



Intercomparison of optical particle size spectrometers

Project: APS-2023-1-1

Location of the quality assurance: TROPOS, Lab 121

Date: 2023-01-16 – 2023-01-21

Principal Investigator	Institution	Participant	Type	Instrument SN
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Intercomparison summary

Status on arrival

No issues due to transportation or other damages.

Flowcheck

The volume flow was checked with a Gilian Gilibrator 3. The measured aerosol flow was acceptable with a deviation of 2.6% compared to the nominal flow of the instrument. The measured sheath flow was acceptable with a deviation of -2.2% compared to the nominal flow of the instrument.

Zerocheck

The zerocheck was acceptable with 0 counts using a period of 1 hours.

Sizing

The mean relative deviation in sizing was acceptable with 7.9%. The extreme values were unacceptable with values in the range of 2 to 16.1%.

Counting efficiency

The mean relative deviation for concentration or counting efficiency was acceptable with -11.6%. The extreme values were acceptable with values in the range of -26.6% to 19.4%.

Dust sample

The deviation of the concentration for a polydisperse dust sample were acceptable with values in the submicron range of 7.6% or supermicron range of -4.3%.

Recommendations

No recommendations.

Overall assessment

Within the scope of the expected performance of this device class, the instrument meets the requirements.

Details

Flowcheck

Table 2: Measured aerosol and sheath flow and the resulting deviation from the nominal values using Gilian 3 as reference.

aerosol (l/min)	err (%)	sheath (l/min)	err (%)
1.026	2.6	3.91	-2.2

Zerocheck

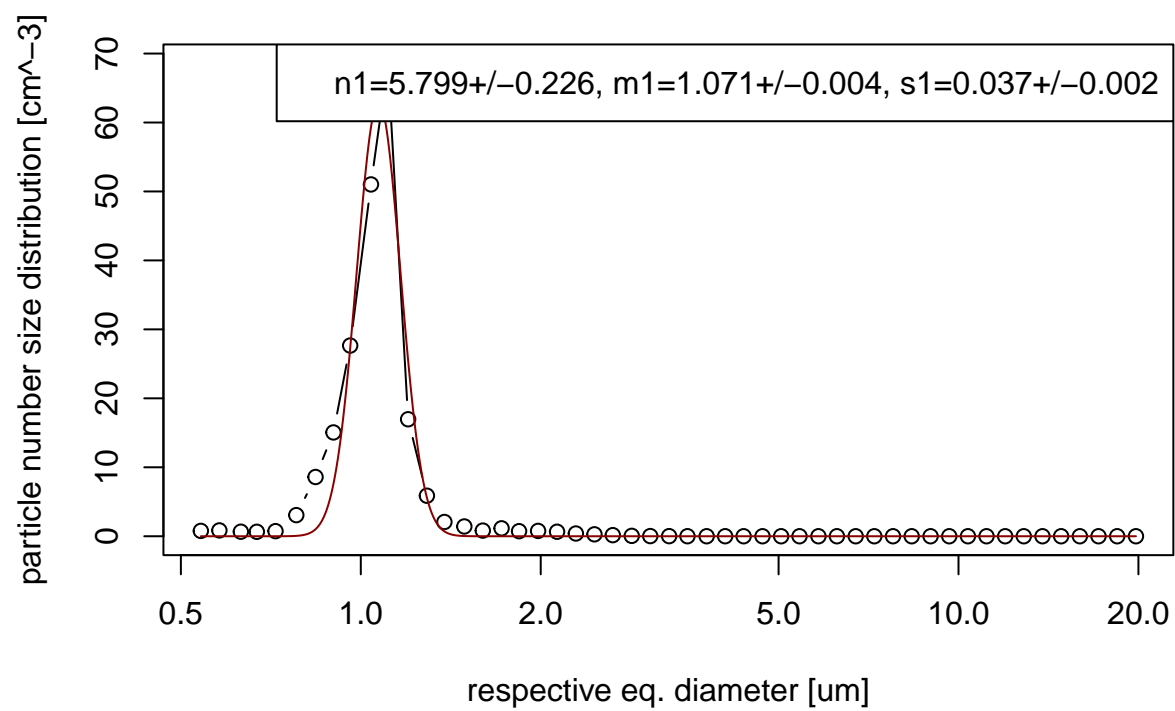
Table 3: Total counts and corresponding mean concentration during a zero period.

