)
1 - uncoated	0.00±0.89	1.00±0.01	1.00±0.02	1.00±0.01	1.00±0.01	1.00±0.07	1.00±0.01
1 - coating 1	0.47±0.10	0.953±0.004	1.35±0.02	0.969±0.005	0.892±0.004	1.67±0.08	1.00±0.01
1 - coating 2	0.83±0.12	1.06±0.01	1.32±0.02	0.953±0.005	0.916±0.005	1.29±0.06	0.953±0.004
1 - coating 3	0.87±0.12	1.08±0.01	1.21±0.02	0.918±0.005	0.912±0.004	1.77±0.09	0.939±0.004
0.1 - uncoated	0.0±0.1	1.00±0.01	1.00±0.03	1.00±0.04	1.00±0.01	1.00±0.02	1.00±0.01
0.1 - coating 1	1.4±0.1	1.31±0.01	1.29±0.03	1.04±0.05	1.20±0.01	2.73±0.05	1.10±0.01
0.1 - coating 2	2.0±0.1	1.49±0.01	1.26±0.03	1.12±0.05	1.49±0.01	1.47±0.03	1.18±0.01
0.1 - coating 3	3.4±0.4	1.65±0.02	1.96±0.05	1.17±0.06	1.91±0.01	1.09±0.03	1.31±0.01

Table S4: b_{abs} and E_{babs} at 950 nm calculated from the measurements taken by the instruments used in this study. The uncertainties correspond to one standard deviation of the mean (k=1; 68 % confidence interval; n=100–160).

Operation point	R_{BC} (-)	$b_{abs,\,950}$ (Mm^{-1})			$E_{babs,\,950}$ (-)		
		AE33 (950 nm)	PAX (870 nm)	PTAAM (1064 nm)	AE33 (950 nm)	PAX (870 nm)	PTAAM (1064 nm)
0.1 - uncoated	0.0±0.1	74.0±0.5	28.7±0.1	31.8±0.4	1.00±0.01	1.00±0.01	1.00±0.02
0.1 - coating 1	1.4±0.1	94.4±0.3	27.6±0.1	28.8±0.3	1.28±0.01	0.963±0.005	0.903±0.014
0.1 - coating 2	2.0±0.1	99.3±0.4	27.2±0.1	28.8±0.2	1.34±0.01	0.948±0.004	0.905±0.012
0.1 - coating 3	3.4±0.4	111±1	27.5±0.1	31.1±0.4	1.50±0.02	0.959±0.005	0.977±0.017

S4 Irregularities in MAAP data

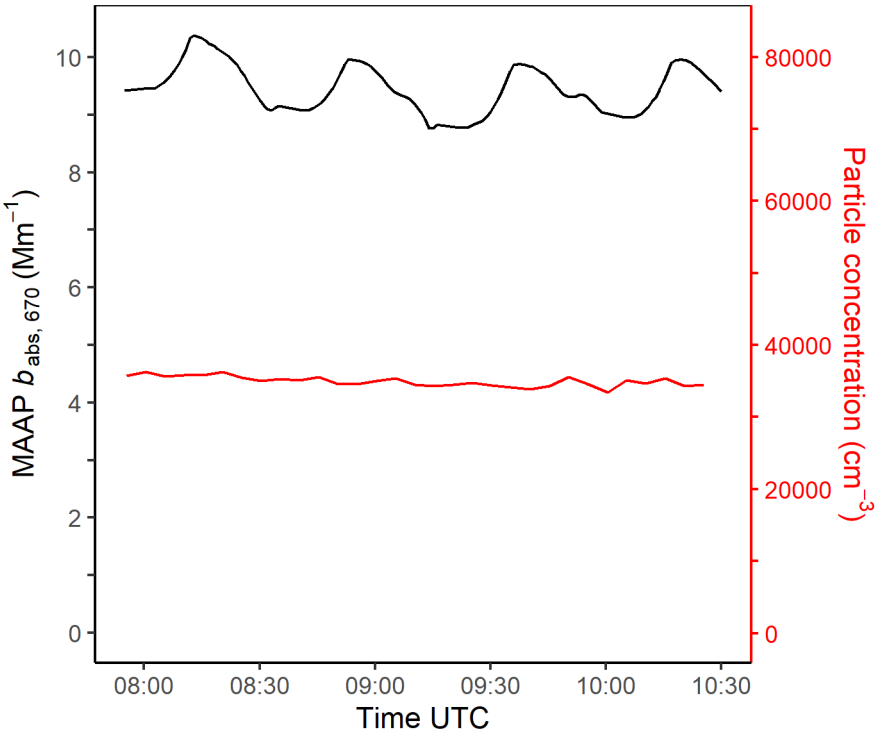

Figure S2: Example of MAAP b_{abs} data showing a periodic variation of the signal over time. This behaviour was consistently observed but was more pronounced at higher concentrations. The data shown are from the measurement of the operation point "1 – coating 1". Total number concentration as measured by SMPS is shown on the secondary y-axis.

