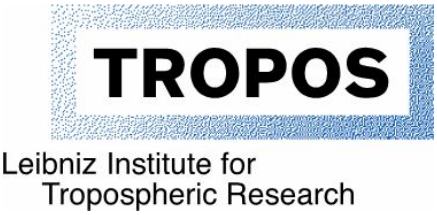
ACTRIS-2 ECAC Workshop 6-10 June, 2016



Intercomparison of Integrating Nephelometers and Extinction monitors
Project No.: IN-2016-1-7

Basic Information:

Location of the quality assurance: TROPOS, lab 121

Delivery Date: 25 July, 2016

Principal Investigator	Home Institution	Participant	Instrument
Konstantinos Eleftheridadis	National Centre of Scientific Research "Demokritos"	Prodromos Fetfatzis	Nephelometer, Aurora3000, SN 07-1774

1. Intercomparison summary

Status on arrival: Instrument was cleaned before shipping. Therefore, it is not possible to give any statement on status of instrument prior to workshop.

Noise: The on minute instrumental noise tested using filtered ambient air was less than 0.41 and 0.47 Mm^{-1} for total- and backscattering, respectively. The noise level conforms to the expected noise.

Span check: An initial span check was not meaningful since the instrument arrived uncalibrated. A series of calibrations and span checks during the workshop showed large deviations. This means, the values of the CO2 span check are very uncertain (see table on span check results). The problem could not be solved during the workshop.

Inspection: the instrument passed the leak check. Instrument was cleaned before workshop.

Comparison to a reference instrument: Comparison to the reference nephelometer (Aurora 4000, SN 14-1408) shows that the instrument can deviate in the backscattering channel at 525 nm from the reference instrument. The deviations are also seen in the variability of the span check results. For ambient air and ammonium sulphate inter comparison measurements the deviations are up to 49 and 22%, respectively. Deviations in the other channels are acceptable.

Other observation: Because of a broken power supply the calibration data were lost during the workshop. Workshop was continued with spare power supply.

Recommendations: Do frequently span checks with special care on the backscattering channel at 525 nm. Do additional span check after calibration.

Overall assessment: The instrument partly meets the requirements. The green channel in backscattering can show large variations.

2. Details

Table: Instrument noise.
The noise is determined by the standard deviation of a time series of 110 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})	-0.74	-0.8	-1.1	-0.75	0.52	0.25
Noise (standard deviation)	0.41	0.41	0.37	0.47	0.28	0.31

Table: Span check. Percentage deviation to theoretical value.
Results after three calibrations and a subsequent span check.

	total scattering			backscattering		
Wavelength [nm]	450	550	700	450	550	700
deviation [%]	3.7	1.3	4.2	3.1	19.4	1.4

Table: Comparison to Reference Nephelometer Aurora4000 (SN 14-1408) with ambient air

(+)See span check results.

(*)Results suffer from low scattering ambient scattering.

	total scattering			backscattering		
Wavelength in nm	450	550	700	450	550	700
slope	0.986	1.025	0.934	1.035(*)	1.493(+),(*)	1.022(*)
R^2	0.974	0.948	0.932	0.675	0.6	0.456

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

(+) See span check results.

	total scattering			backscattering		
Wavelength in nm	450	550	700	450	550	700
slope	1.017	1.043	0.955	0.989	1.227(+)	0.941
R^2	0.994	0.994	0.993	0.994	0.995	0.989