

## Intercomparison of Mobility Particle Size Spectrometers

*Project No.:* OSIA-2017-2-2

*Principal Investigator:* UBA

*Home Institution:* UBA

*Participant:* Olaf Bath

*Candidate:* **DE-UBA-Neuglobsow**

*Made by:* TROPOS

*Counter (SN):* TSI CPC Model 3772, SN: 70944032

*Software:* TROPOS 6.68

*Total CPC:* TSI CPC Model 3772-CEN, SN: 3772164502

*Location of the quality assurance:* Station Neuglobsow

*Comparison period:* September 28, 2017 – October 04, 2017

*Last Intercomparison (with Project No.):* October 2016

### Summary of Intercomparison

*Status:*

The candidate passed the quality standards of ACTRIS and GAW during the onsite intercomparison. The system is within the range of +/-10% of the TROPOS Reference MPSS.

The candidate was in a good status. It was not necessary to change or repair parts of the inlet, instrument or counter. The zero, high voltage and PSL checks are in the correct range of tolerance.

## Information about the instruments:

Date of check: 28.09.2017

<i>List of Components</i>	TROPOS Reference MPSS No.4	Candidate
<i>Position</i>	-	-
<i>Company</i>	TROPOS	TROPOS
<i>Software</i>	TROPOS	TROPOS
<i>CPC-MPSS</i>	TSI CPC, Model 3772	TSI CPC, Model 3772
<i>CPC-total</i>	TSI CPC, Model 3762	TSI CPC, Model 3772-CEN
<i>flow ratio</i>	1.0 : 5.0	1.0 : 5.0
<i>source</i>	Kr85	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>	✓	✓

Date of check: 28.09.2017

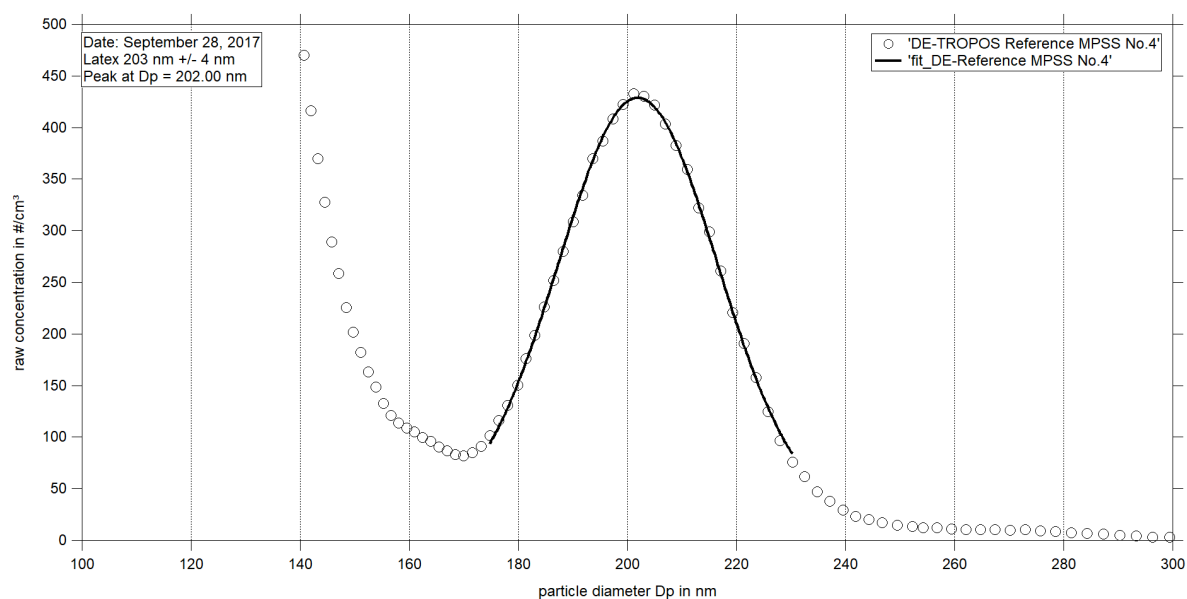
<i>CPC status</i>	TROPOS-MPSS	TROPOS-total	Candidate-MPSS	Candidate-total
<i>power/status</i>	LED green	LED green	LED green	LED green
<i>saturator temp</i>	39 °C	-	39 °C	39 °C
<i>condenser temp</i>	22 °C	-	22 °C	23 °C
<i>optics temp</i>	40 °C	-	40.0 °C	40.0 °C
<i>cabinet temp</i>	34.6 °C	-	29.4 °C	33.4 °C
<i>ambient pressure</i>	101.5 kPa	-	101.0 kPa	101.8 kPa
<i>orifice pressure</i>	83.3 kPa	-	86.5 kPa	89.6 kPa
<i>nozzle pressure</i>	2.9 kPa	-	2.6 kPa	0.6 kPa
<i>laser current</i>	46 mA	LED green	47 mA	41 mA
<i>liquid level</i>	full	full	full	full

