

Intercomparison of Mobility Particle Size Spectrometers

Project No.: MPSS-2018-1-2

Principal Investigator: Maik Merkel

Home Institution: TROPOS
Permoserstraße 15
04318 Leipzig

Participant: Maik Merkel

Candidate: **DE-TROPOS Datenerfassung**
Made by: **TROPOS**
Counter (SN): TSI CPC Model 3760A, SN: 016
Software: LabView version 6.66

Location of the quality assurance: TROPOS Leipzig, lab 118

Comparison period: Jan 17, 2018 – Jan 22, 2018

Last Intercomparison (with Project No.):

Summary of Intercomparison:

Final-Status:

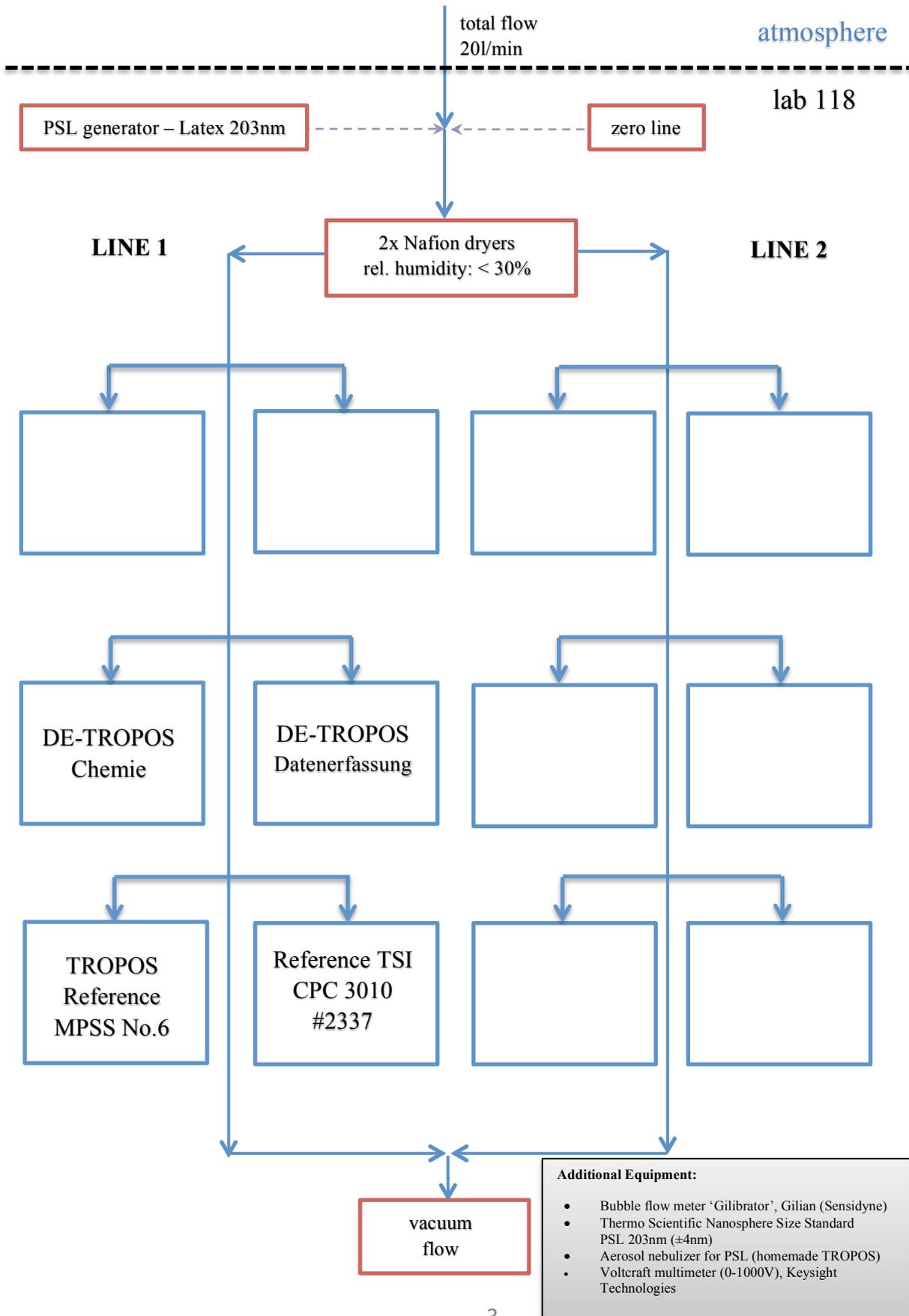
During the Final-Status, the performance of the system showed a concentration 7% lower than the TROPOS Reference Instrument No.6. The candidate used the calibrated TSI CPC model 3760A and their own Kr.85 source. The candidate passed the quality standards of ACTRIS and GAW.

