

## Intercomparison of Absorption Photometers Project No.: AP-2017-1-3

**Location of the quality assurance:** TROPOS, lab 121

**Date:** 11 September, 2017

Principal Investigator	Home Institution	Participant	Instrument
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### 1. Intercomparison summary

**Flow calibration:** The flow of the instrument was 2% too high. Corrections for the flow deviation and the temperature and pressure (STP correction) were considered in the data evaluation.

**Noise:** The noise level of the instrument is in the normal range. The average noise ( $1\sigma$ ) for all seven wavelengths was less than  $27 \text{ ng/m}^3$  for two minutes averaging time. The background level value was less than  $14 \text{ ng/m}^3$ , showing that there was no leak.

**Inspection:** Measurement head was clean. Just a negligible amount of deposited particulates was found in the cell. The sample spots were round with sharp edges.

**Comparison to a reference MAAP:** BC concentrations at 660 nm (BC5) of AE33-SN302 are on average 9% higher than BC concentrations from a reference MAAP (SN 504). For low attenuations, the AE31 was 33% higher. These values are typically found for ambient air in Leipzig.

**Comparison to reference Aethalometer AE33 (SN 163):** The AE33 (SN 302) measures lower concentrations than the reference Aethalometer of type AE33 (SN 163). The values are lower between 34% and 14%. For low loading, attenuation less than 10, the deviations between AE31 and AE33 are between 0% and 15%.

**Recommendations:** None.

**Overall assessment:** The instrument meets the requirements.

## 2. Details

Configuration parameters	
Instrument serial number: SN 302:71D3	
BC Unit: ng	
Sigma values: 39.5, 31.3, 28.1, 24.8, 22.2, 16.6, 15.4	
Volumetric reference: Volumetric	
Air Pressure: 660 hPa	
Temperature: 25 °C	
Spot size : Standard range	
Mean ration 1.18	

Spot size check			
Correction factor for spot sizes $F_{spot}$ .			
Date	Nominal spot size [cm <sup>2</sup> ]	Measured spot size [mm <sup>2</sup> ]	$F_{spot}$
2017-01-21	0.5	Well defined spot, spot size not measured	1.0

Instrumental Noise									
Noise in units of eBC concentration measured with filtered air.									
Date	Avg. time	Wave-length [nm]	Num data points	Median [ng]	10 <sup>th</sup> percentile [ng/m <sup>3</sup> ]	90 <sup>th</sup> percentile [ng/m <sup>3</sup> ]	Mean [ng/m <sup>3</sup> ]	Standard deviation [ng/m <sup>3</sup> ]	Error of the mean [ng/m <sup>3</sup> ]
Jan 29	2 min	370	53	-1.6	-24.7	22.1	-1.0	19.6	2.7
		450	53	-4.3	-17.6	10	-3.2	12.0	1.7
		520	53	-7.7	-32	21.7	-7.2	21.9	3.0
		590	53	-7.6	-23.7	13.6	-6.4	13.7	1.9
		660	53	-10.9	-41.8	19	-11.4	26.7	3.7
		880	53	-9.8	-30	16.1	-9.5	20.0	2.7
		950	53	-14.4	-38	5.8	-13.2	18.5	2.6

### Comparison of AE31 and MAAAP

Comparison of eBC from AE31 (SN302) and the reference MAAAP (SN 504).

Measurement wavelength [nm]	AE31: 660 nm MAAP: 637 nm
<b>All data</b>	
Slope <sup>(1)</sup>	1.092 ± 0.005
R <sup>2</sup>	0.939
<b>Attenuation smaller 10</b>	
Slope <sup>(1)</sup>	1.333 ± 0.005
R <sup>2</sup>	0.998

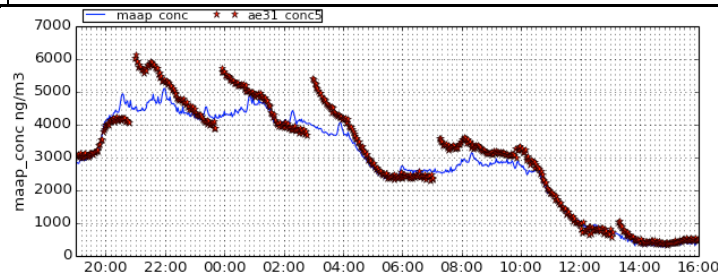


Figure: Comparison of eBC concentrations from AE31 at 660 nm and MAAAP SN-504.