Date of check: 28.09.2017

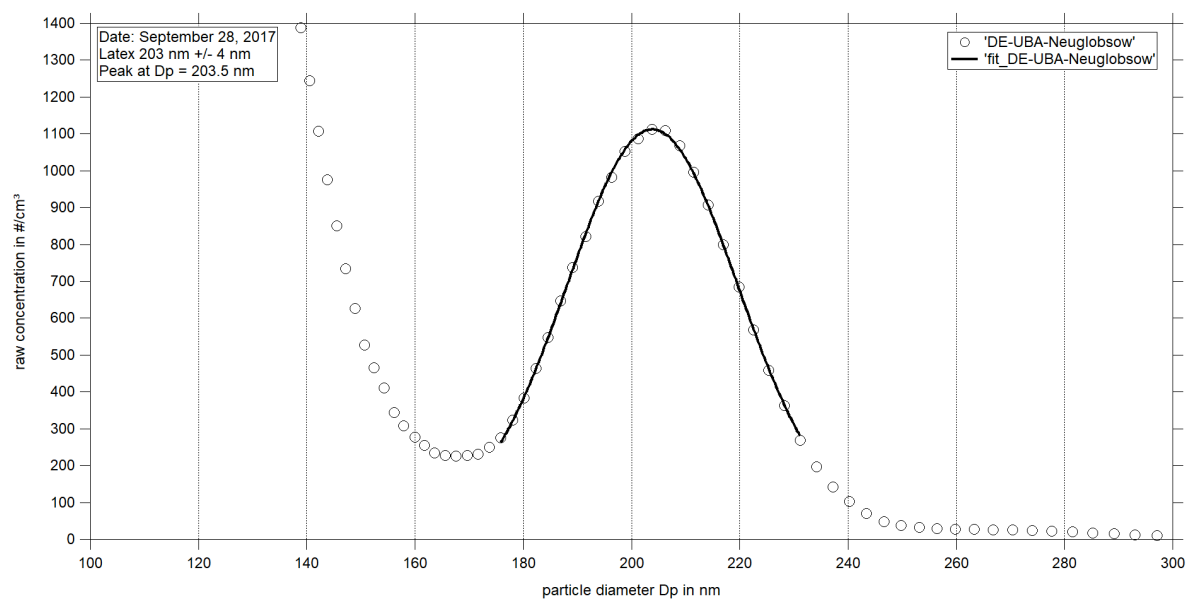
	TROPOS Reference MPSS		Candidate	
<i>date</i>	pre-audit status	final-audit status	pre-audit status	final-audit status
<i>total CPC flow</i>	-	1.020 l/min	1.007 l/min	1.007 l/min
<i>aerosol flow (DMA)</i>	-	1.019 l/min	1.020 l/min	1.020 l/min
<i>aerosol flow (UDMA)</i>	-	-	-	-
<i>aerosol flow (total)</i>	-	1.019 l/min	1.020 l/min	1.020 l/min
<i>zero</i>	-	0 #/cm <sup>3</sup>	0 #/cm <sup>3</sup>	0 #/cm <sup>3</sup>
<i>PSL 203 nm</i>	-	202.00 nm	203.5 nm	203.5 nm
<i>HV – 0 V</i>	-	0 V	0 V	0 V
<i>HV – 4 mV</i>	-	5.05 V	4.6 V	5.0 V
<i>HV – 80 mV</i>	-	100.1 V	-	99.8 V
<i>HV – 800 mV</i>	-	1000.1 V	997.0 V	1000.3 V

