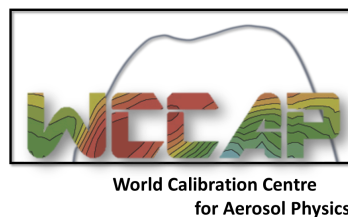




Leibniz Institute for  
Tropospheric Research



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

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

**Date:** 15 October, 2017

Principal Investigator	Home Institution	Participant	Instrument
S. Rodriguez	AEMET	S. Rodriguez	MAAP, SN 50

### 1. Intercomparison summary

**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 3.4% too low compared to reference flow meter (Gilibrator). 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 was little higher than expected from the MAAP specification sheet. The average noise ( $1\sigma$ ) was  $20.2 \text{ ng}\cdot\text{m}^{-3}$  for 1 min averaging time.

**Inspection:** Measurement cell was contaminated with dust and plant remains. The sample spots showed well defined, sharp edges with slight shadowing effects due to plant remains.

**Comparison to a reference MAAP:** BC concentrations are about 7.8% lower than BC concentrations from reference MAAP.

**Comparison to reference absorption:** The absorption coefficients derived from MAAP are 21.6% lower than absorption coefficients from the multi-wavelength absorption reference setup. The uncertainty of the reference absorption for the present concentrations is about 10% to 15%.

**Recommendations:** None.

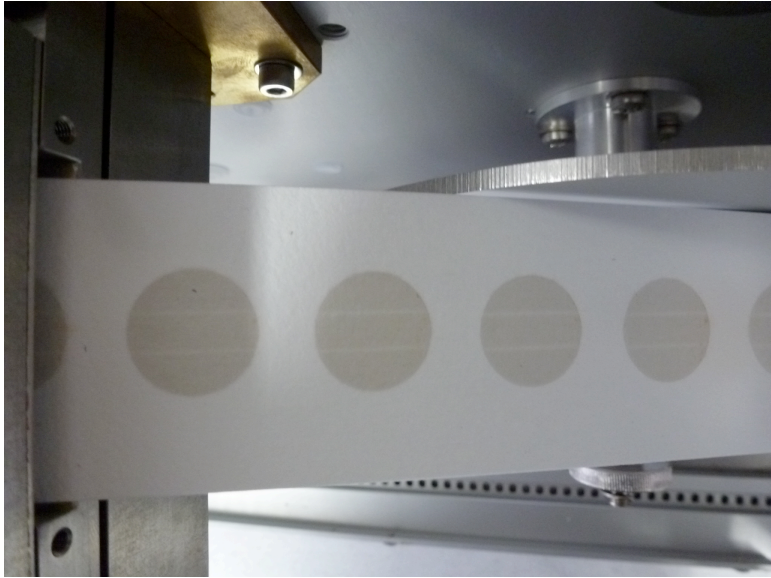
**Overall assessment:** The instrument meets the requirements.



## 2. Details

Configuration parameters	
SIGMA BC:	6.6 m2/g
AIR FLOW:	1000
STORE AVERAGES:	30 min
VOLUME REFERENCE    OPERATING CONDITIONS	
STANDARD TEMPERATURE	0 _C
PRINTFORMAT:	COM1    12
PRINTCYCLE:	12 s
BAUDRATE:	Bd COM1 9600
BAUDRATE:	Bd COM2 9600
DEVICE-ADDRESS:	0
FILTER CHANGE	
TRANSM. <	%    70
CYCLE	h    100
HOUR:	0
CALIBRATION OF SENS.	
P1,SP P1,Z P2,SP P2,Z P3,Z T1,Z T2,Z T3,Z T4,Z	
-11 29 -62 65 8 73 -48	
AIR FLOW	94.8
ANALOG OUTPUTS	
OUTPUT ZERO:	4mA
CBC	0 10
MBC	0 2400
Q-OP	0 1000
T1	-20 40
T2	-20 40
P3	900 1100
GESYTEC-PROTOKOL	
STATUS VERSION	STANDARD
NUMBER OF VARIABLES	1
CBC	
END	

Flow check								
<sup>1</sup> 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).								
Date	System Flow			Reference flow		Flow correction factor <sup>1</sup> Fehler! Textmarke nicht definiert.	STP correction factor <sup>1</sup> Fehler! Textmarke nicht definiert.	
				Reference flow meter: Gilibrator ‘TROPOS-T’				
	Mass flow	Volume reference		Volume flow	Ambient $T$ and $P$			
	$Q_{MAAP}$ [slpm]	$T_{0,MAAP}$ [°C]	$P_{0,MAAP}$ [hPa]	$Q$ [lpm]	$T$ [°C]	$P$ [hPa]	$F_{flow}$	$F_{STP}$
2017-09-06	16.67	0	1013.25	17.64	22	1001	1.034	1.000

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> ]	$F_{spot}$
2017-09-06	0.785	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> ]
2016-09-30	1 min	637	181	2	--23	28	2.77	20.23	1.50

### Comparison to reference MAAP

Correlation of eBC from MAAP (SN 50) and the reference MAAP (SN 504).

