

Intercomparison of Mobility Particle Size Spectrometers

Project No.: MPSS-2018-2-3

Principal Investigator: Wolfram Birmili

Home Institution: Umweltbundesamt

Participant:

<i>Candidate:</i>	UBA
<i>Made by:</i>	GRIMM
<i>Counter (SN):</i>	Grimm 5.416
<i>Software:</i>	Grimm

Location of the quality assurance: TROPOS Leipzig, lab 118

Comparison period: March 12, 2018 – March 16, 2018

Last Intercomparison (with Project No.):

Summary of Intercomparison:*Pre-Status:*

The instrument arrived with participant. The instrument was running with the own GRIMM software. During the Pre-Status, the candidate showed a concentration 19% lower than the TROPOS Reference MPSS No.6. The PSL check showed a peak at 205 nm.

Final-Status:

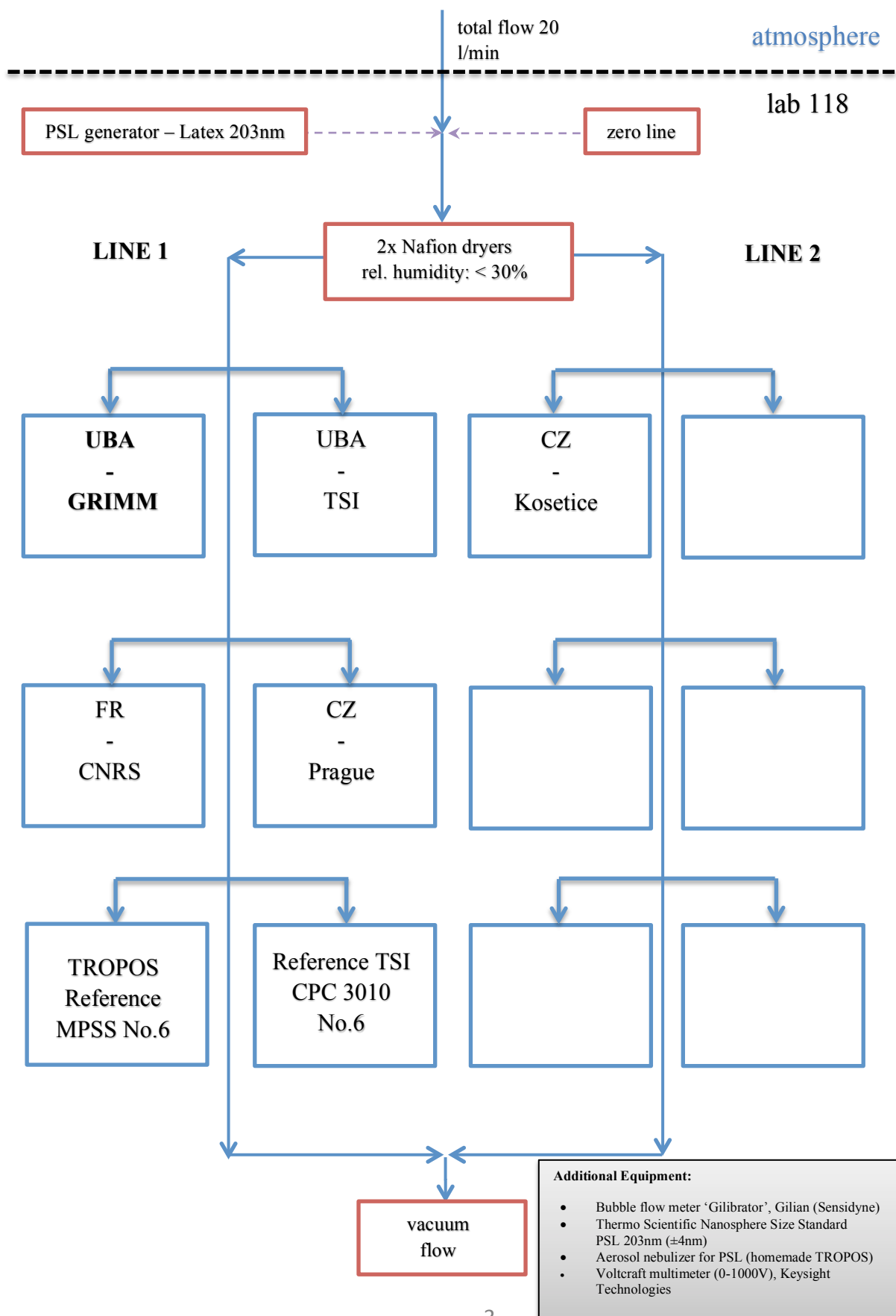
During the Pre-Status, the candidate showed a concentration 4% lower than the TROPOS Reference MPSS No.6. The instrument was checked and cleaned from the inlet. The candidate passed the quality standards of ACTRIS and GAW.

Information about the instruments:

Date of check: March 12, 2018

<i>List of Components</i>	TROPOS Reference MPSS No.6		Candidate
<i>Position</i>	Line 1		Line 1
<i>Company</i>	TROPOS		Grimm 1-7-1
<i>Software</i>	TROPOS		Grimm
<i>CPC-MPSS</i>	TSI CPC, Model 3772		Grimm 5.416
<i>CPC-total</i>	TSI CPC, Model 3010		Grimm 5.416
<i>flow ratio</i>	1.0 : 5.0		0.3:3
<i>source</i>	Ni.63		Am-241
<i>HV power supply</i>	Positive		Positive
<i>DMA</i>	Hauke medium		GRIMM
<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 system checks:

<i>date</i>	12.03.2018	13.03.2018	14.03.2018	15.03.2018	unit
<i>total CPC flow</i>	-	-	-	-	l/min
<i>aerosol flow (DMA)</i>	-	-	-	-	l/min
<i>aerosol flow (UDMA)</i>	-	-	-	-	l/min
<i>aerosol flow (total)</i>	298.8	302	301	-	l/min
<i>Zero MPSS</i>	0			-	#/cm ³
<i>Zero total CPC</i>	✓				#/cm ³
<i>PSL 203 nm</i>	✓				nm
<i>HV check</i>					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	-	-	checked
<i>change aerosol Nafion dryer</i>	No	-	-	checked
<i>change sheath Nafion dryer</i>	No	-	-	checked
<i>check source</i>	No	-	-	checked
<i>change HV power supply</i>	No	-	-	checked
<i>clean/change DMA</i>	No	-	-	checked
<i>change aerosol RH/T-sensor</i>	No	-	-	checked
<i>change sheath RH/T-sensor</i>	No	-	-	checked
<i>change pressure sensor</i>	No	-	-	checked
<i>change inlet Nafion dryer (500)</i>	No	-	-	checked
<i>Change Total filter</i>	No	-	-	checked
<i>NI-card</i>	No			checked

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

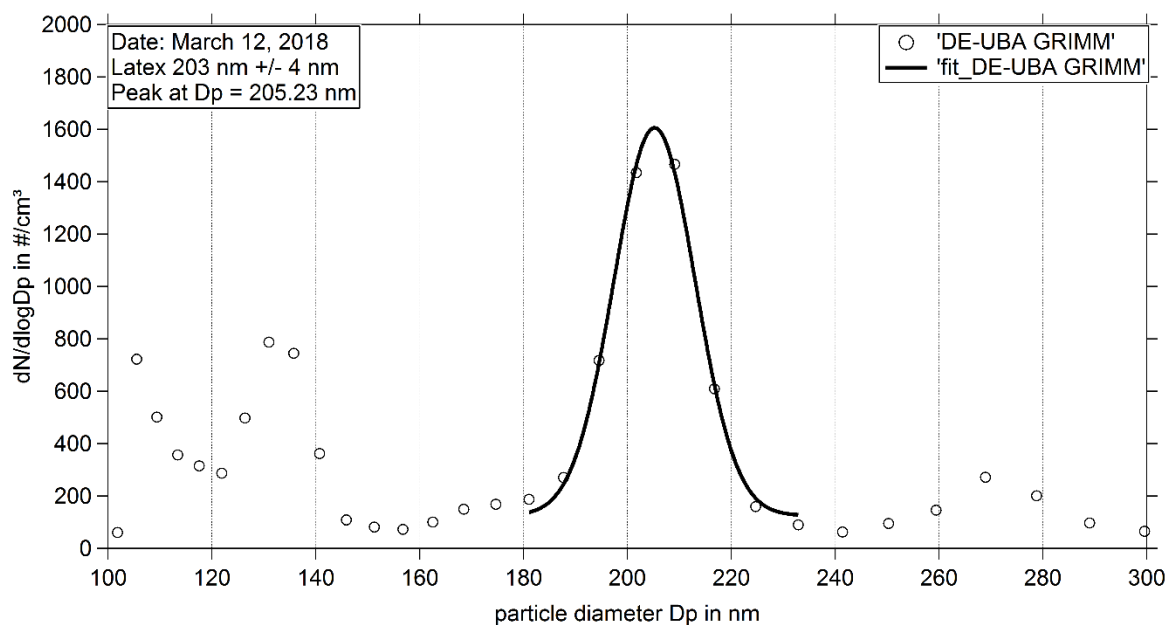


Figure 01: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 12, 2018.

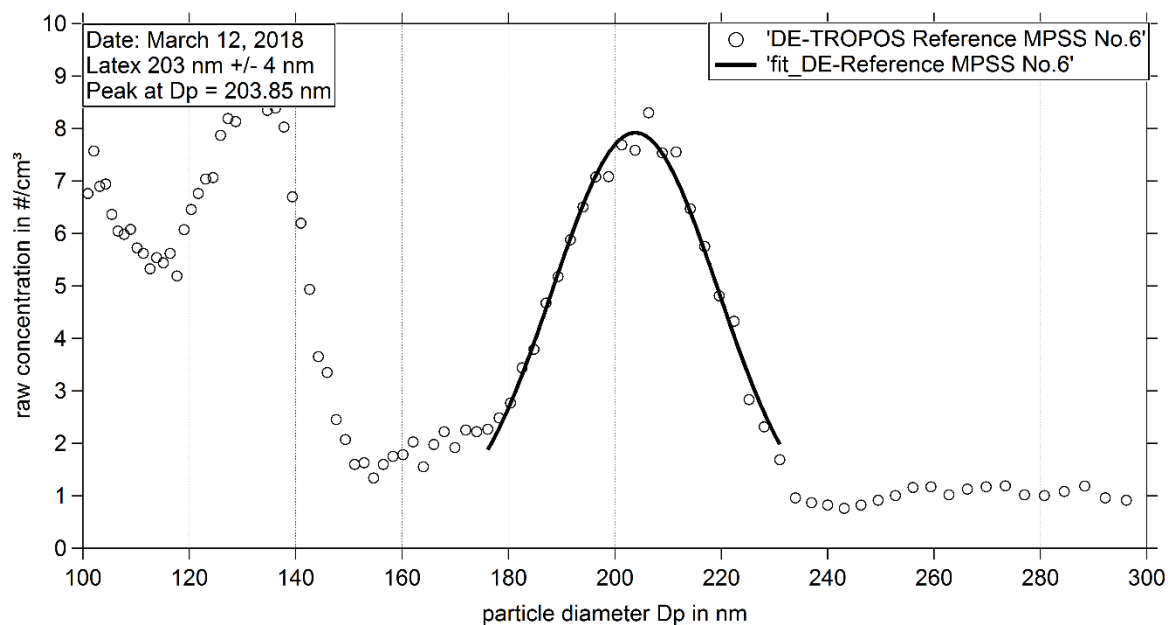


Figure 02: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 12, 2018.