Special Information regarding to 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			Need a new membrane!
<i>change sheath Nafion dryer</i>	no			
<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			

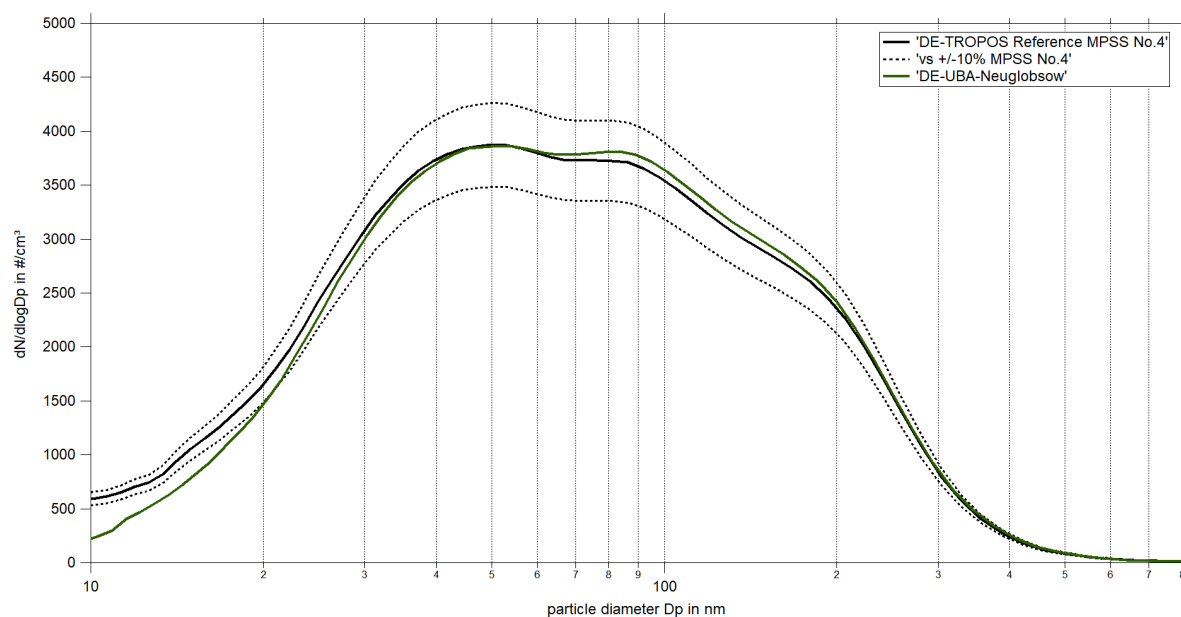
**PSL Scan and calibration: Latex 203 nm +/- 4 nm**