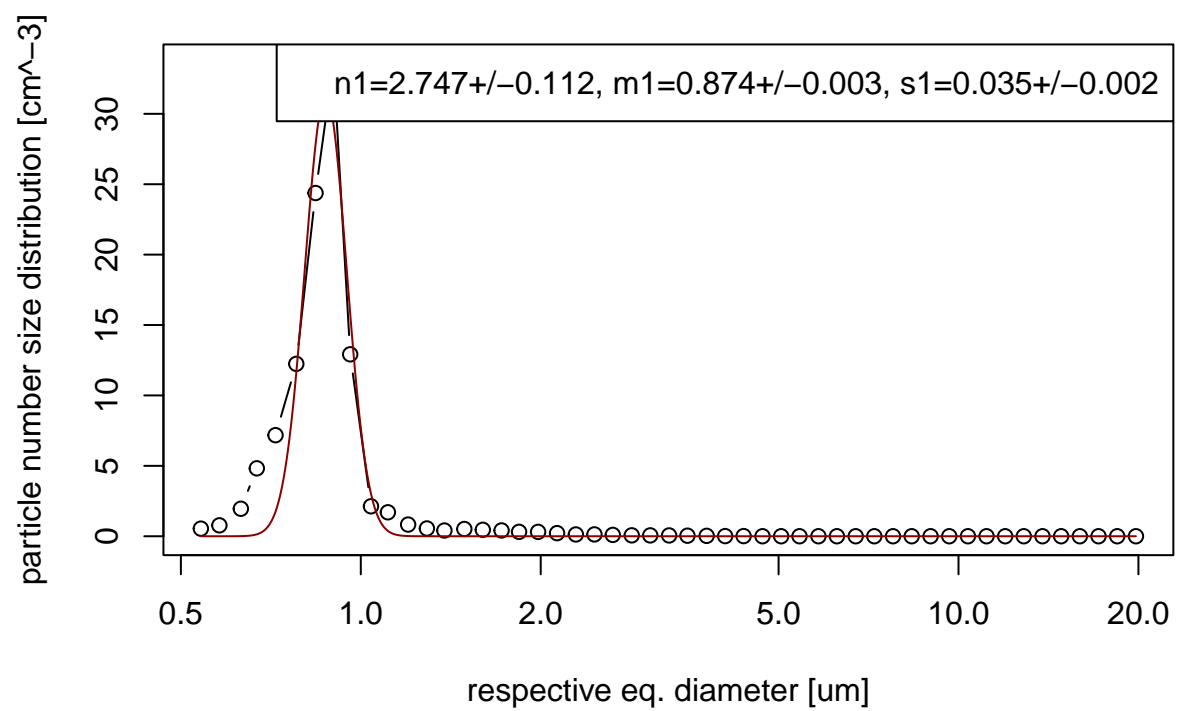
duration (h)	Total counts ()	Mean conc (1/cm ³)
1	0	0