Status of the TROPOS Reference Instruments in February: Particle Number Size Distribution, Time Series and Correlation

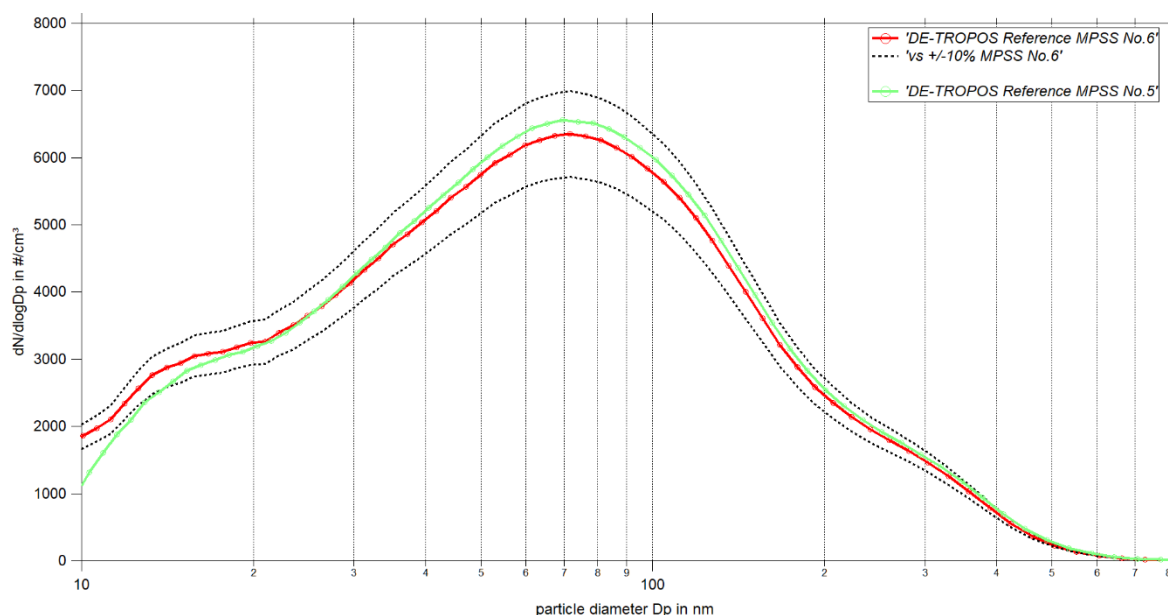


Figure 03: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against TROPOS Reference MPSS No.5 from February 19, 2018 08:00 PM – February 20, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

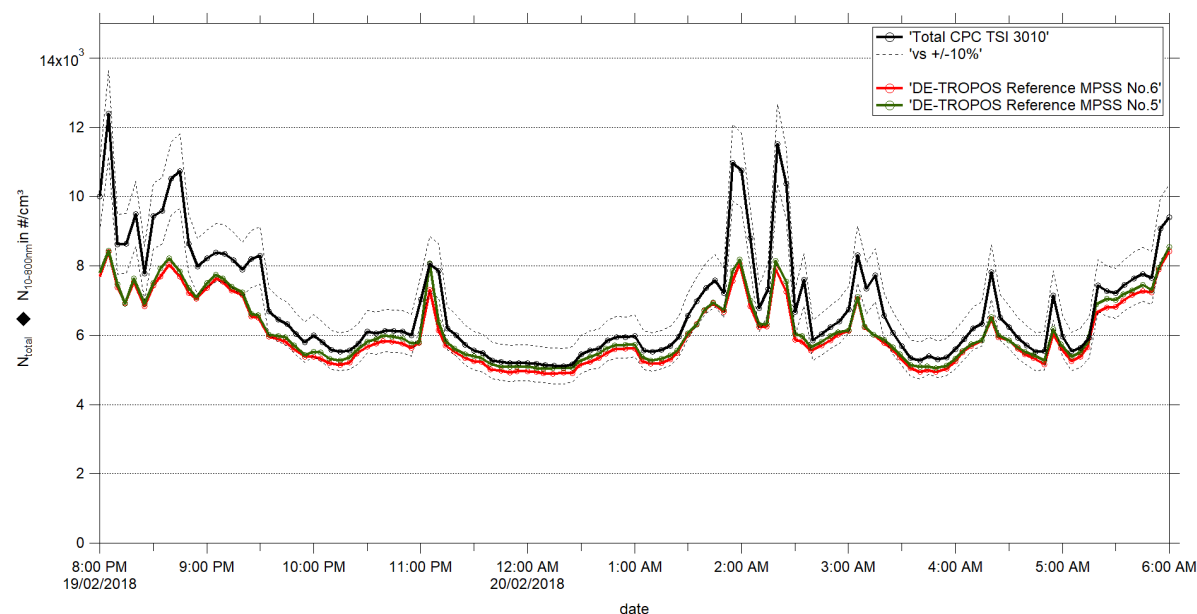


Figure 04: Time series (February 19, 2018 08:00 PM – February 20, 2018 06:00 AM) of the integrated particle number concentration ($N_{10-800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

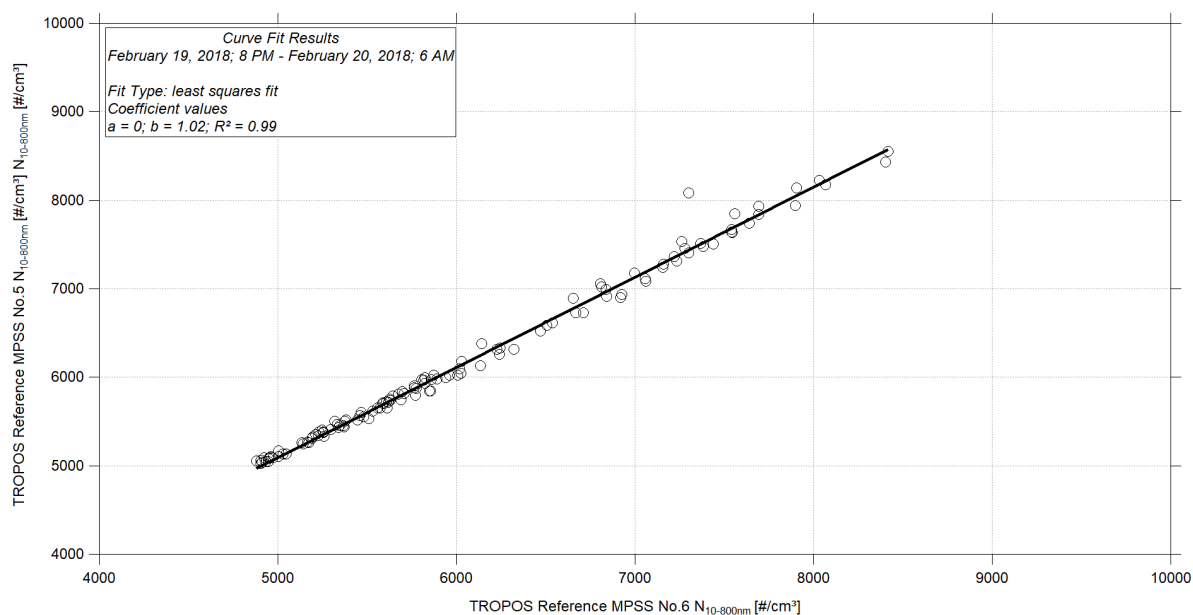


Figure 05: Linear regression between the number concentrations of the TROPOS Reference MPSS No.6 and TROPOS Reference MPSS No.5. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Status of the TROPOS Reference Instruments: Particle Number Size Distribution

