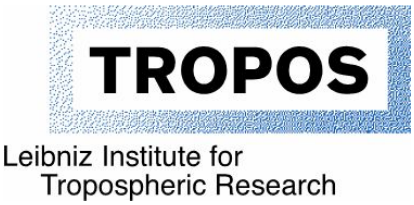
ACTRIS-2 ECAC Workshop 23-28 November, 2015



Intercomparison of Integrating Nephelometers and Extinction monitors
Project No.: IN-2015-1-4

Basic Information:

Location of the quality assurance: TROPOS, lab 121

Date: 26 July, 2016

Principal Investigator	Home Institution	Participant	Instrument
Marco Pandolfi	IDAEA-CSIC	Marina Ealo	Ecotech Aurora3000, S/N 12-0932

1. Intercomparison summary

Status on arrival: The instrument did not start in the normal operating mode. The instruments reports 'backscatter shutter driver error'. Inspection of the cell showed that the cell was clean and no obvious damages to the shutter were found. After a couple of restarts the instrument error disappeared.

Noise: The noise for one minute averages is below 1.3 Mm^{-1}. For the green channel the noise is smaller than 1.0 Mm^{-1}. The noise is in the accepted range.

Span check: An initial span check failed! After recalibration the span check results shows deviations of less then 2%.

Inspection: The cell was clean. Temperature, pressure and humidity sensors are ok.

Comparison to other Nephelometer: Comparison to other instruments was made as the instruments arrived using ammonium sulphate. Scattering coefficients for

total scattering in the blue and green were higher by up to 15% compared to an average of four TSI model 3563 Nephelometers. Compare to a reference Nephelometer Aurora 4000, S/N 14-1408) the values are higher by 11%. For backscattering the values are lower by 10% and 17% compared to the TSI 3563 Nephelometers and the Aurora 4000, respectively. The values are out of the acceptable range.
After recalibration the instrument agreed to the reference Aurora4000 between 1% and 8% for total scattering. Data for backscattering are differ by up to 35%.

Other observation: None

Recommendations: Problems with shutter need to be solved.

Overall assessment: The instrument does not meet the requirements.

2. Details

Table: Noise checks for 50 minutes duration.
The noise is determined by the standard deviation of a time series of 30 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	525	635	450	525	635
Zero check (average in Mm^{-1})	1.94	-0.92	-1.59	-1.72	-2.41	-0.95
Noise (standard deviation)	1.23	0.52	1.06	1.07	0.434	0.75

Table: Span check, deviation to theoretical value after recalibration

	total scattering			backscattering		
Wavelength in nm	450	525	635	450	525	635
Deviation [%]	-1.6	-1.9	-1.5	-0.8	-1.5	-1.4

Table: Comparison to an average four TSI nephelometers model 3563 as instruments arrived. Scattering coefficients were corrected for truncation. Values for the TSI Nephelometer were adjusted using the Angström equation to match the wavelengths of the Aurora 3000.						
	total scattering			backscattering		
Wavelength in nm	450	525	635	450	525	635
slope	1.154	1.117	0.993	0.931	0.933	0.908
intercept	-1.529	-1.613	1.83	0.729	2.419	1.386
R^2	0.971	0.997	0.992	0.99	0.98	0.95

Table: Comparison to the reference Nephelometer (Aurora4000, S/N 14-1408).						
	total scattering			backscattering		
Wavelength in nm	450	525	635	450	525	635
Deviation [%]	0.5	3.6	7.8	35	15	8.8
R^2	-	-	-	-	-	-