Intercomparison of Mobility Particle Size Spectrometers

Project No.:	MPSS-2018-7-5
Principal Investigator:	Dr. Diana Rose
Home Institution:	Hessisches Landesamt für Naturschutz, Umwelt und Geologie Dezernat I2 Luftreinhaltung: Immissionen
Participant:	Dr. Diana Rose
Candidate:	DE-HLNUG MPSS 005 – Labor
Made by:	TSI – EC 3082
Counter (SN):	CPC 3772 SN3772180903
Location of the quality assurance:	TROPOS Leipzig, lab 118
Comparison period:	October 15, 2018 – October 19, 2018
Last Intercomparison (with Project No.):	

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

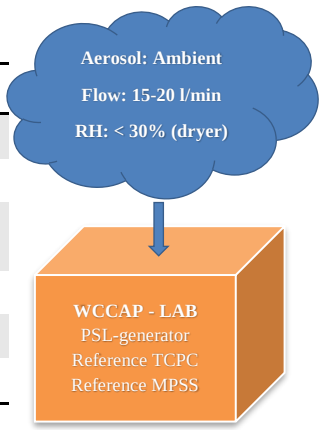
Summary of Intercomparison:

Pre-Status:
The candidate from DE-HLNUG MPSS_004 Labor, UNH participated in the ACTRIS workshop from October 15, 2018 to October 19, 2018 with the participant. The setup of the candidate was done on Monday, October 15th, afternoon. During the Pre-Status the candidate was running under the same settings, with their own TSI Kr.85 source, like on the Institute. The performance of the candidate showed a concentration 8% higher than the TROPOS Reference Instrument No.1. On Tuesday, October 16th, after the CPC-Workshop the MPSS was checked and the first part of maintenance was done. The performance of the CPC is shown in the Report of the CPC-Workshop. The TSI CPC 3772 passed the CPC Workshop after maintenance. For more information, please look at the CPC-workshop report. During the workshop week, the whole candidate was checked and cleaned. More details are in the Tables for each night run. The participant was instructed and trained how to optimize his instrument. In addition, the station setup and quality assurance procedures were discussed.

Final-Status:
The final run took place from October 18 to October 19, 2018. Running the candidate using the original source Kr.85 the performance showed the same concentration than the TROPOS Reference Instrument No.1.. The candidate passed the standards of ACTRIS and GAW.

Laboratory Setup and Legend

Candidates
DE-HLNUG MPSS 001 - Schwanheim
DE-HLNUG MPSS 002 - Raunheim
DE-HLNUG MPSS 003 - mobile Messstation
DE-HLNUG MPSS 004 - Labor UNH
DE-HLNUG MPSS 005 - Labor
DE-IUTA Mülheim-Styrum



Additional Equipment:
- Bubble flow meter 'Gilibrator', Gilian (Sensidyne)
- Thermo Scientific Nanosphere Size Standard PSL 203nm (±4nm)
- Aerosol nebulizer for PSL (homemade TROPOS)
- Voltcraft multimeter (0-1000V), Keysight Technologies

Legend for plots:
- MC = multiple charge correction
- DL = diffusion loss correction
- CE = CPC efficiency curve
- AL = additional loss corrections

Lab setup:

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

TROPOS Reference Instruments No. 1 and No. 6

October 15 – October 16, 2018: Time Series, Particle Number Size Distribution and Correlation