Slope 0.922±0.009

R<sup>2</sup> 0.946

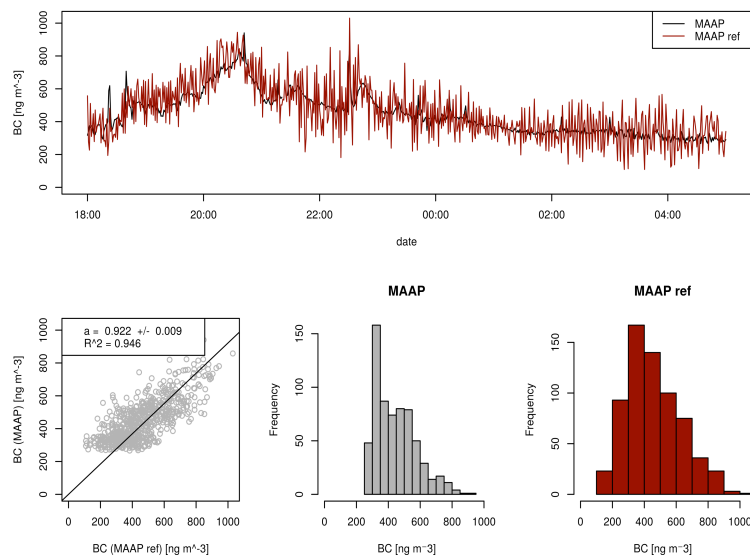


Figure: Comparison of eBC concentrations from MAAP (SN 50) and the reference MAAP (SN 504).

**Comparison to multi-wavelength absorption reference**  
 Correlation of absorption coefficients from MAAP (SN 50) and the multi-wavelength absorption reference

Slope	0.784±0.011
R <sup>2</sup>	0.897

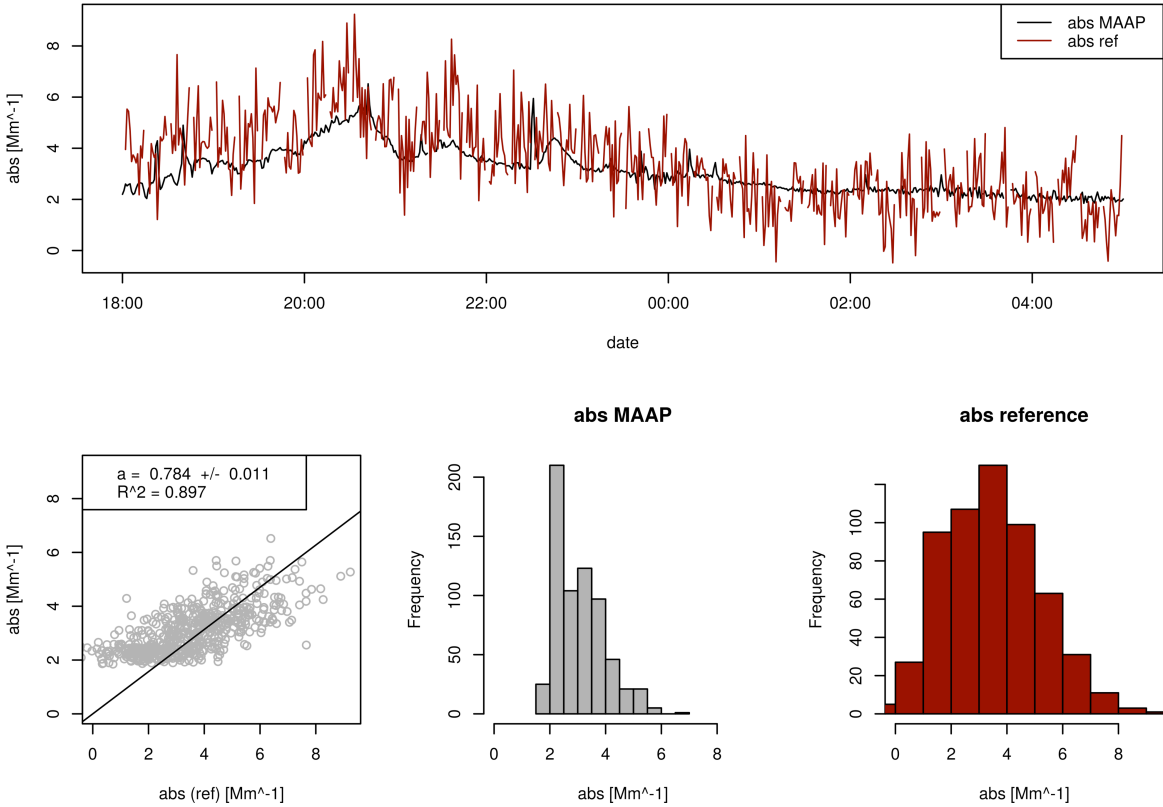


Figure: Comparison of absorption coefficients from MAAP (SN 50) and the multi-wavelength absorption reference.