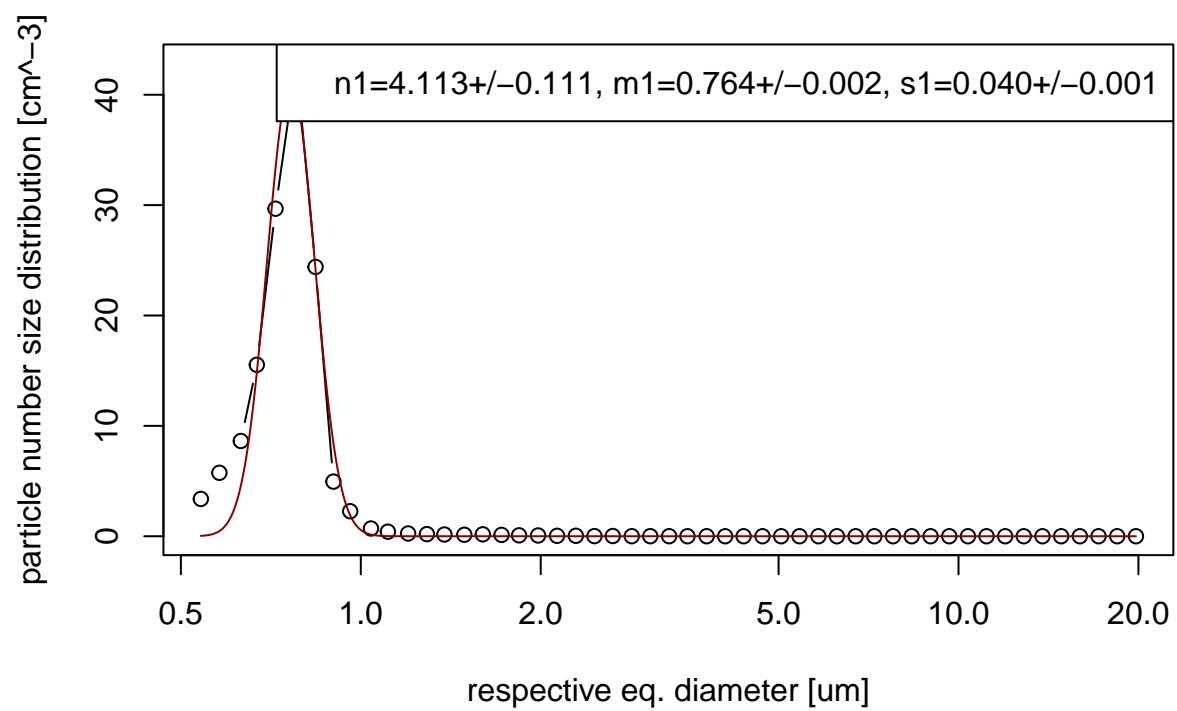
PSL samples

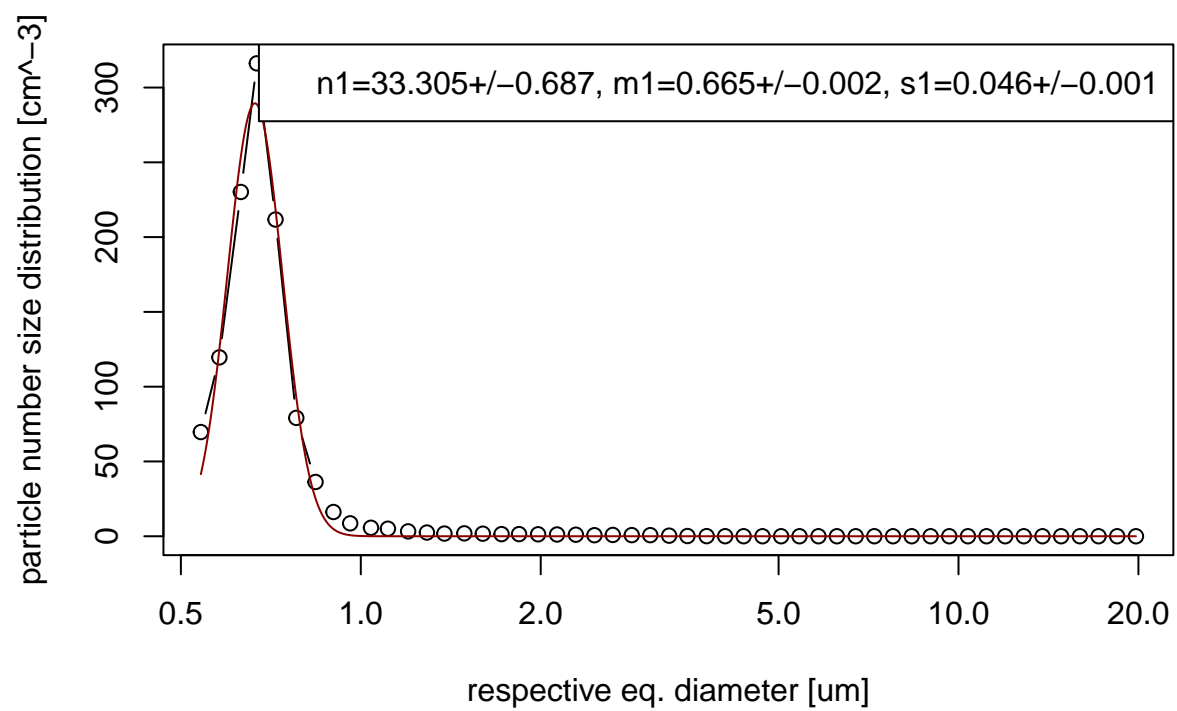
Table 4: Resulting mean diameter and concentration from mode fitting using PSL in comparison with the nominal PSL size and concentration from reference OPSS.