**Figure 01:** Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on September 28th, 2017.



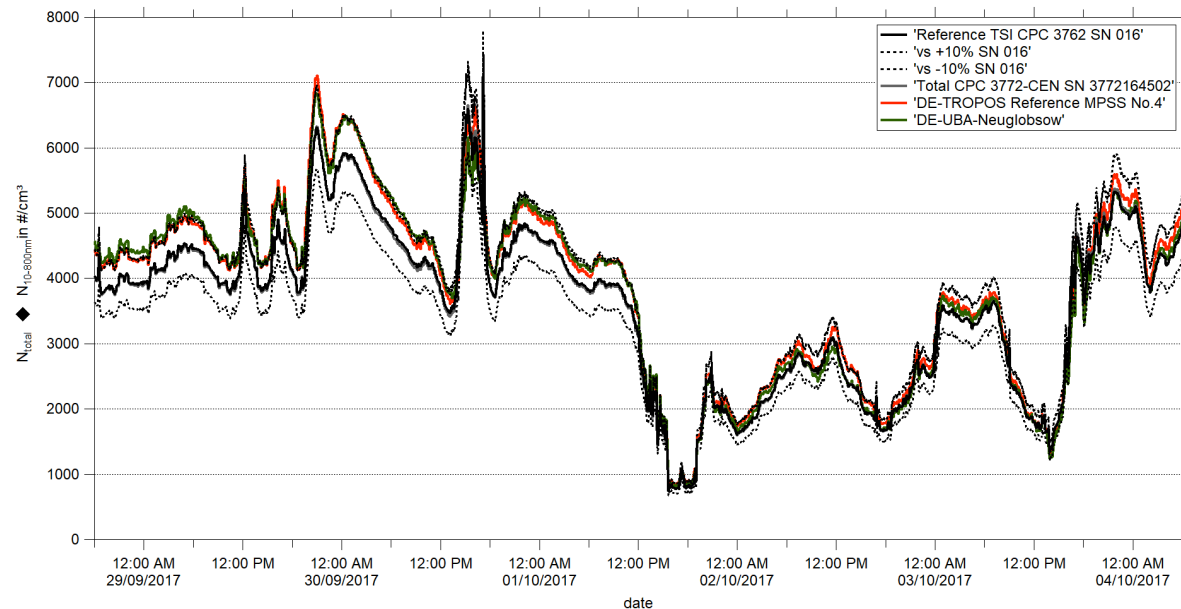
**Figure 02:** Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on September 28th, 2017.

## Status of the Candidate: Particle Number Size Distribution



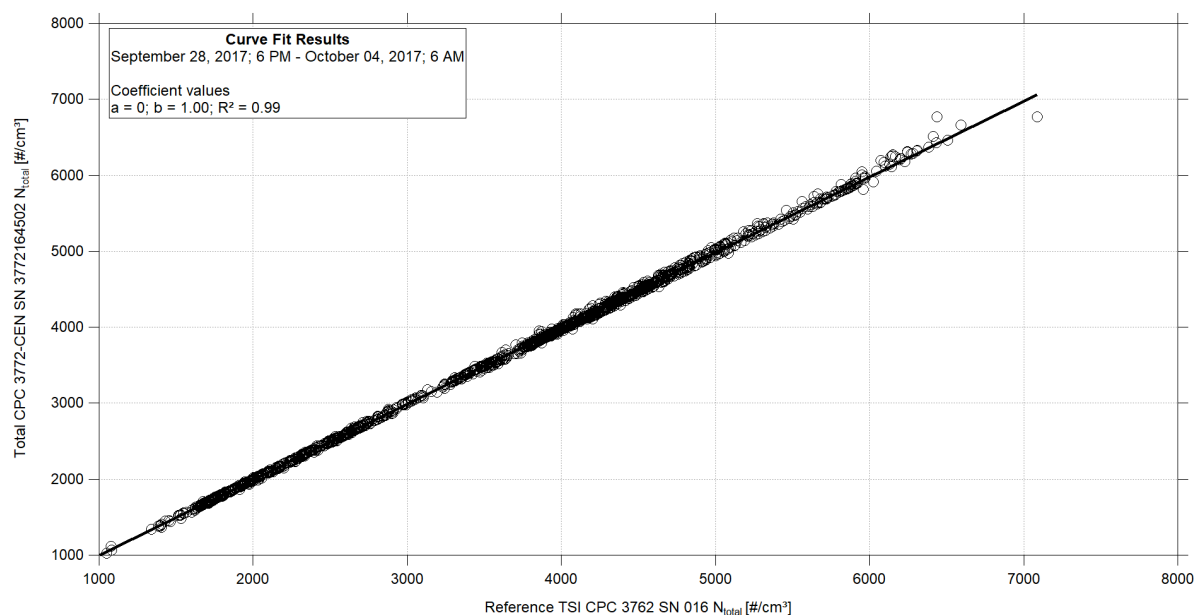
**Figure 03:** Comparison of mean particle number size distribution of TROPOS Reference MPSS No.4 against DE-UBA-Neuglobsow from September 28, 2017 18:00 PM until October 04, 2017 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included for both of the TROPOS Reference MPSS.