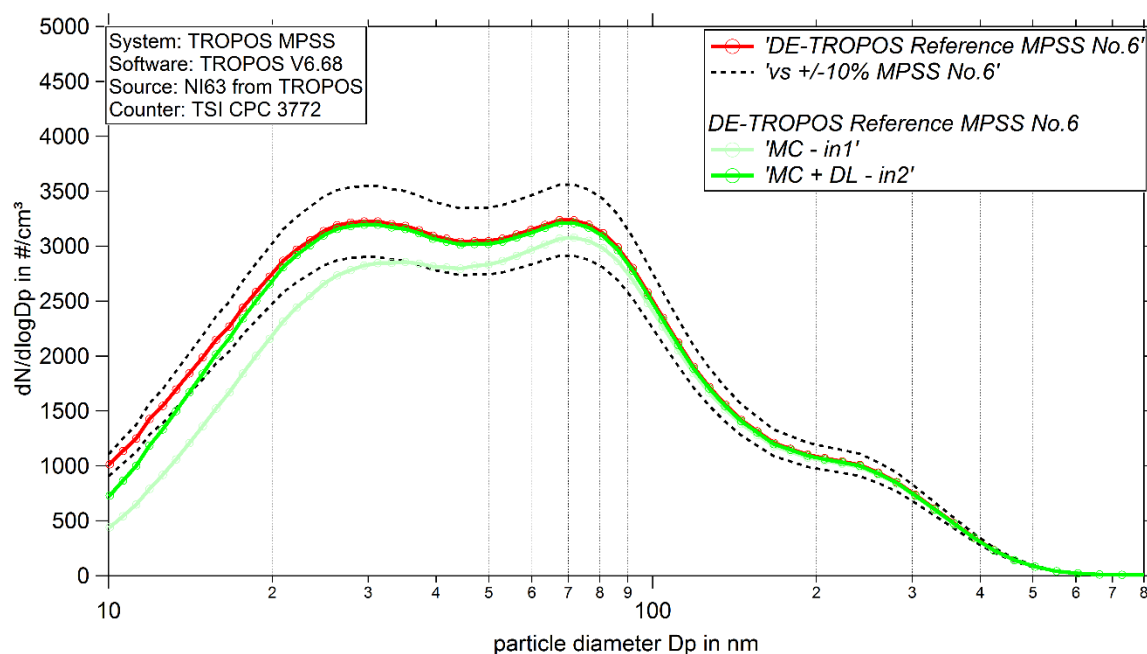


Figure 06: Comparison of mean particle number size distribution of TROPOS Reference TSI CPC Model 3010 Ref 6 against TROPOS Reference MPSS No.6 from March 12, 2018 08:00 PM – March 13, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Status of the TROPOS Reference Instruments: Time Series

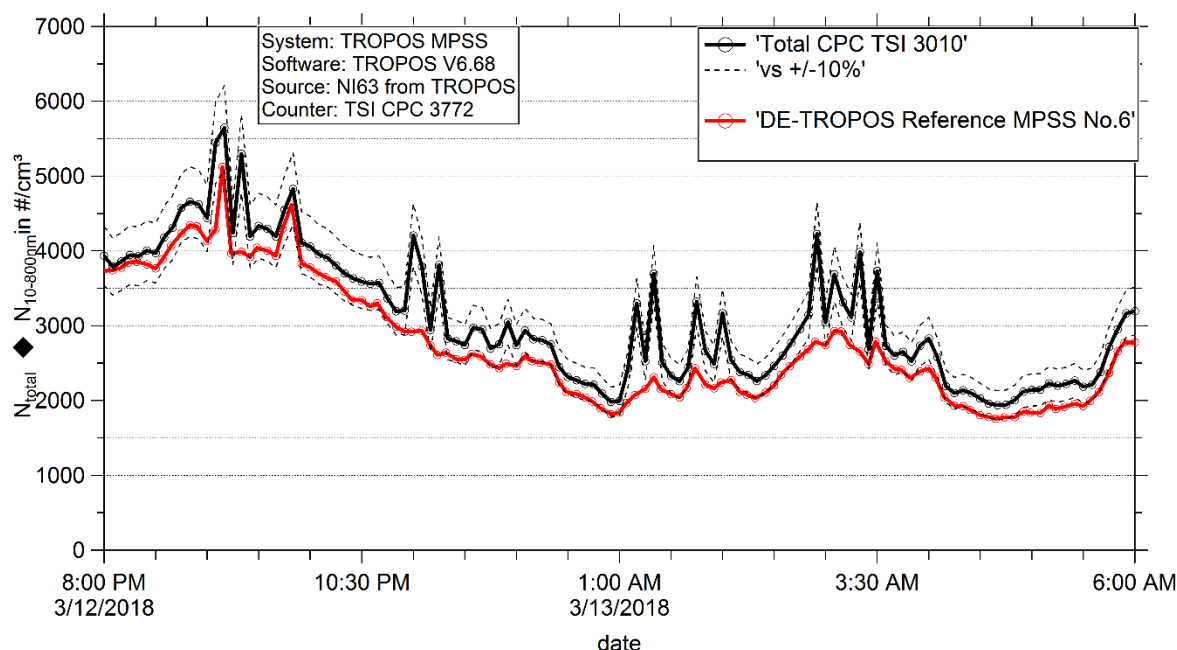


Figure 07: Time series (March 12, 2018 08:00 PM – March 13, 2018 06:00 AM) of the integrated particle number concentration ($N_{10-800\text{nm}}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Status of the TROPOS Reference Instruments: Correlation