nom. diam (μm)	ref. conc (1/cm ³)	mean diam (μm)	conc (1/cm ³)	err. sizing (%)	err. conc. (%)
0.6	39.045	0.665	33.305	8.2	-14.7
0.7	5.061	0.764	4.113	6.5	-18.7
0.8	3.334	0.874	2.747	6.6	-17.6
0.9	7.902	1.071	5.799	16.1	-26.6
5.0	0.306	5.227	0.366	2.0	19.4









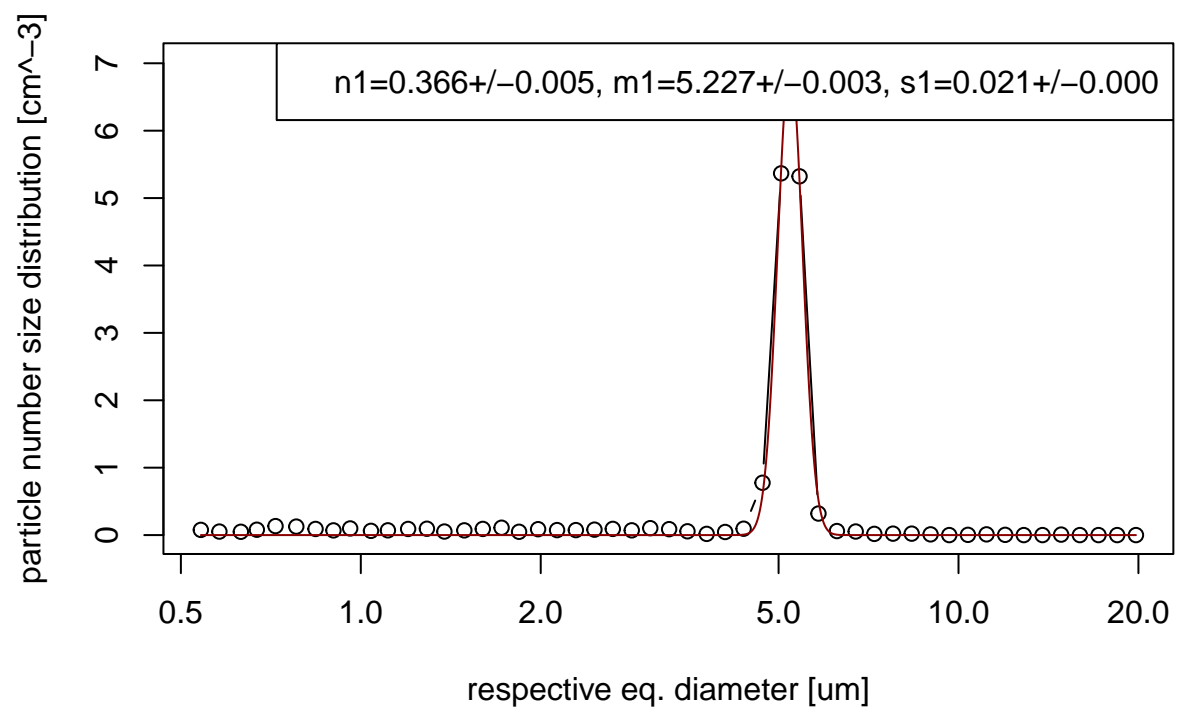


Figure 1: Particle number size distribution for the respective monodisperse PSL sample and the resulting fitted mode.

Dust samples