## Status of the Candidate: Time Series

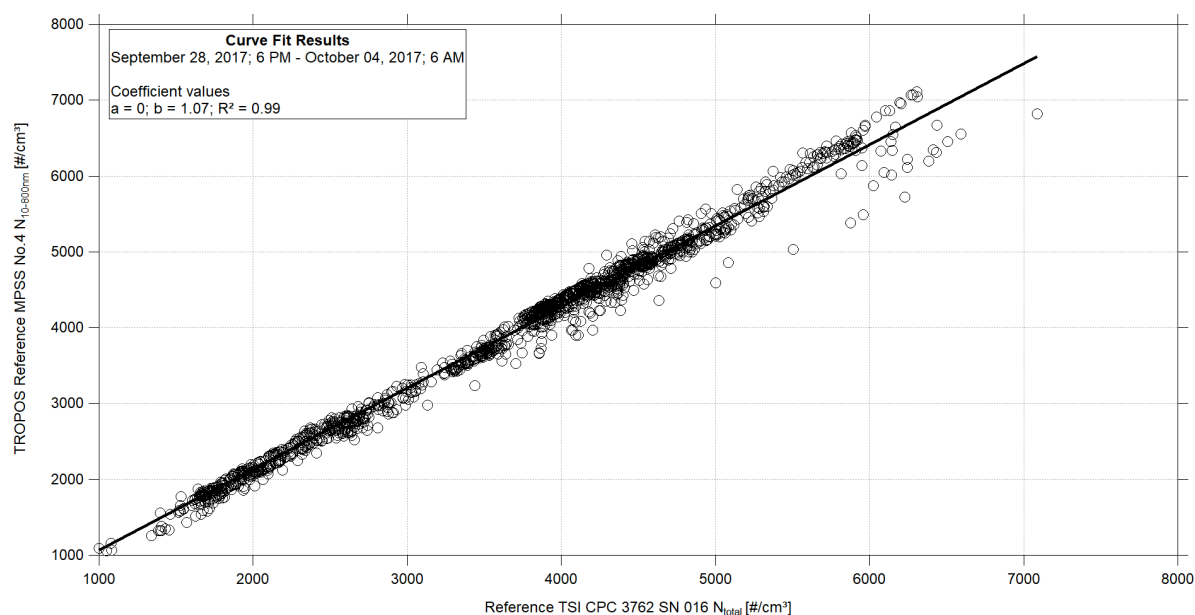


**Figure 04:** Time series (September 28, 2017 18:00 PM until October 04, 2017 06:00 AM) of the integrated particle number concentration ( $N_{10-800nm}$ ) of the MPSS and total number concentration ( $N_{total}$ ) of the reference TSI-CPC Model 3762. The inversion was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

