



Intercomparison of Integrating Nephelometers and Extinction monitors

Project No.: IN-2016-1-6

Basic Information:

Location of the quality assurance: TROPOS, lab 121

Delivery Date: 25 July, 2016

Principal Investigator	Home Institution	Participant	Instrument
András Hoffer	University of Pannonia	-	Nephelometer, TSI model 3563, SN 70543079

1. Intercomparison summary

Status on arrival: ok

Noise: The on minute instrumental noise tested using filtered ambient air was less than 0.26 and 0.19 Mm^{-1} for total- and backscattering, respectively. The noise level conforms to the expected noise.

Span check: Span check using CO₂ revealed good results for blue and green channels with deviations less than +2.5%. The red channel shows deviations of -6.7 and -4.5% for total- and backscattering, respectively.

Inspection: Temperature and pressure sensors are working well. An insect was found on the mirror of the light trap. Calibration and span check after cleaning suggest that data were not affected by insect.

Comparison to Reference instruments: Comparison to the reference nephelometer (Aurora 4000, SN 14-1408) shows that the instruments is 4% higher for total scattering at 550 nm. A comparison using ammonium sulphate gave similar results with total scattering at 550 nm 4% higher than the reference. Considering the calibration errors of 3% for both instruments and the low ambient concentration during the experiment the comparison was successful. Deviations in back scattering at 700 nm are up to 6%.

Other observation: None

Recommendations: None

Overall assessment: The instrument meets the requirements.

2. Details

Table: Instrument noise.						
The noise is determined by the standard deviation of a time series of 60 minutes with a temporal resolution of 1 minute. Test aerosol was filtered room air.						
	total scattering in Mm^{-1}			backscattering in Mm^{-1}		
Wavelength in nm	450	550	700	450	550	700
Zero check (average in Mm^{-1})	-0.09	0.05	0.10	-0.08	0.02	0.00
Noise (standard deviation)	0.26	0.15	0.18	0.19	0.12	0.16

Table: Span check. Percentage deviation to theoretical value.						
	total scattering			backscattering		
Wavelength [nm]	450	550	700	450	550	700
deviation [%]	2.3	0.2	-6.7	2.5	0.3	-4.5

Table: Comparison to Reference Nephelometer Aurora4000 (SN 14-1408) with ambient air						
(*)Scattering coefficients were extrapolated to wavelenghtes 525 and 635 nm using the Ångström equation.						
	total scattering			backscattering		
Wavelength in nm	450	550 (*)	700(*)	450	550 (*)	700(*)
slope	1.016	1.041	0.98	0.951	1.004	1.068
R ²	0.985	0.981	0.984	0.83	0.815	0.844

Table: Comparison to Reference Nephelometer Aurora4000 (SN 14-1408) with ammonium sulphate

(*)Scattering coefficients were extrapolated to wavelengthes 525 and 635 nm using the Ångström equation.
 (+) Outlier can not be explained. This values is not consistent with span checks and ambient air measurements.

	total scattering			backscattering		
Wavelength in nm	450	550 (*)	700(*)	450	550 (*)	700(*)
slope	1.038	1.043	0.875(+)	0.959	0.950	0.985
R ²	0.998	0.997	0.996	0.973	0.957	0.958