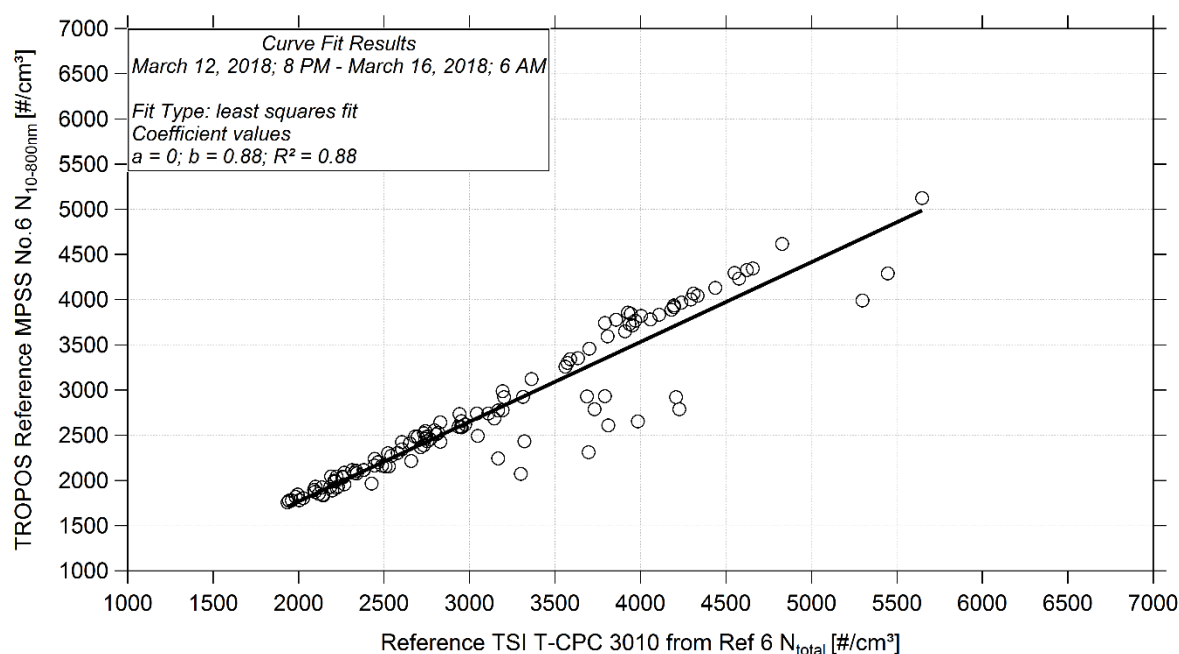


Figure 08: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 Ref 6 and TROPOS Reference MPSS No.6. Multiple charge correction, internal diffusion losses and CPC flow corrections are included

Pre-Status of the Candidate: Particle Number Size Distribution

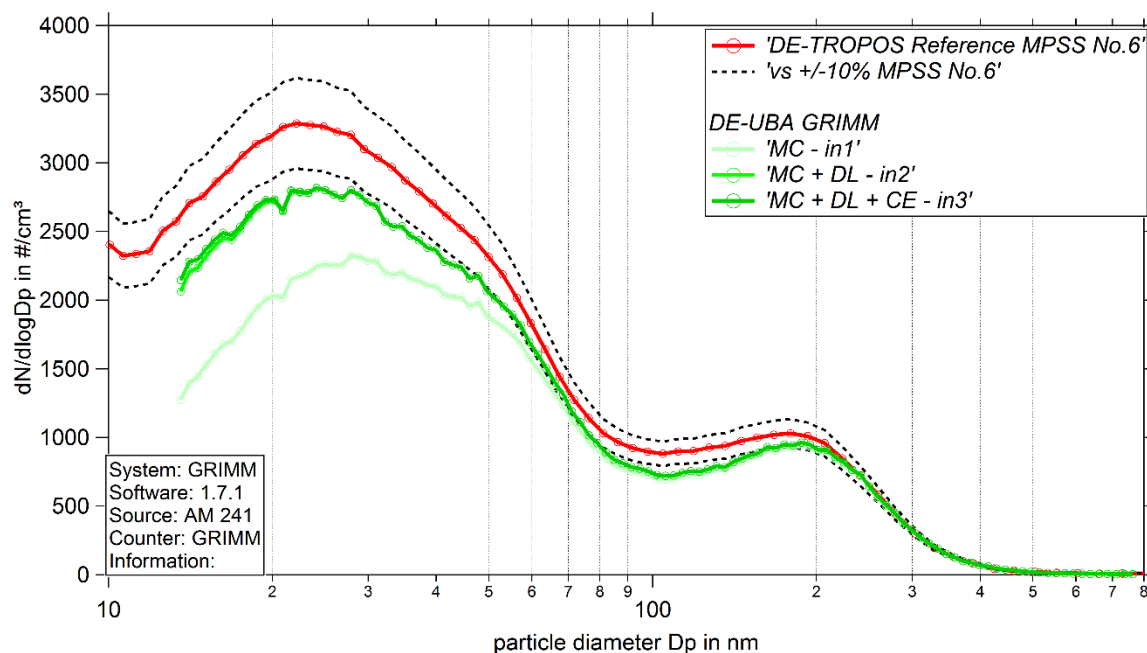


Figure 09: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against UBA-Grimm 5.416 from March 12, 2018 08:00 PM – March 13, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Pre-Status of the Candidate: Time Series and Correlation

