TROPOS
Leibniz Institute for Tropospheric Research

ECAC
European Center for Aerosol Calibration

WCCAP
World Calibration Centre for Aerosol Physics

Intercomparison of Absorption Photometers
Project No.: AP-2017-2-4

Location of the quality assurance: TROPOS, lab 121

Date: 18 September, 2017

Principal Investigator	Home Institution	Participant	Instrument
A. Eija	Finish Meteorological Institue (FMI)	J. Backmann	MAAP, SN 42545/15

1. Intercomparison summary

Flow calibration: The flow meter of the instrument is set to report flow for conditions of 21.11°C and 1013.25 hPa. The flow was 9.3% 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 (1σ) was 30.8 $ng \cdot m^{-3}$ for 1 min averaging time.

Inspection: Measurement cell was dirty and had to be cleaned. Seal ring at the inlet had to be replaced. The sample spots showed well defined, sharp edges.

Comparison to a reference MAAP: BC concentrations are about 17% higher than BC concentrations from reference MAAP.

Comparison to reference absorption: The absorption coefficients derived from MAAP are 31% higher 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

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SIGMA BC:            6.6 m2/g
AIR FLOW:            600
STORE AVERAGES:         1 min

VOLUME REFERENCE    STANDARD TEMPERATURE
STANDARD TEMPERATURE     0 _C

PRINTFORMAT:        COM1     5
PRINTCYCLE:             1 min
BAUDRATE:        Bd COM1  9600
BAUDRATE:        Bd COM2  9600
DEVICE-ADDRESS:         1

FILTER CHANGE
TRANSM. <       %       50
CYCLE           h        0
HOUR:                    0

CALIBRATION OF SENS.
 P1,SP  P1,Z P2,SP  P2,Z  P3,Z  T1,Z  T2,Z  T3,Z  T4,Z
   -22    -4   -36    65  -334  -200   299
AIR FLOW             92.6

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
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Flow check

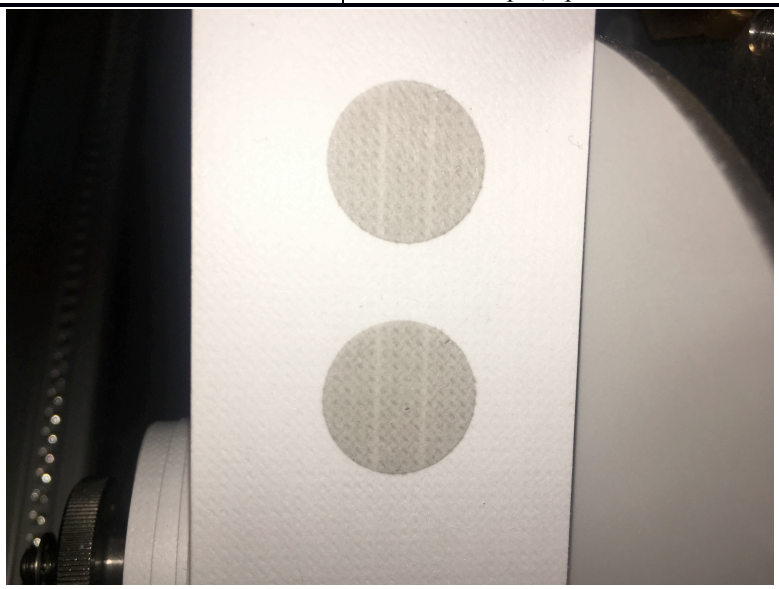
[1]Correction factors F_{flow} and F_{STP} for correcting eBC concentrations. F_{flow} corrects for inlet flow errors considering leakage. F_{STP} is used to adjust concentrations to STP conditions (0°C, 1013.25 hPa).

Date	System Flow			Reference flow Reference flow meter: Gilibrator 'TROPOS-T'			Flow correction factor[1]**Fehler! Textmarke nicht definiert.**	STP correction factor[1]**Fehler! Textmarke nicht definiert.**
	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	10	21.11	1013.25	9.283	20	995	1.093	1.077