Table 5: Resulting concentration for the overlapping size range for particles $<1\mu\text{m}$ and $>1\mu\text{m}$ in comparisson to the reference APS.

range	ref. conc ($1/\text{cm}^3$)	conc ($1/\text{cm}^3$)	err. conc. (%)
submicron	0.242	0.260	0.076
micron	3.163	3.027	-0.043

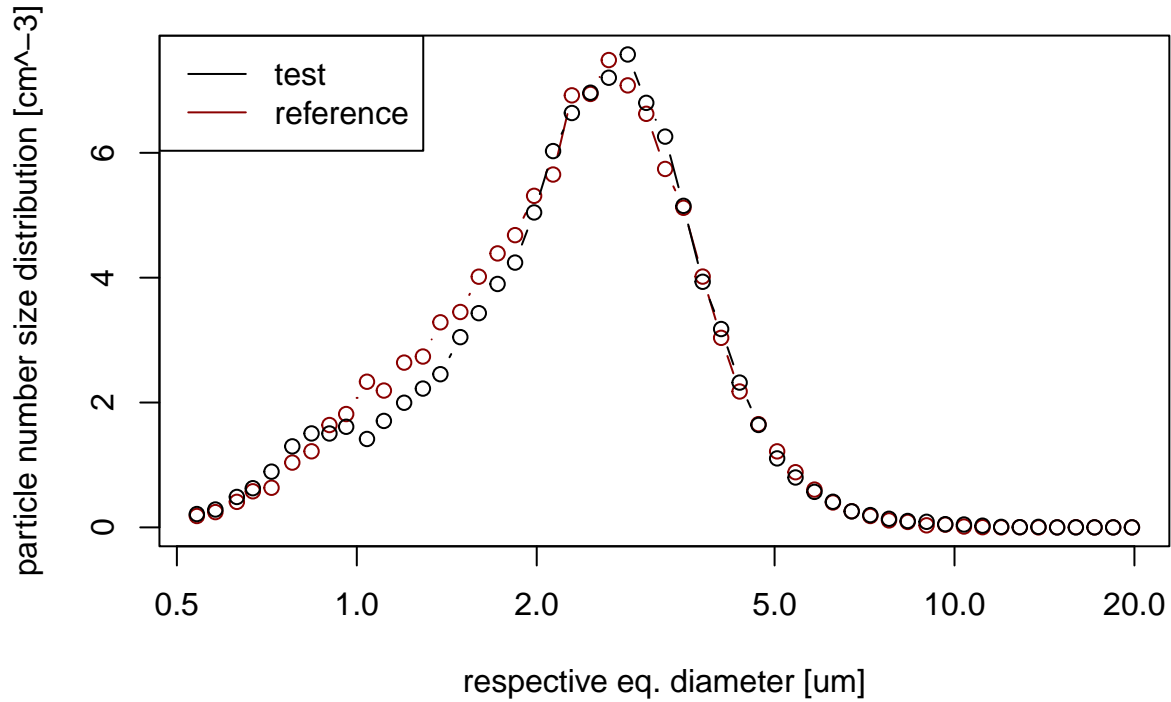


Figure 2: Particle number size distribution of the test instrument and the reference device for a mineral dust sample.