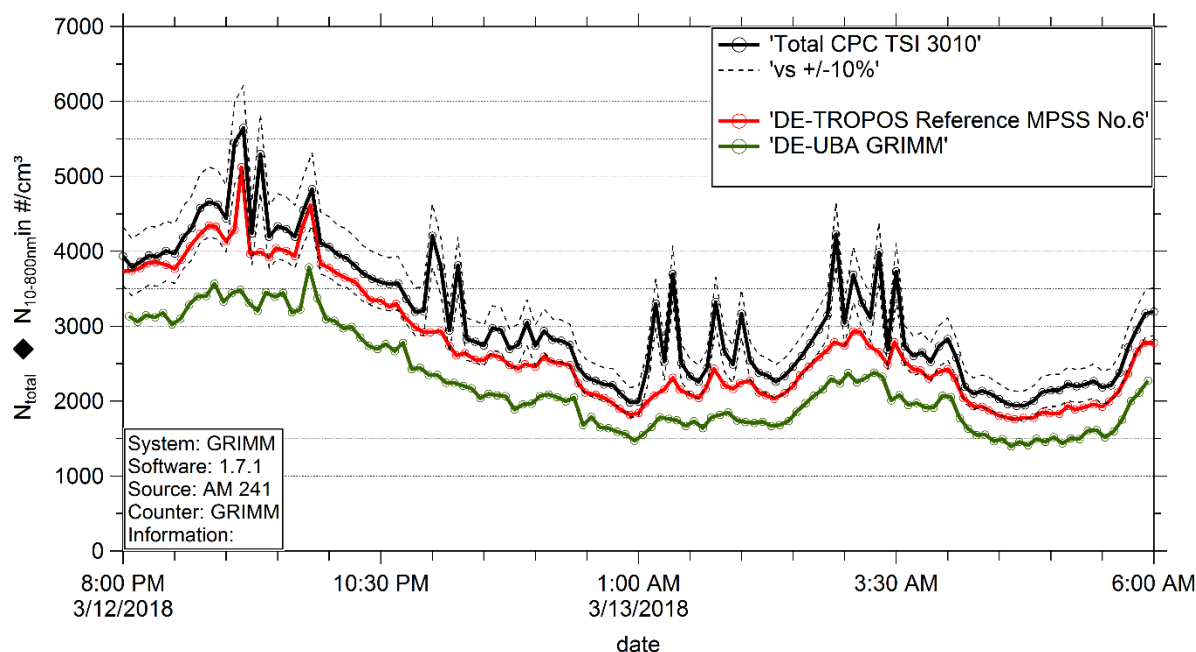


Figure 10: Time series (March 12, 2018 08:00 PM – March 13, 2018 06:00 AM) of the integrated particle number concentration ($N_{10-800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion and corrections for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

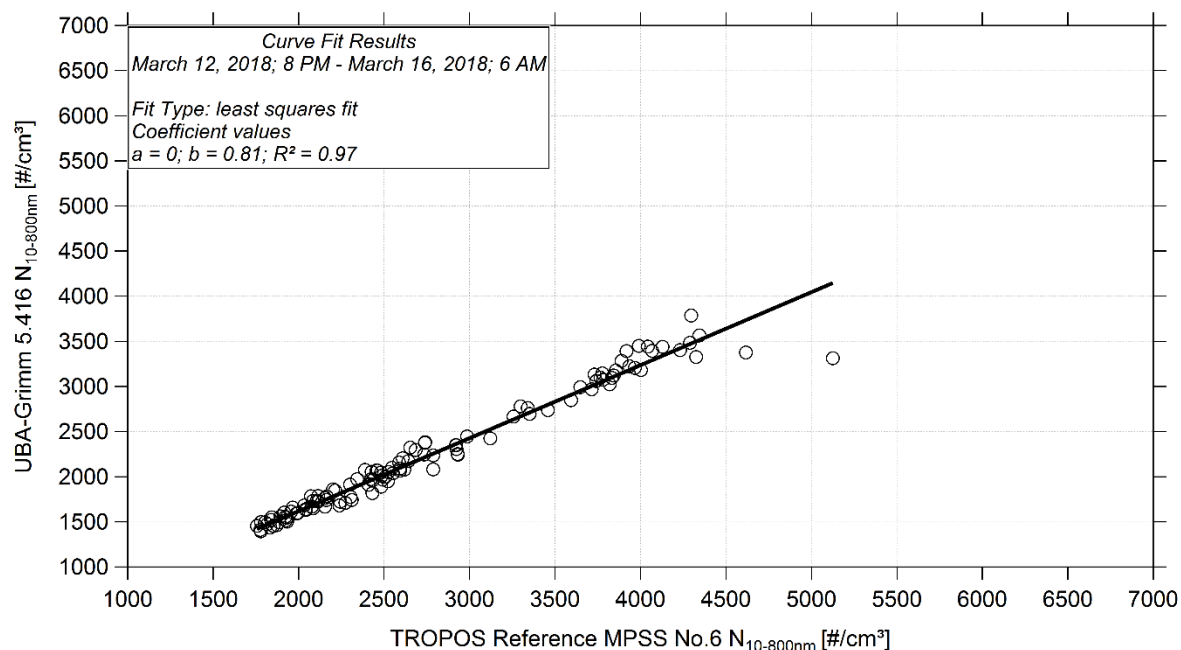


Figure 11: Linear regression between the number concentrations of the TROPOS Reference MPSS No. 6 and UBA-Grimm 5.416. The inversion and corrections for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Final-Status of the Candidate: Particle Number Size Distribution