S5. Stability of the PTAAM-2λ response during AEROTOX campaign

Instrument performance was tested every working day during the campaign (Figure S3). The response of channel 1 was determined by measuring the absorption of 1 ppm NO_2. The response of channel 2 was determined by multiplying the response of channel 1 with the absorption ratio ($b_{abs,\ ch2}/b_{abs,\ ch1}$) obtained for aerosolized nigrosin.

Standard deviation of the instrument response was 3 % for channel 1 and 4 % for channel 2.

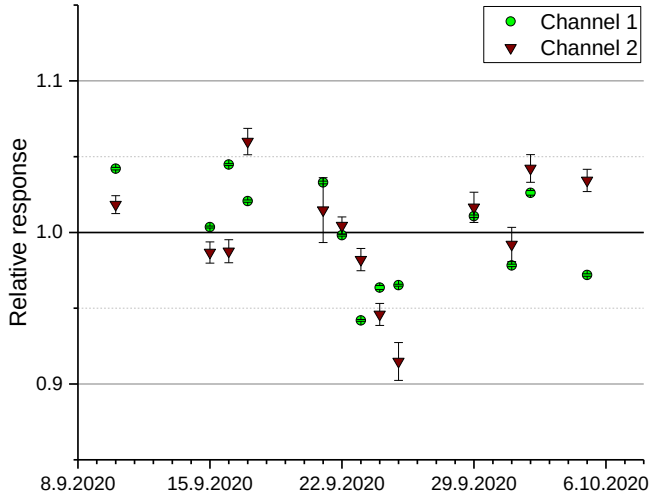

Figure S3. Relative response of PTAAM-2λ during the campaign. Error bars represent one standard deviation of the mean.

S6 Comparison of MSPTI and PTAAM

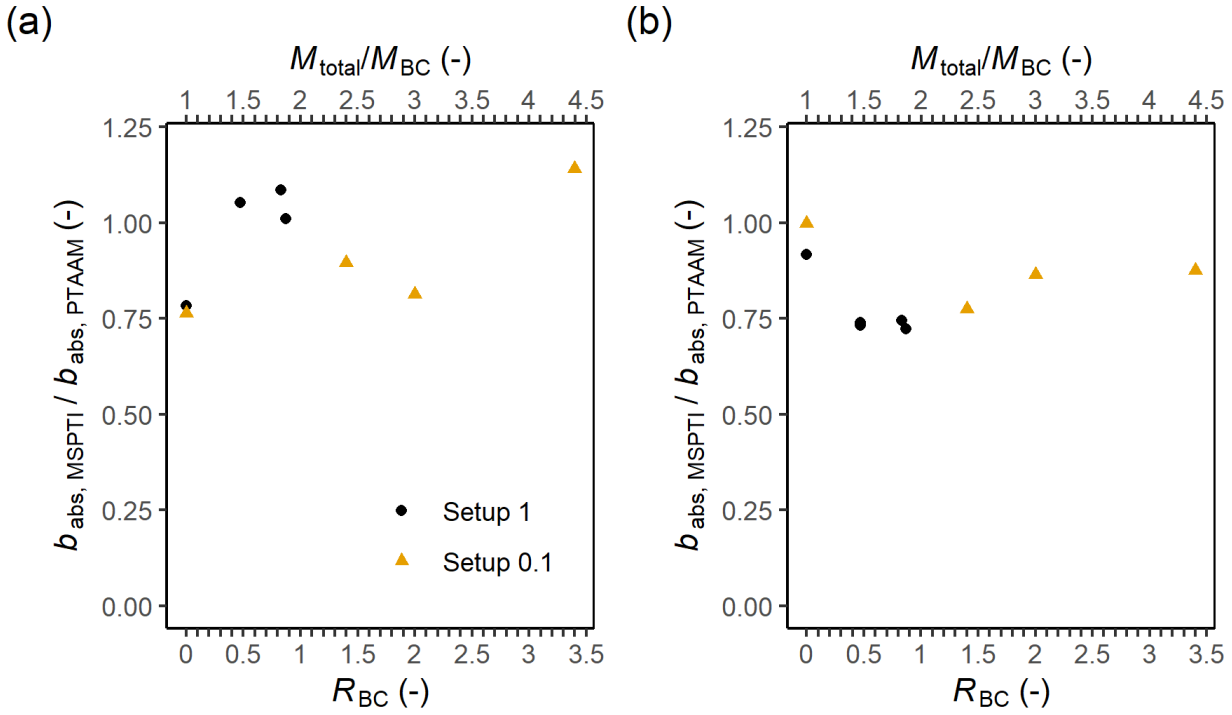

Fig S4. Absorption ratio MSPTI/PTAAM measured at 532 nm as a function of total mass to BC mass ratio and R_{BC} during the main experiments (a) and the additional experiments (b).