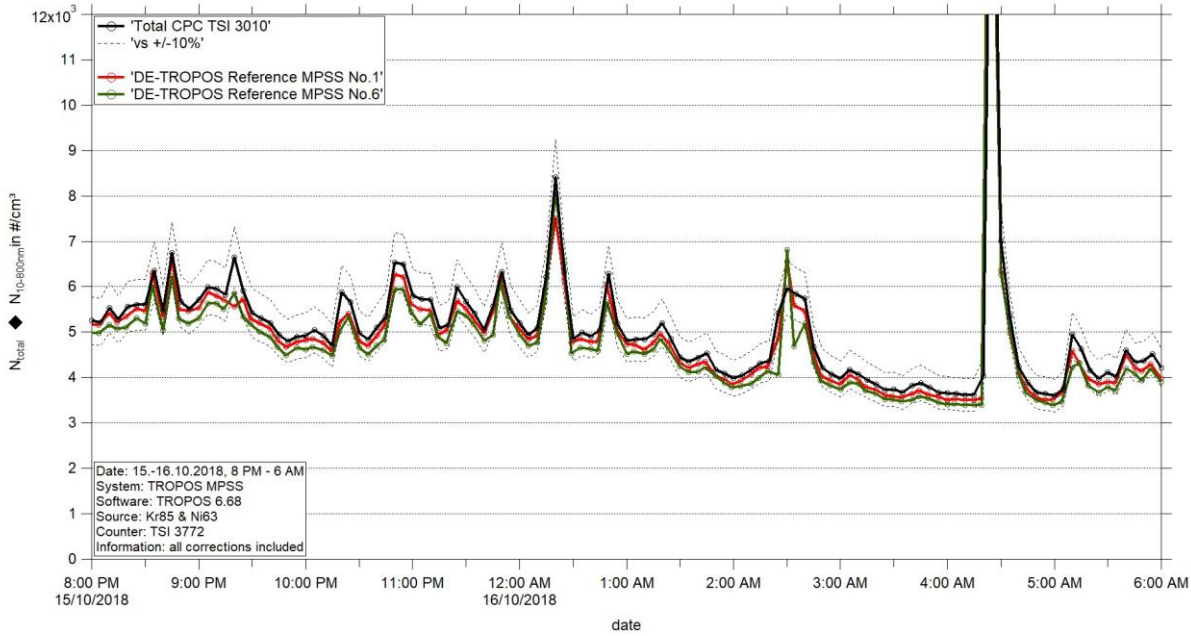


Figure 01: Time series (October 15, 2018 8 PM – October 16, 2018 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the TROPOS Reference MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

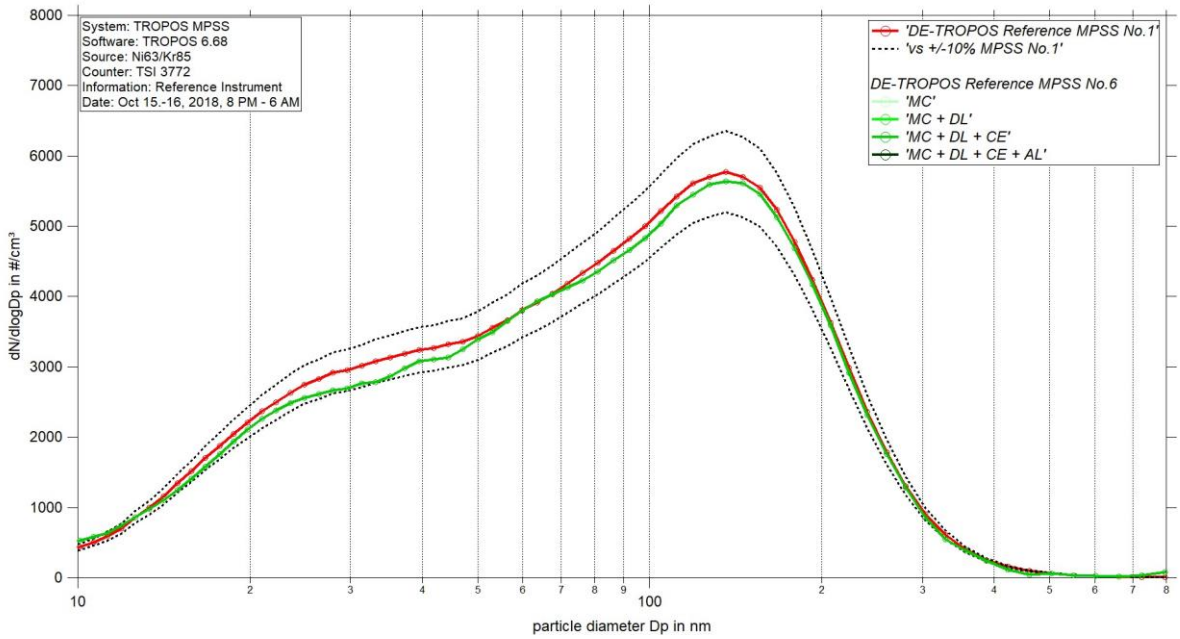


Figure 02: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against TROPOS Reference MPSS No.6 from October 15, 2018 8 PM – October 16, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