Information about the instruments:

Date of check: Jan 19, 2018

List of Components	TROPOS Reference MPSS No.6	TROPOS Reference MPSS No.	Candidate
<i>Position</i>	Line 1	-	Line 1
<i>Company</i>	TROPOS	-	TROPOS
<i>Software</i>	TROPOS	-	TROPOS V6.66
<i>CPC-MPSS</i>	TSI CPC, Model 3772	-	TSI CPC, Model 3760A
<i>CPC-total</i>	TSI CPC, Model 3010	-	-
<i>flow ratio</i>	1.0 : 5.0	-	1.0 : 5.0
<i>source</i>	Ni63	-	Kr85
<i>HV power supply</i>	Positive	-	positive
<i>DMA</i>	Hauke medium	-	Hauke medium
<i>aerosol dryer</i>	✓	-	✓
<i>aerosol RH- sensor</i>	✓	-	✓
<i>aerosol T-sensor</i>	✓	-	✓
<i>sheath RH-sensor</i>	✓	-	✓
<i>sheath T-sensor</i>	✓	-	✓
<i>Sheath dryer</i>	✓	-	✓
<i>pressure sensor</i>	✓	-	✓
<i>info</i>			

Laboratory setup:



Status of the instruments:

Date of check (Pre-Status):

<i>CPC status</i>	MPSS		Total CPC	
<i>power/status</i>	-	-	-	-
<i>saturator temp</i>	-	°C	-	°C
<i>condenser temp</i>	-	°C	-	°C
<i>optics temp</i>	-	°C	-	°C
<i>cabinet temp</i>	-	°C	-	°C
<i>ambient pressure</i>	-	kPa	-	kPa
<i>orifice pressure</i>	-	kPa	-	kPa
<i>nozzle pressure</i>	-	kPa	-	kPa
<i>laser current</i>	-	mA	-	mA
<i>liquid level</i>	-	-	-	-

Date of check (Final-Status):

<i>CPC status</i>	MPSS Reference 6		Total CPC	
<i>power/status</i>	green	-	-	-
<i>saturator temp</i>	39.0	°C	-	°C
<i>condenser temp</i>	22.0	°C	-	°C
<i>optics temp</i>	40.1	°C	-	°C
<i>cabinet temp</i>	29.8	°C	-	°C
<i>ambient pressure</i>	99.0	kPa	-	kPa
<i>orifice pressure</i>	78.2	kPa	-	kPa
<i>nozzle pressure</i>	2.7	kPa	-	kPa
<i>laser current</i>	51	mA	-	mA
<i>liquid level</i>	fill	-	-	-

Date of system checks:

<i>date</i>	19.01.2018 Reference 6	19.01.2018 Datenerfassung			unit
<i>total CPC flow</i>	1.015	-			l/min
<i>aerosol flow (DMA)</i>	-	-			l/min
<i>aerosol flow (UDMA)</i>	-	-			l/min
<i>aerosol flow (total)</i>	1.025	0.995			l/min
<i>Zero MPSS</i>	0	0			#/cm ³
<i>Zero total CPC</i>	0	-			#/cm ³
<i>PSL 203 nm</i>	201.41	201.31			nm
<i>HV – 0 V</i>	0.0	0.0			V
<i>HV – 5 V</i>	5.0	5.1			V
<i>HV – 100 V</i>	99.3	99.5			V
<i>HV – 1000 V</i>	1000.0	999.1			V

Special Information regarding the Candidate:

<i>Was it necessary to:</i>	yes/no (date)	old part (ID/SN)	new part (ID/SN)	information
<i>clean the aerosol inlet</i>	no			
<i>change aerosol Nafion dryer</i>	no	-	-	-
<i>change sheath Nafion dryer</i>	no	-	ND 0.7- 150d ND 0.7 – 246d ND 0.7 – 247d	-
<i>check source</i>	no	-	-	-
<i>change HV power supply</i>	no	-	-	-
<i>clean/change DMA</i>	no	-	-	-
<i>change aerosol RH/T- sensor</i>	no	-	-	-
<i>change sheath RH/T- sensor</i>	no	-	-	-
<i>change pressure sensor</i>	no	-	-	-
<i>change inlet Nafion dryer</i>	no	-	-	-
<i>Total filter</i>	no	-	-	-