### Comparison of AE33 (SN302) and reference AE33 (SN163): All Data

Slope larger unity means that AE31 SN302 measured higher BC concentrations.

Wavelength [nm]	370	470	520	590	660	880	950
Slope	0.660±0.008	0.739±0.008	0.784±0.008	0.788±0.008	0.814±0.008	0.856±0.007	0.843±0.007
R <sup>2</sup>	0.642	0.704	0.719	0.741	0.749	0.783	0.783

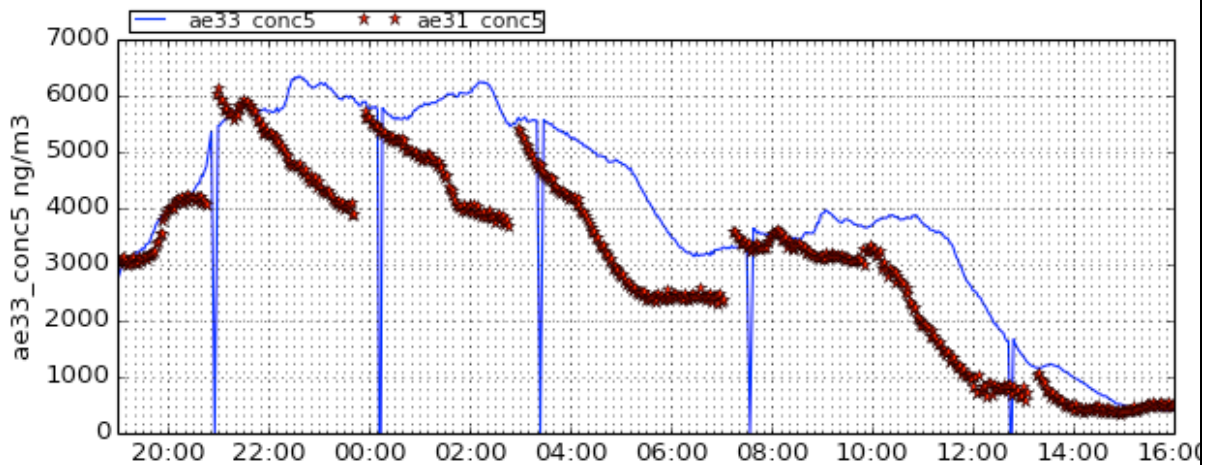


Figure: Comparison of eBC concentrations at 660 from of AE33 SN302 and the reference instrument AE33 SN-163.

### Comparison of AE33 (SN302) and reference AE33 (SN163): Low Loading

Data for attenuation smaller 10

Slope larger unity means that AE31 SN302 measured higher BC concentrations.

Wavelength [nm]	370	470	520	590	660	880	950
Slope	0.859±0.018	0.918±0.019	0.947±0.021	0.955±0.021	1.000±0.022	0.999±0.021	1.003±0.023
R <sup>2</sup>	0.949	0.949	0.948	0.950	0.950	0.954	0.947

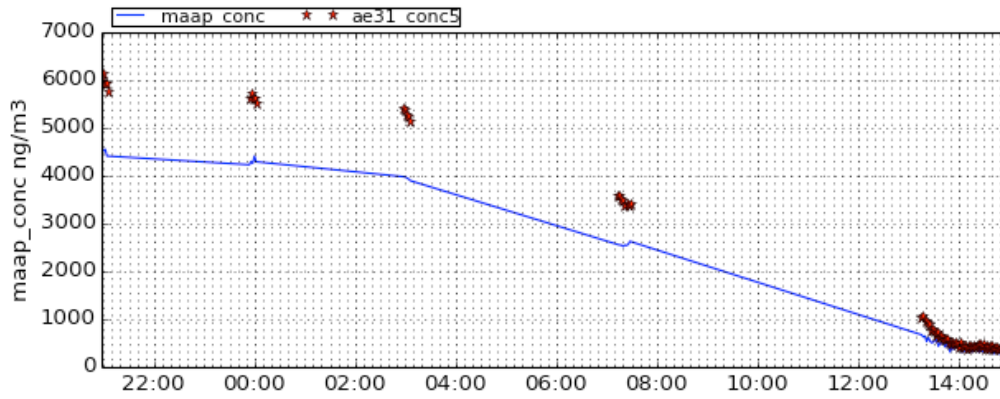


Figure: Comparison of eBC at 660 nm concentrations from of AE33 SN302 and the reference instrument AE33 SN-163.