Spot size check

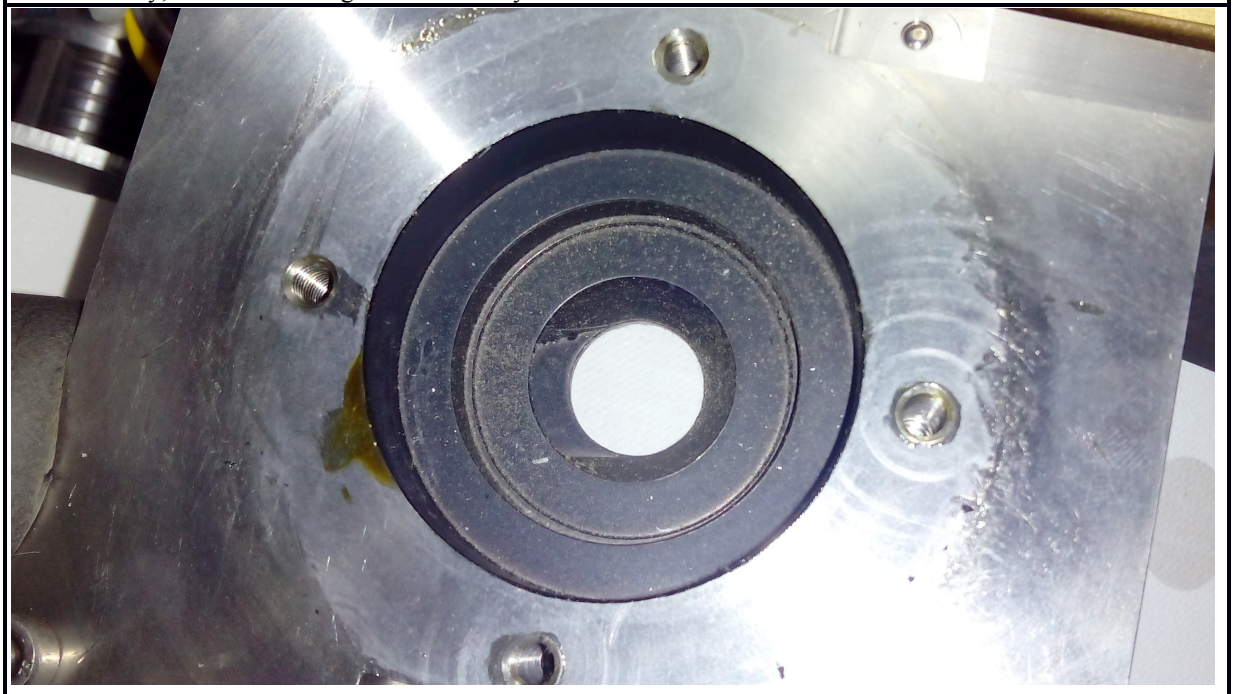
Correction factor for spot sizes F_{spot}.

Date	Nominal spot size [cm^2]	Measured spot size [mm^2]	F_{spot}
2017-09-06	0.785	Well defined spot, spot size not measured	1.0



Cell inspections

Cell was dirty, coated with a significant dust layer.



Instrumental Noise

Noise in units of eBC concentration measured with filtered air.

Date	Avg. time	Wave-length [nm]	Num data points	Median [ng]	10^{th} percentile [ng/m^3]	90^{th} percentile [ng/m^3]	Mean [ng/m^3]	Standard deviation [ng/m^3]	Error of the mean [ng/m^3]
2016-09-30	1 min	637	466	0.0	-37.5	26.5	-3.56	30.81	1.43

Comparison to reference MAAP
Correlation of eBC from MAAP (SN 42545/15) and the reference MAAP (SN 504).