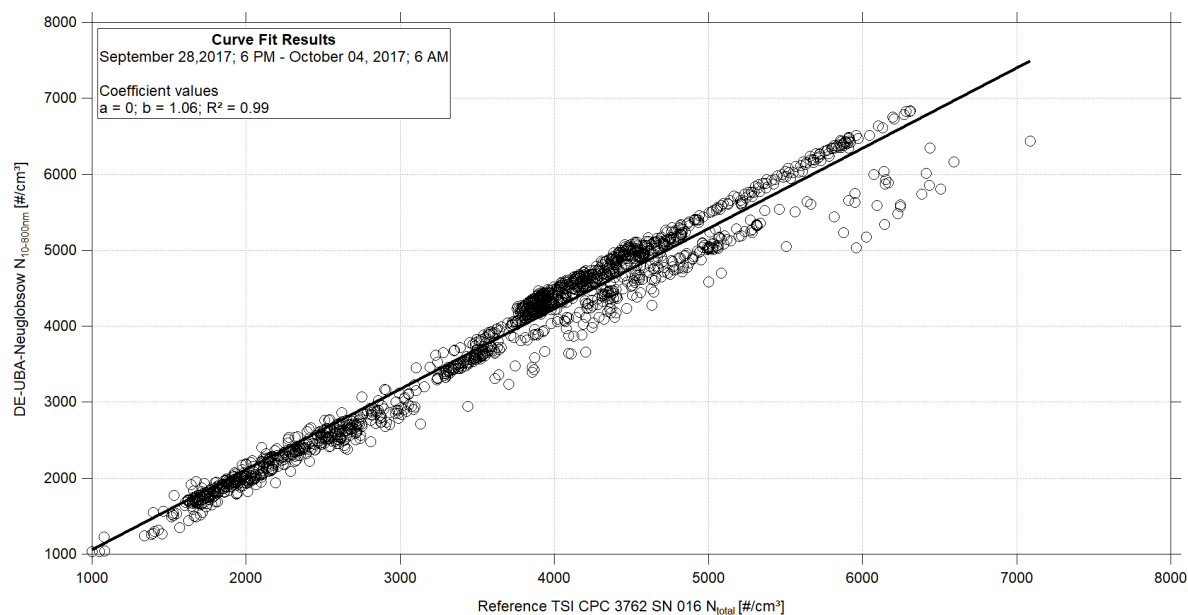
## Status of the Candidate: Correlation



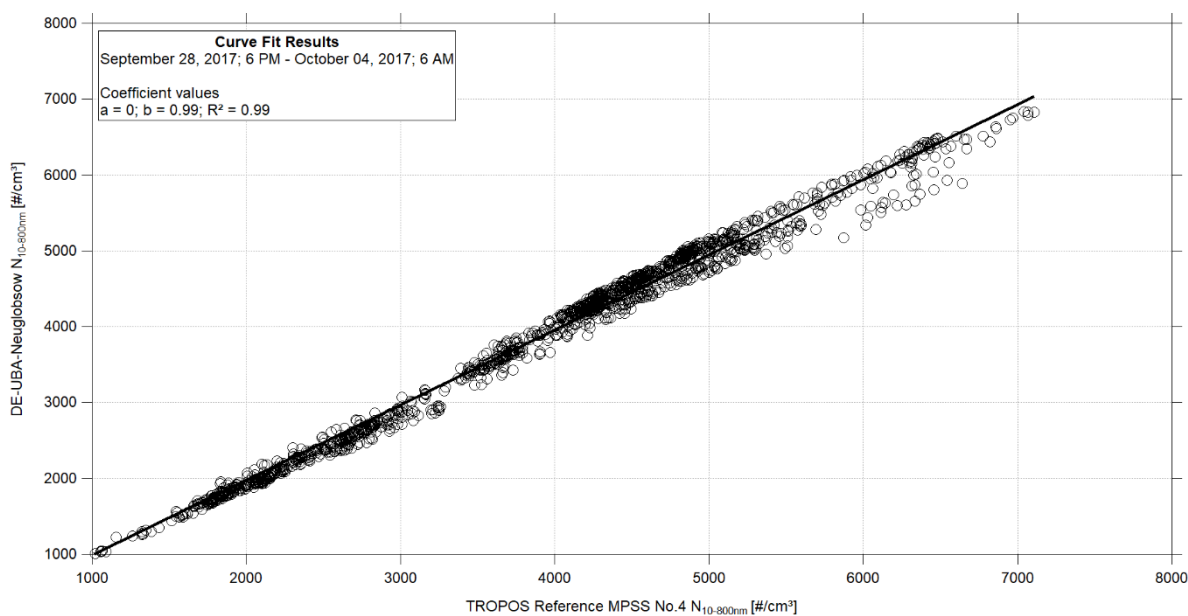
**Figure 05:** Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3762 SN: 016 and Total CPC 3772-CEN Neuglobsow SN: 3772164502. All corrections are included.



**Figure 05:** Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3762 SN: 016 and TROPOS Reference MPSS No.4. 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 3762 SN: 016 and DE-UBA-Neuglobsow. 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.4 and DE-UBA-Neuglobsow. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.