Intercomparison of Integrating Nephelometers

Project No.: IN-2017-5-3

Basic informations:

Location of the quality assurance: TROPOS, lab 121

Date: 10 November, 2017

Principal Investigator	Home Institution	Participant	Instrument
G. Mocnik	Aerosol d.o.o.	A. Gregoric	Nephelometer, Ecotech Aurora 4000, SN 170080

1 Intercomparison summary

Status on arrival: No issues due to transportation or other damages.

Noise: The one minute instrumental noise (single standard deviation) for total scattering was in the range of 0.60 for 450 nm backscatter to and 0.94 for 700 nm total scatter. The number of angles was 18. Considering the high number of angles, the noise is very good.

Span check: The span check before instrument inspection show deviation for total scattering in the range of -5.5% for the blue channel to -0.8% for the red channel. The deviation for the backscattering are slightly higher in the range of -3.8% for the blue and 2.1 % for the red channel.

Comparison to a reference instrument:

Before inspection: Comparison to the reference nephelometer (Aurora 4000, SN 14-1408) showed a deviation with values less than 2% for the total scattering. The deviation for the backscattering is higher with values up to 8.1% for the red channel.

After inspection and calibration: The deviations for total scattering was stable with values less than 2% and a slight improvement for the backscattering with values less than 6.2%.

All deviations are in the acceptable range.

Inspection: The instrument was in clean and in a good condition.

Recommendations: No recommendations.

Overall assessment: The instrument meets the requirements.

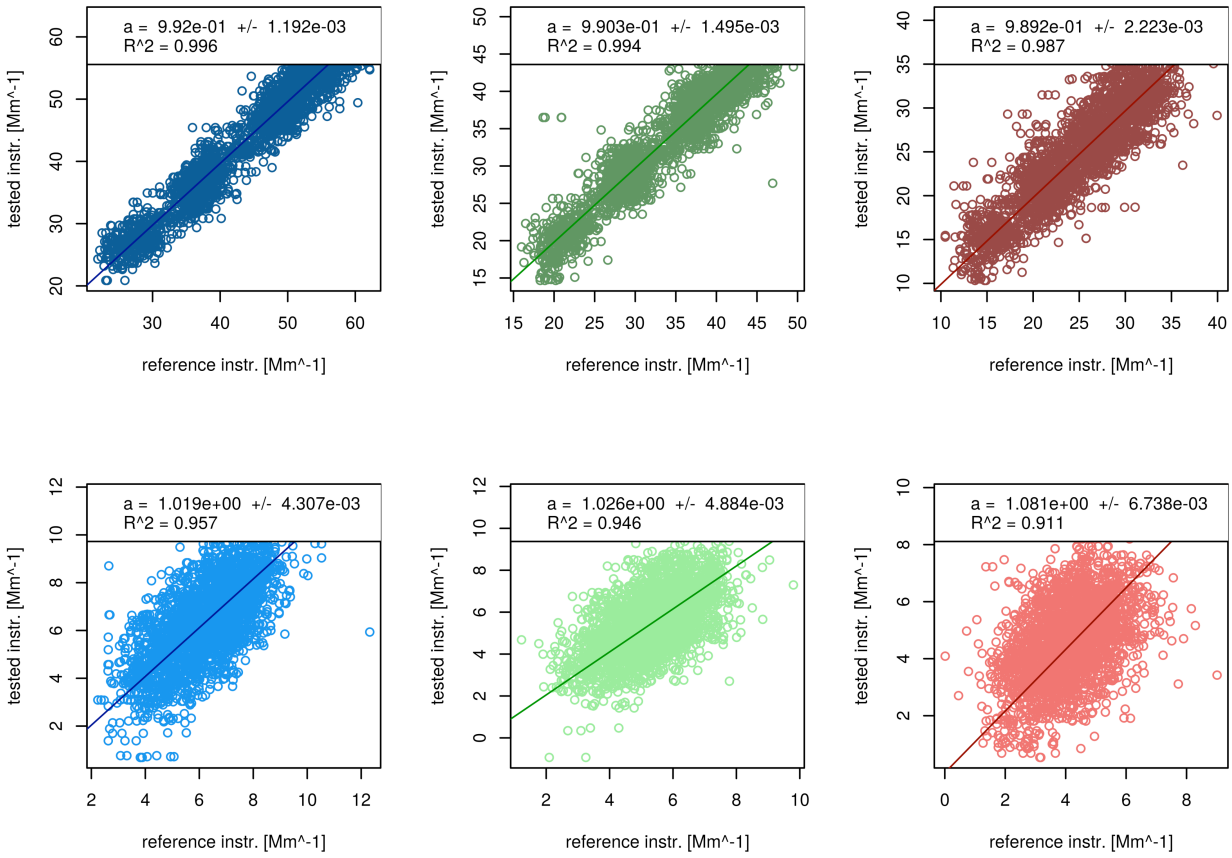
2 Details

Instrument noise The noise is determined by the standard deviation of a time series of 60 minutes with a temporal resolution of 1 minute. Number of angles was 18. Test aerosol was filtered room air.						
	total scattering in Mm^{-1}			backscattering in Mm^{-1}		
Wavelength [nm]	450	525	635	450	525	635
Zero check (median in Mm^{-1})	-0.87	-0.29	-0.08	-0.05	0.12	-0.20
Zero check (average in Mm^{-1})	-0.82	-0.32	-0.17	0.08	0.16	0.02
Noise (standard deviation)	0.78	0.72	0.94	0.60	0.65	0.73

Span check Percentage deviation to theoretical value. A positive number means that the instrument measure too high values.						
	total scattering			backscattering		
Wavelength [nm]	450	525	635	450	525	635
before recalibration (as instrument arrived) deviation [%]	-5.5	-4.5	-0.8	-3.8	-2.1	2.1

Comparison to reference instrument before inspection
Reference nephelometer: Aurora4000 (SN 14-1408)
Test aerosol: ambient air
Measurements were done before inspection and recalibration.
(*) See span check results. Scattering coefficients were interpolated to the wavelengths of the reference nephelometer.

	total scattering			backscattering		
Wavelength [nm]	450	525	635	450	525	635
slope	0.992	0.990	0.989	1.019	1.026	1.081
R^2	0.996	0.994	0.987	0.957	0.946	0.991



Comparison to reference instrument before inspection
Reference nephelometer: Aurora4000 (SN 14-1408)
Test aerosol: ammonium sulfate
Measurements were done after inspection and recalibration.
(*) See span check results. Scattering coefficients were interpolated to the wavelengths of the reference nephelometer.

	total scattering			backscattering		
Wavelength [nm]	450	525	635	450	525	635
slope	0.991	0.992	0.983	0.944	0.962	0.938
R^2	0.999	0.998	0.993	0.990	0.985	0.964