



## Intercomparison of absorption photometer Project No.: AP-2018-3-1

### Basic informations:

Location of the quality assurance: TROPOS, Lab 121  
Date: 22 October - 26 October 2018

Principal Investigator	Home Institution	Participant	Instrument
B. Briel	DWD	B. Briel	42545

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## 1 Intercomparison summary

### Status on arrival

No issues due to transportation or other damages.

### Flow calibration

The flow meter of the instrument is set to report flow for conditions of 0 °C and 1013.25 hPa. The flow was 5.7 % too low compared to reference flow meter (TSI 4100). 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 the all wavelengths was less equal  $20 \text{ ng m}^{-3}$  for one minute averaging time. The background level was acceptable with deviations of less equal  $-2 \text{ ng m}^{-3}$ .

### **Inspection**

The instrument was clean without any contamination.

### **Comparison to reference MAAP**

BC concentrations of MAAP are 1.8 % higher than BC concentrations from a reference MAAP.

### **Comparison to reference absorption**

The deviations of the absorption coefficients derived from MAAP relative to the absorption coefficients from the multi-wavelength absorption reference setup is 52.3 %.

### **Recommendations**

No recommendations.

### **Overall assessment**

The instrument meets the requirements.

## 2 Details

### Configuration parameters

Thermo ELECTRON	CARUSSO v1.28	SERIENNUMMER	-32768	18-10-22
SIGMA BC:	6.6	m2/g		
LUFTDURCHSATZ 1/h	480			
MITTELWERTSPEICHER:	1	min		
KONZ. BEZOGEN AUF	BETRIEBSBEDINGUNGEN			
NORMTEMPERATUR	0	°C		
DRUCKFORMAT:	COM1	12		
DRUCKZYCLUS:		1	min	
BAUDRATE:	Bd COM1	9600		
BAUDRATE:	Bd COM2	9600		
GERAETE-ADRESSE:	0			
FILTERWECHSEL				
TRANSM. <	%	50		
ZYCLUS	h	0		
UHRZEIT	UHR	0		
SENSORKALIBRIERUNG				
P1,V P1,NP P2,V P2,NP P3,NP T1,NP T2,NP T3,NP				
-25 -9 -81 65 -83 -245 -180				
LUFTDURCHSATZ	87.1			
ANALOGAUSGAENGE				
AUSGABENULLPUNKT:	4mA			
CBC	0	10		
MBC	0	2400		
Q-OP	0	1000		
T1	-20	40		
T2	-20	40		
P3	900	1100		
GESYTEC-PROTOKOLL				
STATUSBELEGUNG	STANDARD			
VARIABLEN-ANZAHL	1			
CBC				
END				

### Flow check

Table 1: Correction factors  $F_{flow}$  and  $F_{STP}$  for correcting eBC concentrations.  $F_{flow}$  corrects for inlet flow errors considering leakage.  $F_{STP}$  is used to adjust concentrations to STP conditions (0 °C, 1013.25 hPa).

System flow and reference			Measured	$F_{flow}$	$F_{STP}$
$Q_{MAAP}$	$T_{0,MAAP}$	$p_{0,MAAP}$	flow $Q$		
[slpm]	[°C]	[hPa]	[slpm]		
8	0	1013.25	8.153	1.057	1

## Spot size check

Table 2: Correction factor for spot sizes  $F_{spot}$ .

Nominal spot size [cm <sup>2</sup> ]	Measured spot size [cm <sup>2</sup> ]	$F_{spot}$
2.00	Well defined spot, spot size not measured	1.0



Figure 1: New spot from MAAP (42545) on filter tape.

## Instrumental Noise

Table 3: Noise parameters of MAAP (42545) measured with filtered air.

Wavelength [nm]	Number of data points	Median [ng m <sup>-3</sup> ]	10th percentile [ng m <sup>-3</sup> ]	90th percentile [ng m <sup>-3</sup> ]	Mean [ng m <sup>-3</sup> ]	Std. dev. [ng m <sup>-3</sup> ]	Error of mean [ng m <sup>-3</sup> ]
660	481	-2	-28	15	-5	20	1

## Comparison to reference MAAP

Table 4: Correlation parameter of eBC coefficients from MAAP (42545) and reference MAAP.