PSL Scan and calibration: Latex 203 nm +/- 4 nm

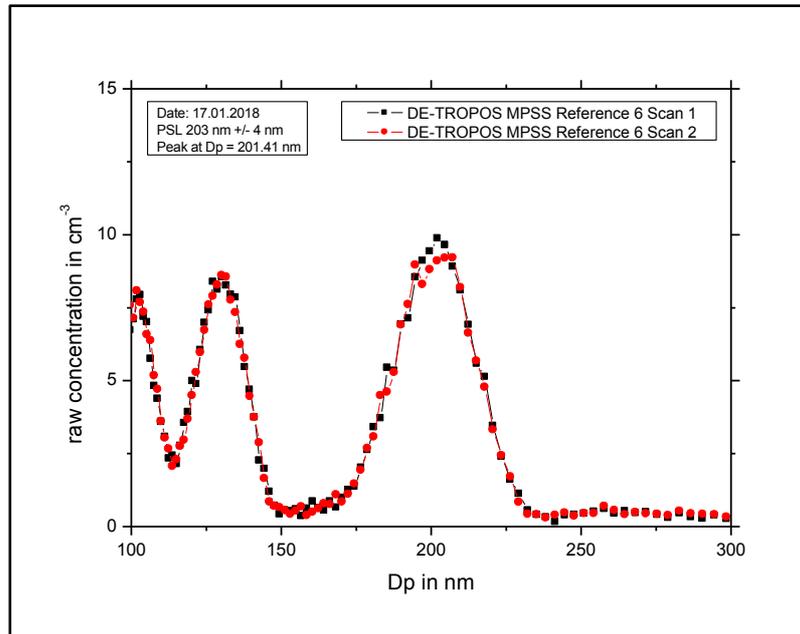


Figure 01: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Jan 17th, 2018 for the MPSS Reference 6 instrument.

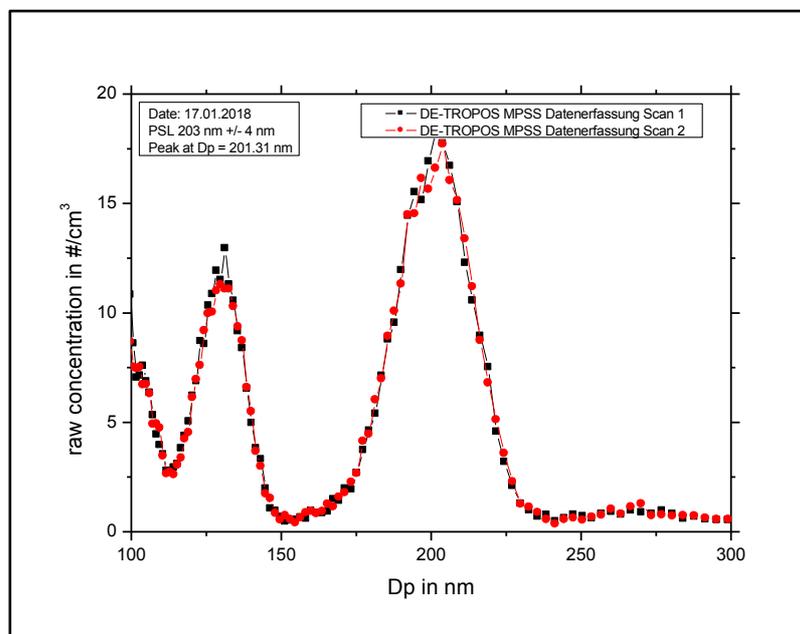


Figure 02: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Jan 17th, 2018 for the MPSS Datenerfassung.