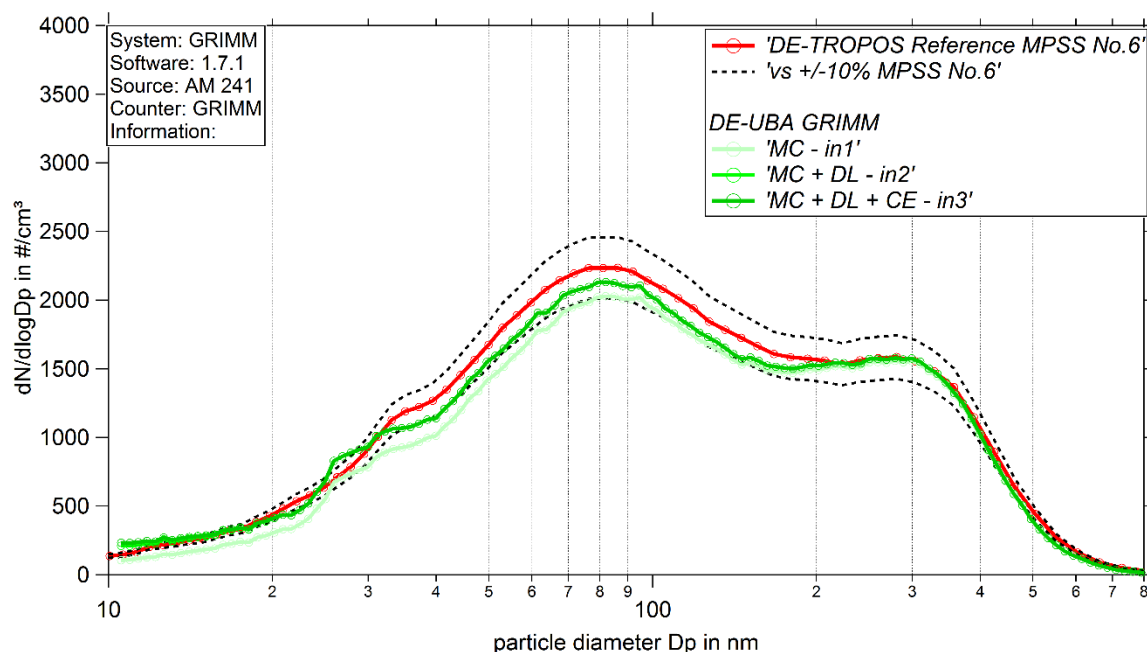


Figure 12: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against UBA-Grimm 5.416 from March 15, 2018 08:00 PM – March 16, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Final-Status of the Candidate: Time Series and Correlation

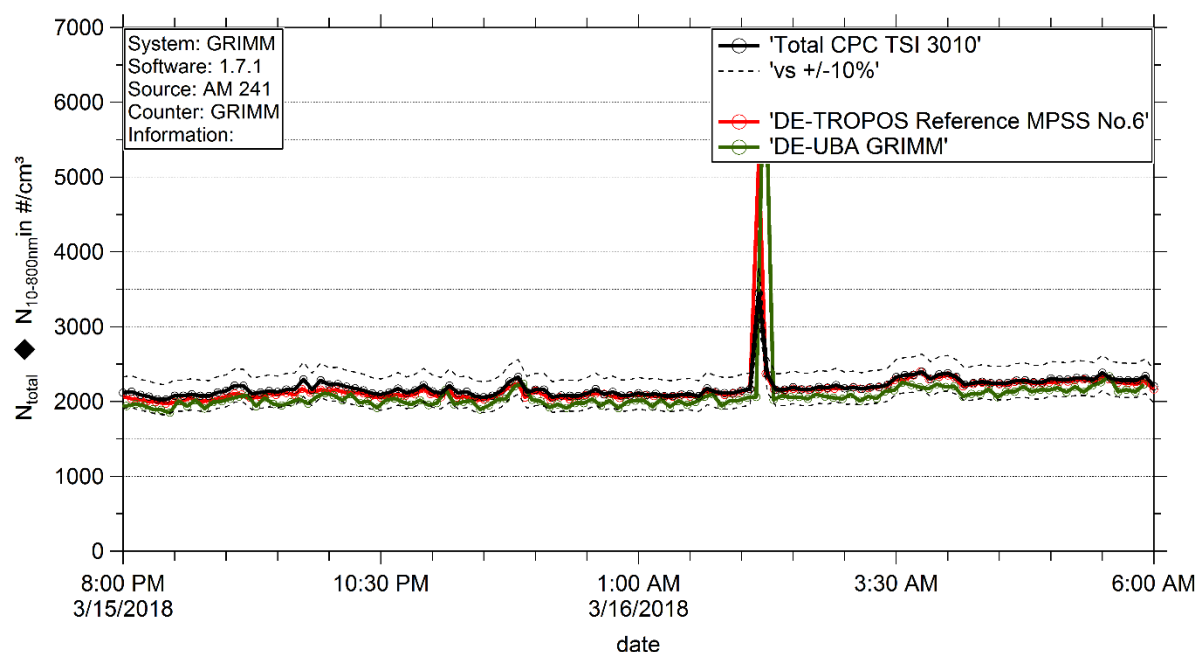


Figure 13: Time series (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM) of the integrated particle number concentration ($N_{10-800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion and correction for the candidate was performed using TROPOS software.

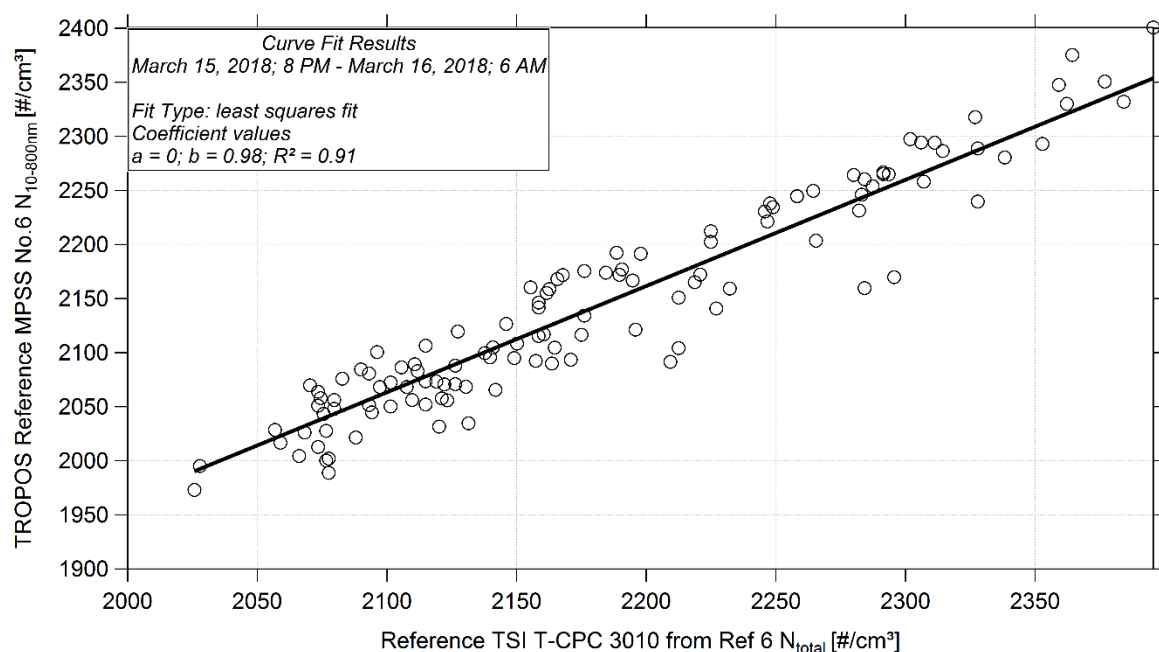


Figure 14: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 Ref 6 and TROPOS Reference MPSS Ref 6 (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM). All corrections are included.

