

Intercomparison of Absorption Photometers Project No.: AP-2017-3-4

Location of the quality assurance: TROPOS, lab 121

Date: 24 September, 2017

Principal Investigator	Home Institution	Participant	Instrument
J.-P. Putaud	Joint Research Center (JRC)	-	MAAP, SN 2310

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 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 little higher than expected from the MAAP specification sheet. The average noise (1σ) was $26.8 \text{ ng}\cdot\text{m}^{-3}$ for 1 min averaging time.

Inspection: Measurement cell was clean. The black coating has peeled off in a small spot. The sample spots showed well defined, sharp edges.

Comparison to a reference MAAP: BC concentrations are about 9% lower than BC concentrations from reference MAAP.

Comparison to reference absorption: The absorption coefficients derived from MAAP are 12% 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: 480

STORE AVERAGES: 10 min

VOLUME REFERENCE STANDARD TEMPERATURE

STANDARD TEMPERATURE 25_C

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PRINTFORMAT:    COM1    8
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PRINTCYCLE: 30 min

BAUDRATE: Bd COM1 9600

BAUDRATE: Bd COM2 9600

DEVICE-ADDRESS: 0

FILTER CHANGE

TRANSM. < % 50

CYCLE h 0

HOUR: 0

CALIBRATION OF SENS.

T1	T2	T3	T4	P1	P2	P3
-17	28	-22	58	-36	-155	-104

AIR FLOW	98.5
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HEATER PARAMETERS

Diff. T2-T1 nominal 0_C

Max. Heating Temp. 45_C

Min. Heating Power	10 %
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ANALOG OUTPUTS

OUTPUT ZERO: 4mA

CBC	0	10
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MBC	0 2400
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GESYTEC-PROTOKOL

STATUS	VERSION	STANDARD

NUMBER OF VARIABLES 1

CBC

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			Flow correction factor ¹ Fehler! Textmarke nicht definiert.	STP correction factor ¹ 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	8	21.11	1013.25	8.183	20	990	0.997	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

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	287	-10.0	-40	20	-12.02	26.81	1.58

Comparison to reference MAAP

Correlation of eBC from MAAP (SN 2310) and the reference MAAP (SN 504).

Slope	0.907 ± 0.005
R^2	0.930

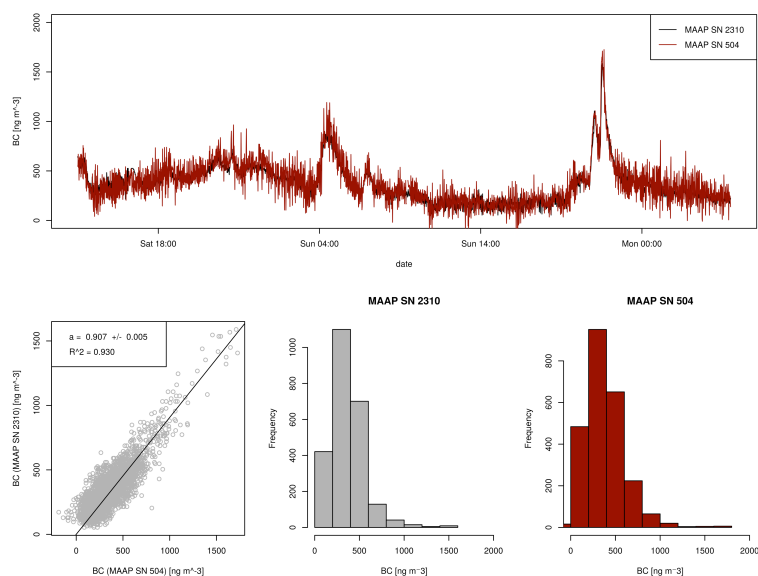


Figure: Comparison of eBC concentrations from MAAP SN 2310 and MAAP SN-504

Comparison to multi-wavelength absorption reference
 Correlation of absorption coefficients from MAAP (SN 2310) and the multi-wavelength absorption reference

Slope	0.888±0.007
R ²	0.881

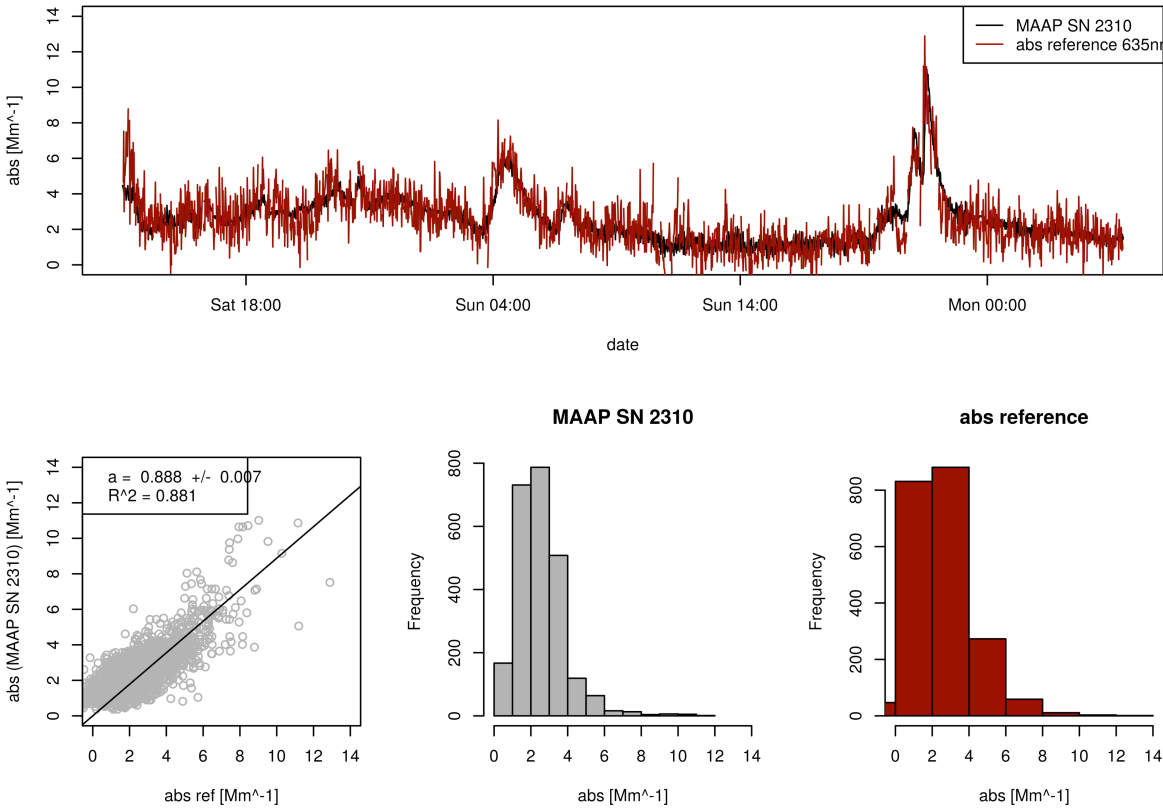


Figure: Comparison of absorption coefficients from MAAP SN 2310 and the multi-wavelength absorption reference