Leibniz Institute for Tropospheric Research

European Center for Aerosol Calibration

World Calibration Centre for Aerosol Physics

Intercomparison of Absorption photometer
Project No.: AP-2018-1-1

Basic informations:

Location of the quality assurance: TROPOS, lab 121

Date: 19 March 2018

Principal Investigator	Home Institution	Participant	Instrument
B. Bergmans	ISSeP	B. Bergmans	AE22 (**Fehler! Verweisquelle konnte nicht gefunden werden.**)

1 Intercomparison summary

Status on arrival: Instrument was not wrapped tight enough. An broken inlet connector was plugged in during transport.

Flow calibration: The flow meter of the instrument is set to report flow for conditions of 20°C and 1013 hPa. The flow was 1.2% 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 is in the normal range. The average noise (1σ) for the all wavelengths was less eqal 80 $ng \cdot m^{-3}$ for one minute averaging time. The background level was acceptable with deviations of less equal 49 $ng \cdot m^{-3}$ for all wavelengths.

Inspection: The instrument was almost clean. The measuring head was not removable properly, therefor not checked.

Comparison to reference MAAP: BC concentrations at 880 nm of AE22 are 33.1% lower than BC concentrations from a reference MAAP.

Comparison to reference AE33: BC concentrations at 880 nm of AE22 are 29.9% lower than BC concentrations from a reference AE33.

Recommendations: The deviations appear to be systematic. The instrument requires a thorough inspection.

Overall assessment: In general, the instrument does not meet the requirements.

2 Details

Configuration parameters

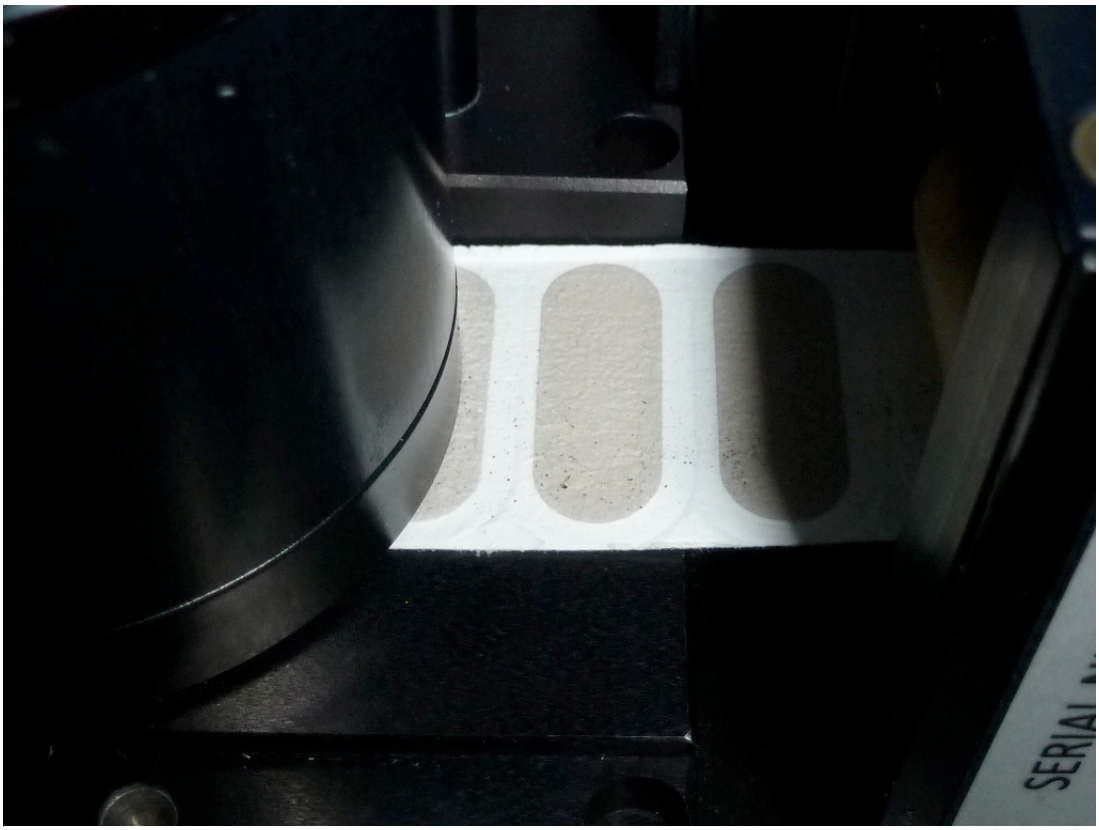
```
--- AE-SETUP.TXT ---
Created : 16.03.2018 10:02:01
.
Instrument serial number: 1111
Software version: AF985d7
Instrument type (0..U (1X), 1..UV+LED (2X), 2..7xLED (3X)): 1
Instrument Chassis : Stationary
Smoothing factor : 0
Selected Pump Flow : 4.0 LPM
Flow scale factor : 1.84 LPM/V
Flow zero : .026V
Date format (0=US, 1=EU): 1
Tape saver: 0
Spots per advance: 1
Filter change interval: 0
Maximum attenuation: 150
Over old data: 1
Warm up wait: 0
Spot size: Extended Range
MeanRatio:  .78
BC Unit (0..ng, 1..ug): 0
.
Serial comm. mode (1..OFF, 2..Dataline, 3..Gesytec): 2
Serial communication parameters:
   Speed(bps) : 9600
   Data bits  : 8
   Parity bits:N
   Stop bits  : 1
.
Gesytec parameters:
   Network Scale Factor: 10
   Instrument ID for Gesytec:333
.
Dataline parameters:
Alarm mode (0..Analog out, 1..Alarm): 0
Alarm ON/OFF : 1
Alarm value limit: 10
Alarm channel selection (channel number): 1
.
Data format (0..Extended, 1..Compressed): 0
Prepend SerNumber to dataline (0..No, 1..Yes): 0
.
UV channel OFF (0..UV ch. ON, 1..UV ch. OFF): 0
.
Sigma values:
   Sigma  1  : 16.6
   Sigma  2  : 39.5
   Sigma  3  : 0
   Sigma  4  : 0
   Sigma  5  : 0
   Sigma  6  : 0
   Sigma  7  : 0
Volumetric unit settings:
   Volumetric units (0..Standard,  1..Volumetric): 0
   Air Pressure(mbars): 1013
   Temperature(C): 20
```