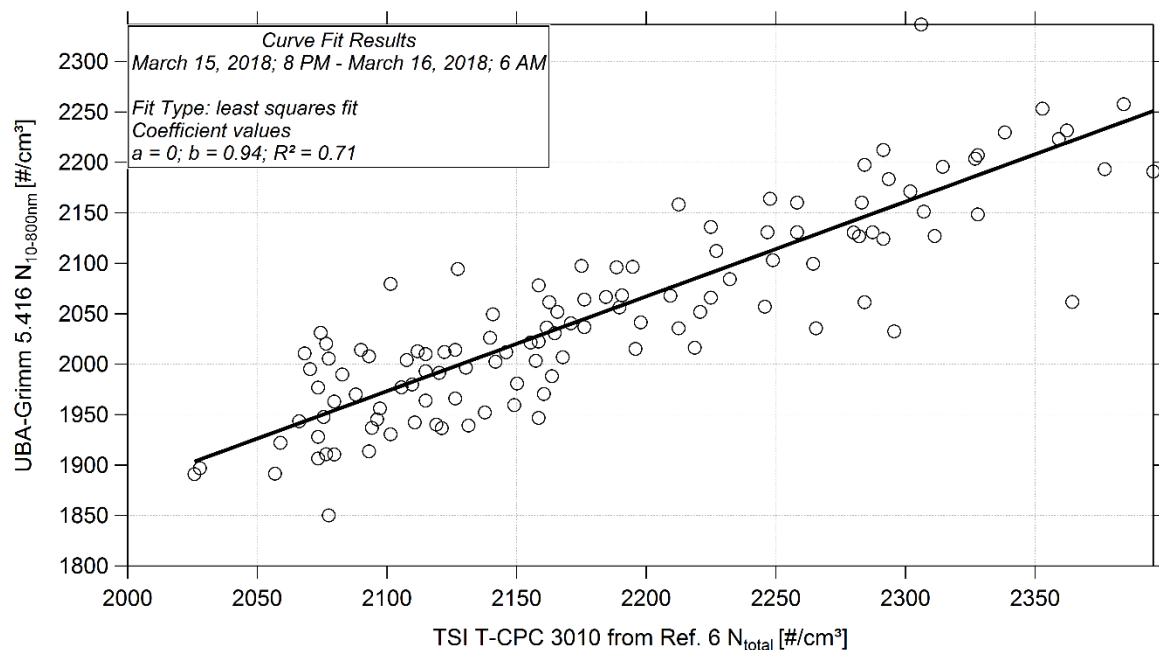


Figure 15: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 Ref 6 and UBA-Grimm 5.416 (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM). All corrections are included.

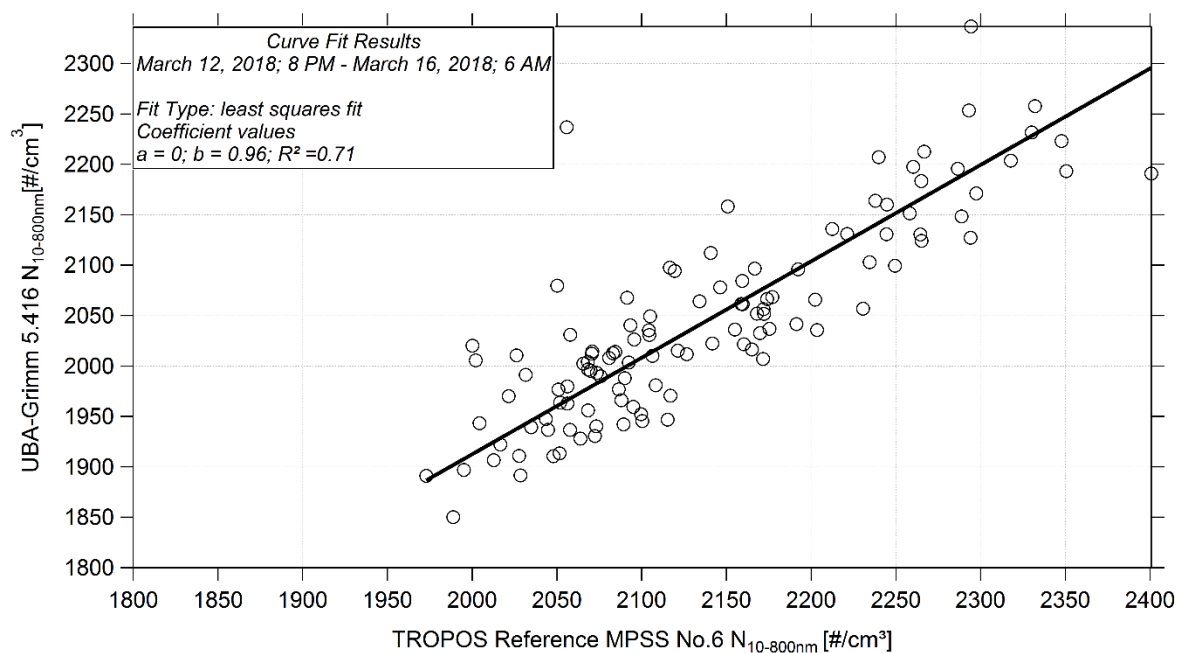


Figure 16: Linear regression between the number concentrations of the TROPOS Reference MPSS Ref 6 and UBA-Grimm 5.416 (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM). All corrections are included.