Final Status of the Candidate: Particle Number Size Distribution

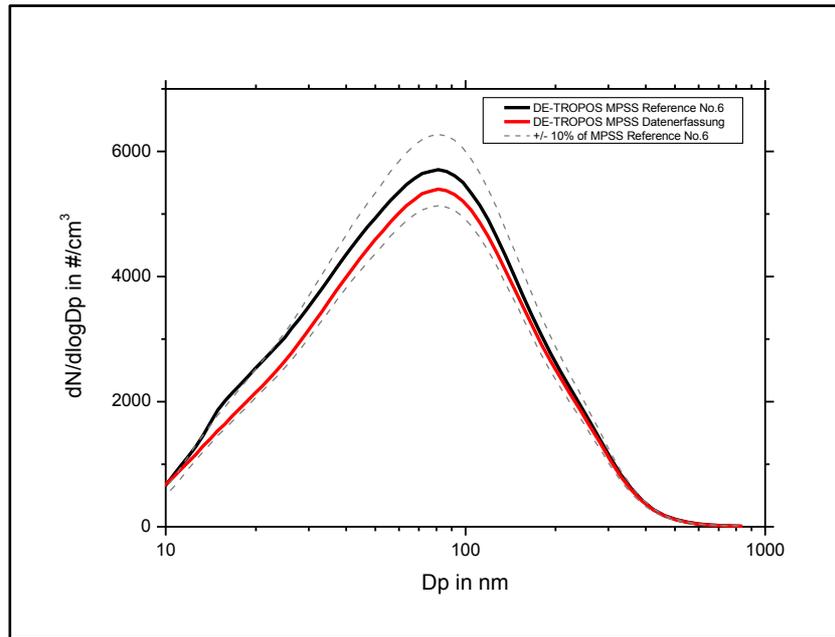


Figure 03: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against DE-TROPOS MPSS Datenerfassung from Jan 20, 2018 12:00 AM – Jan 22, 2018 12:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Final Status of the Candidate: Time Series

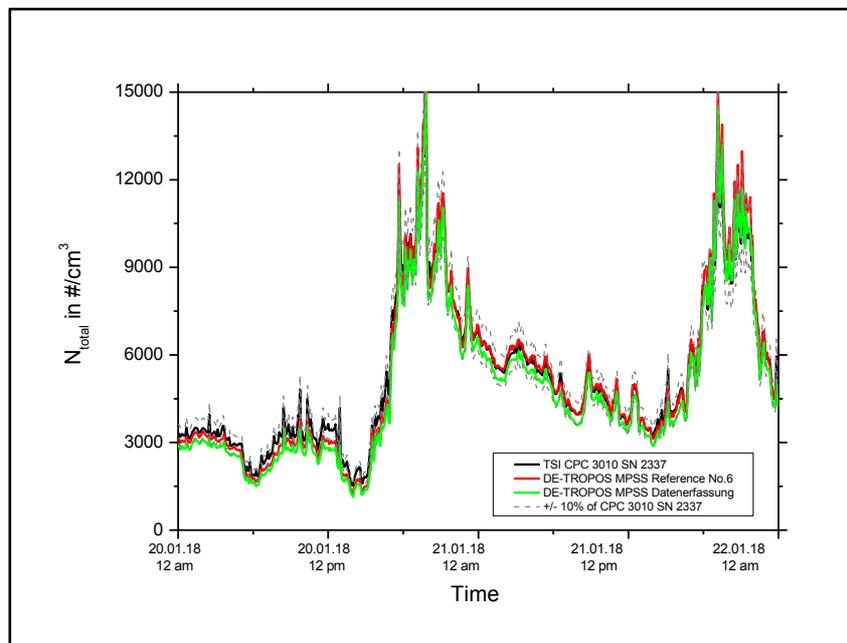


Figure 04: Time series (Jan 20, 2018 12:00 AM – Jan 22, 2018 12:00 AM) of the integrated particle number concentration ($N_{10-800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Final Status of the Candidate: Correlation