Slope	1.170±0.006
R^2	0.978

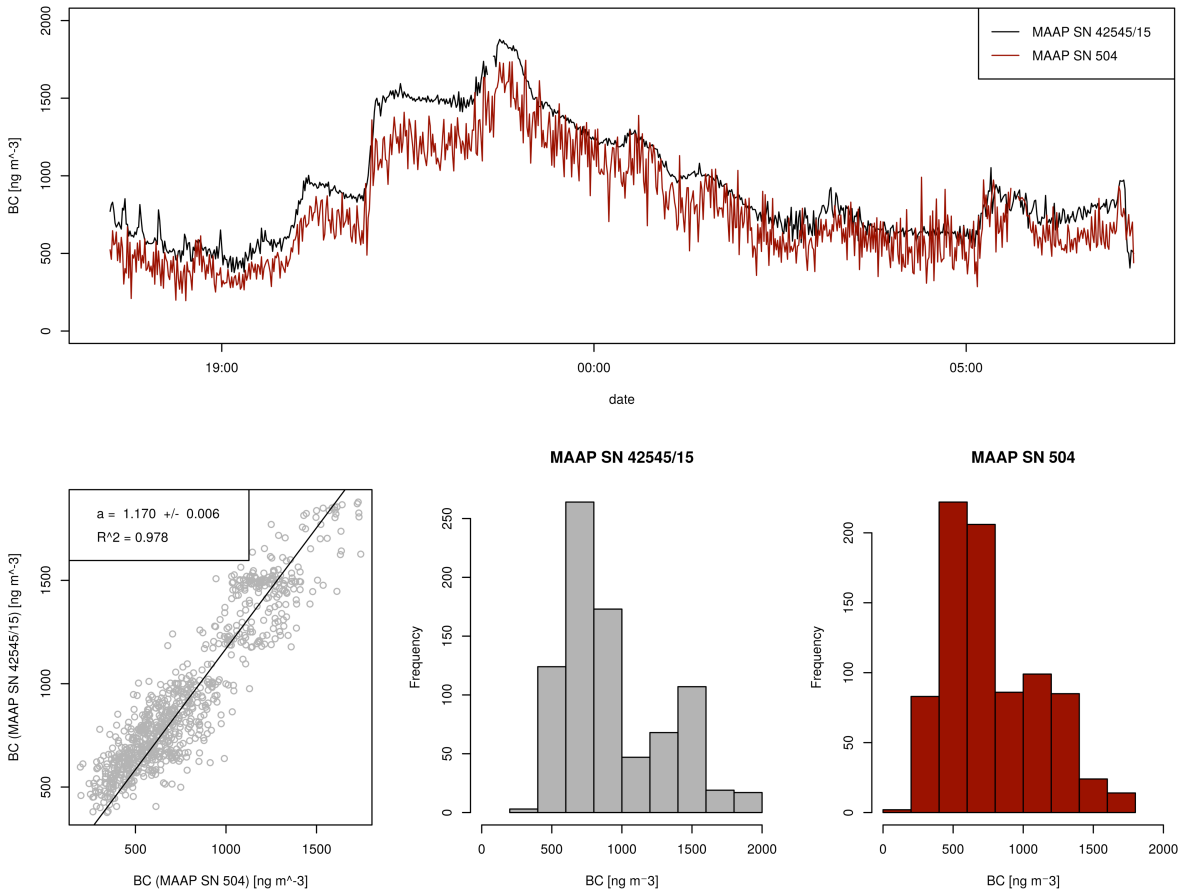


Figure: Comparison of eBC concentrations from MAAP SN 42545/15 and MAAP SN-504.

Comparison to multi-wavelenght absorption reference
Correlation of absorption coefficients from MAAP (SN 42545/15) and the multi-wavelenght absorption reference

Slope	1.316±0.012
R^2	0.943

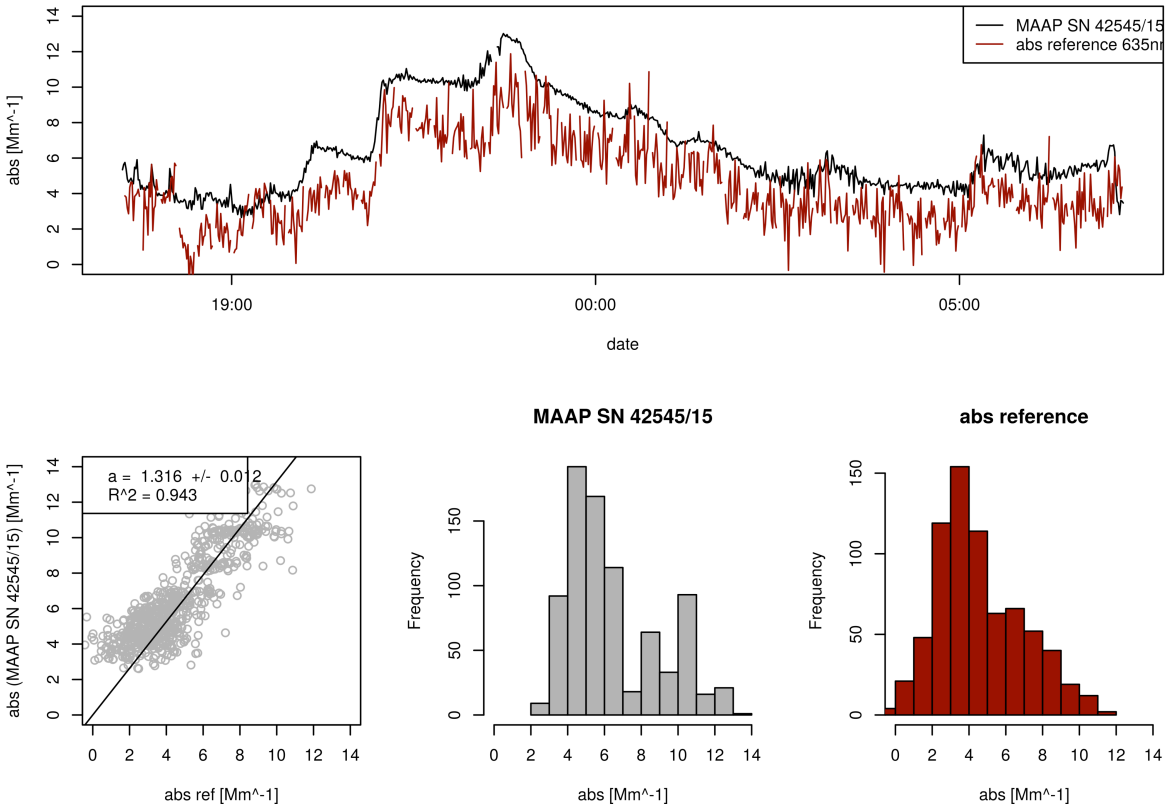


Figure: Comparison of absorption coefficients from MAAP SN 42545/15 and absorption reference.