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]	STP correction factor[1]
	Mass flow	Volume reference		Volume flow	Ambient T and p			
	Q_{AE22} [slpm]	$T_{0,AE22}$ [°C]	$p_{0,AE22}$ [hPa]	Q [lpm]	T [°C]	P [hPa]	F_{flow}	F_{STP}
2018-03-20	4.0	20.0	1013	4.023	20	995	1.012	1.072

Spot size check
Correction factor for spot sizes F_{spot}.

Date	Nominal spot size [cm^2]	Measured spot size [cm^2]	F_{spot}
2018-03-20	NA	Well defined spot, spot size not measured	1.0



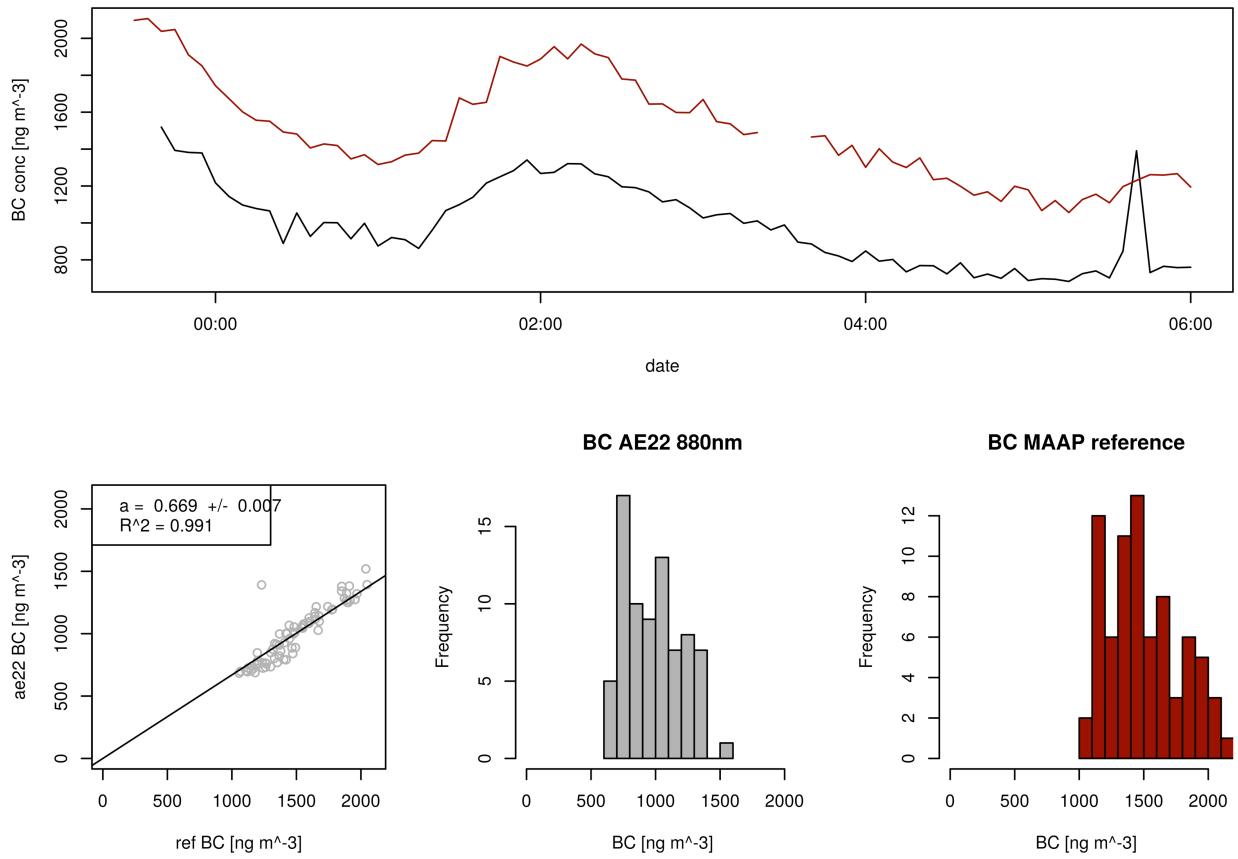
Instrumental Noise
Noise in units of eBC concentration measured with filtered air.

Date	Avg. time	Wave-length [nm]	Num data points	Median [ng]	10th percentile [ng/m^3]	90th percentile [ng/m^3]	Mean [ng/m^3]	Standard deviation [ng/m^3]	Error of the mean [ng/m^3]
2018-03-20	5 min	370	19	-44	-90	-35	-53	31	7
		880	19	-49	-216	-27	-83	80	18

Comparison to reference MAAP

Correlation of eBC from AE22 (**Fehler! Verweisquelle konnte nicht gefunden werden.**) and the reference MAAP (SN 504).

Slope	0.669±0.007
R^2	0.991



Comparison to reference AE33
Correlation of eBC coefficients from AE22 (**Fehler! Verweisquelle konnte nicht gefunden werden.**) and reference AE33.

wavelength	Slope	R^2
370	0.618±0.009	0.985
880	0.701±0.007	0.992