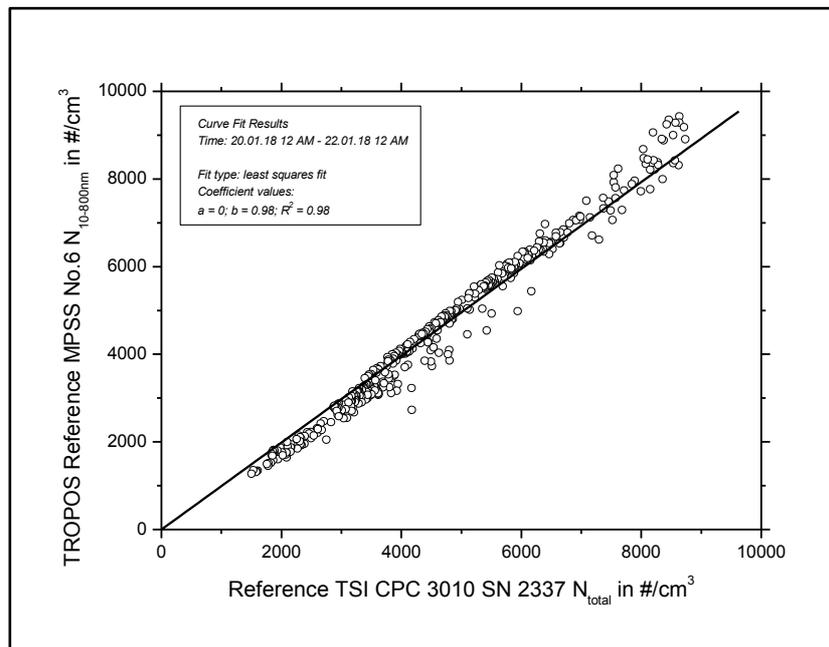


Figure 05: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 SN: 2337 and TROPOS Reference MPSS No.6. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

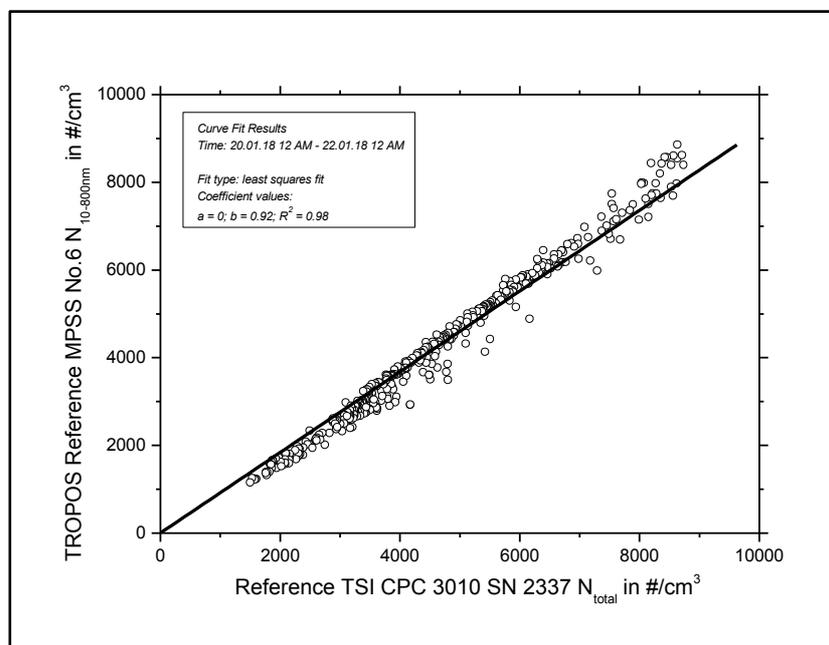


Figure 06: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 SN: 2337 and DE-TROPOS MPSS Datenerfassung. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

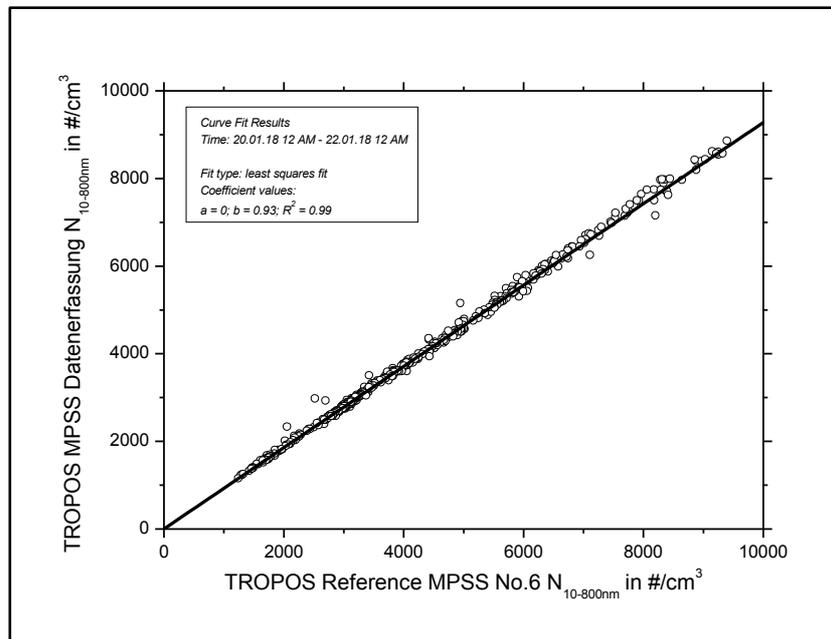


Figure 07: Linear regression between the number concentrations of the TROPOS Reference MPSS No.6 and DE-TROPOS Datenerfassung. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.