Wavelength [nm]	Slope	Error	$R^2$
660	0.982	0.004	0.999

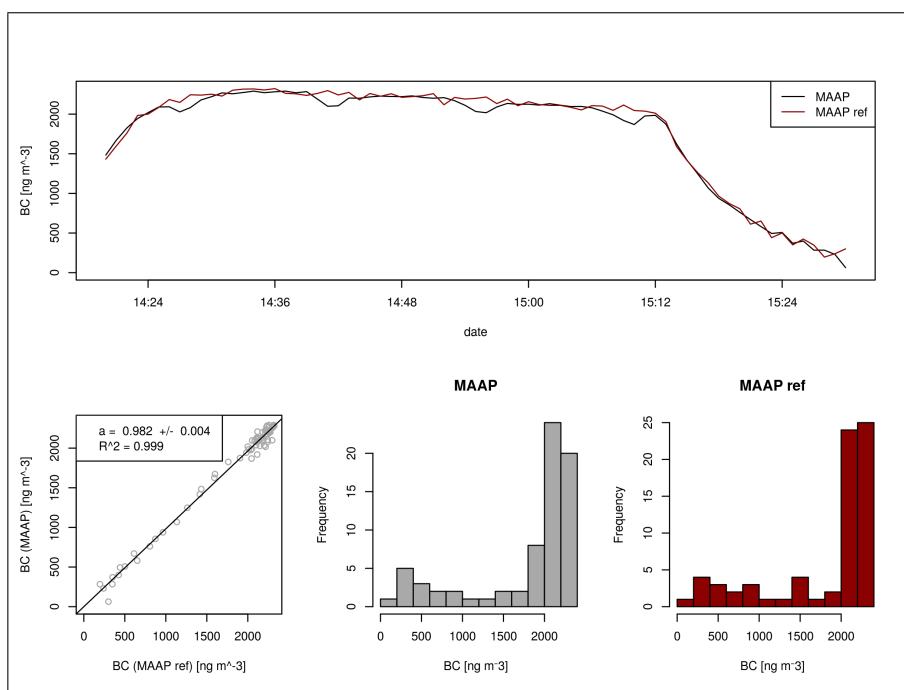


Figure 2: Correlation of eBC coefficient from MAAP (42545) and reference MAAP.

## Comparison to multi-wavelength absorption

Table 5: Correlation parameter of absorption from MAAP (42545) and the multi-wavelength absorption reference.

Wavelength [nm]	Slope	Error	$R^2$
637	1.523	0.018	0.994

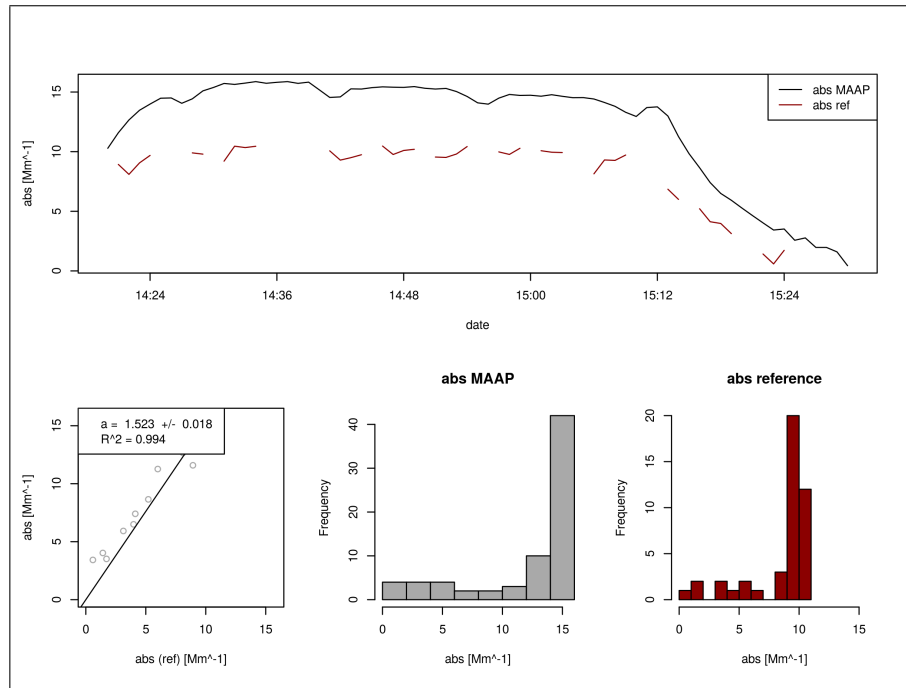


Figure 3: Correlation of absorption from MAAP (42545) and the multi-wavelength absorption reference at 660 nm.