



Leibniz Institute for
Tropospheric Research



World Calibration Centre
for Aerosol Physics

Intercomparison of Absorption photometer Project No.: AP-2017-4-1

Basic informations:

Location of the quality assurance: TROPOS, lab 121

Date: 10 November, 2017

Principal Investigator	Home Institution	Participant	Instrument
M. Gysel	PSI	-	MAAP, SN 030382

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 0.2% too high compared to reference flow meter (Giliblator). 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 as expected from the MAAP specification sheet. The average noise (1σ) was $30 \text{ ng} \cdot \text{m}^{-3}$ for 1 min averaging time.

Inspection: Measurement cell was contaminated with dust with a small fuzz at the cell wall.

Comparison to reference MAAP: BC concentrations are about 3% higher than BC concentrations from reference MAAP.

Comparison to reference absorption: The absorption coefficients derived from MAAP are 13.3% 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: No recommendations.

Overall assessment: The instrument meets the requirements.

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SIGMA BC:                6.6 m2/g
AIR FLOW:                 1000
STORE AVERAGES:           1 min

VOLUME REFERENCE          OPERATING CONDITIONS
STANDARD TEMPERATURE      0 _C

PRINTFORMAT:              12
PRINTFORMAT:              12
PRINTCYCLE:               1 min
BAUDRATE:                 Bd COM1  9600
BAUDRATE:                 Bd COM2  9600
DEVICE-ADDRESS:           0

  17    0.98584 -3.396   1.456   602   0.878
FILTER CHANGE
TRANSM. <                %    20.000
CYCLE                    h    100.000
HOUR:                    0.000

CALIBRATION OF SENS.
  P1,SP  P1,Z P2,SP  P2,Z  P3,Z  T1,Z  T2,Z  T3,Z  T4,Z
  50.000 35.000-34.000 65.000-89.000 310.000 307.000
AIR FLOW                91.5

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

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Flow check

¹Correction 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 ¹	STP correction factor ¹
	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}
2017-11-04	16.67	0	1013.25	18.21	23.7	1009.6	0.998	1

Spot size check

Correction factor for spot sizes F_{spot}.

Date	Nominal spot size [cm ²]	Measured spot size [cm ²]	F _{spot}
2017-11-04	2.00	Well defined spot, spot size not measured	1.0

Instrumental Noise

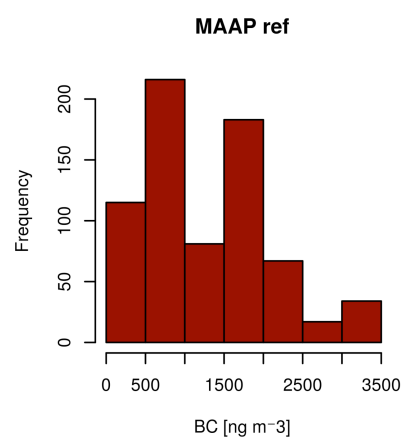
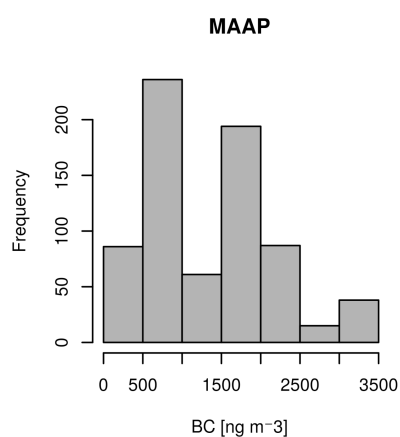
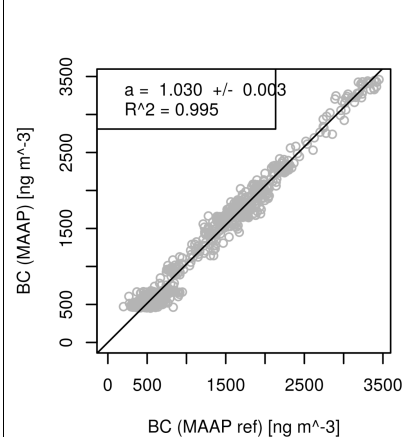
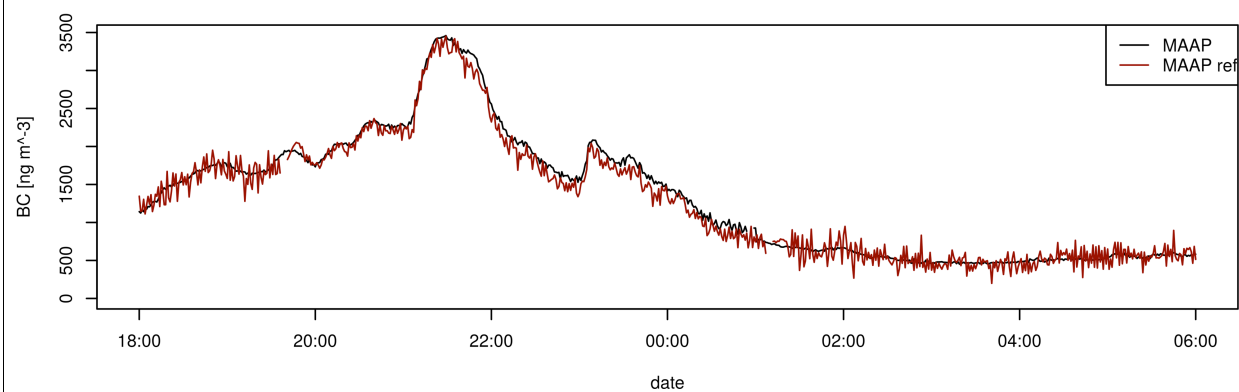
Noise in units of eBC concentration measured with filtered air.

Date	Avg. time	Wave-length [nm]	Num data points	Median [ng]	10 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]
2017-11-04	1 min	637	104	-8	-59	7	-19	30	3

Comparison to reference MAAP

Correlation of eBC from MAAP (SN 030382) and the reference MAAP (SN 504).

Slope	1.030
R^2	0.995



Comparison to multi-wavelength absorption reference

Correlation of absorption coefficients from MAAP (SN 030382) and the multi-wavelength absorption reference.

Slope	0.867
R^2	0.985