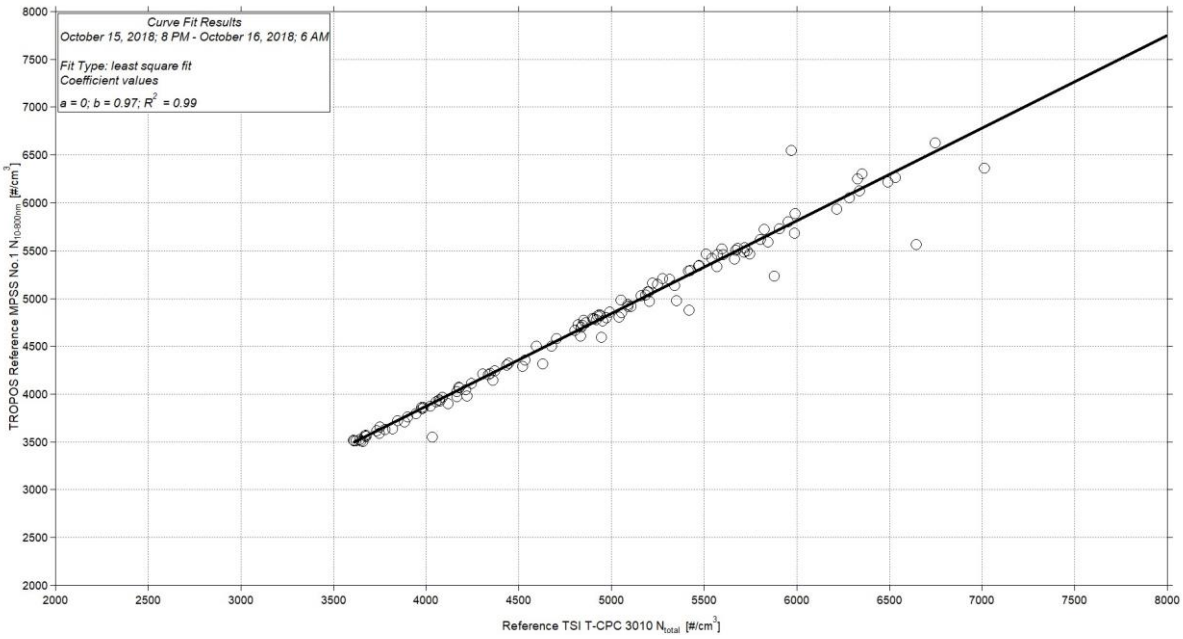


Figure 03: Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and TROPOS Reference MPSS No.1. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

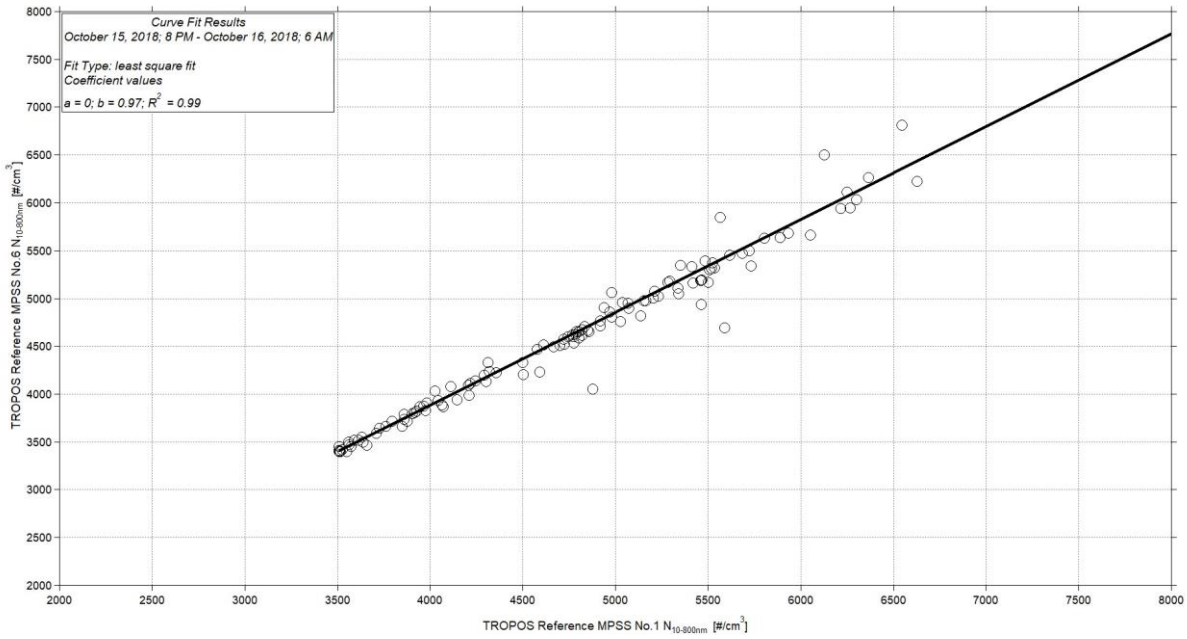


Figure 04: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and TROPOS Reference MPSS No.6. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

PSL Scan: Latex 203 nm +/- 4 nm

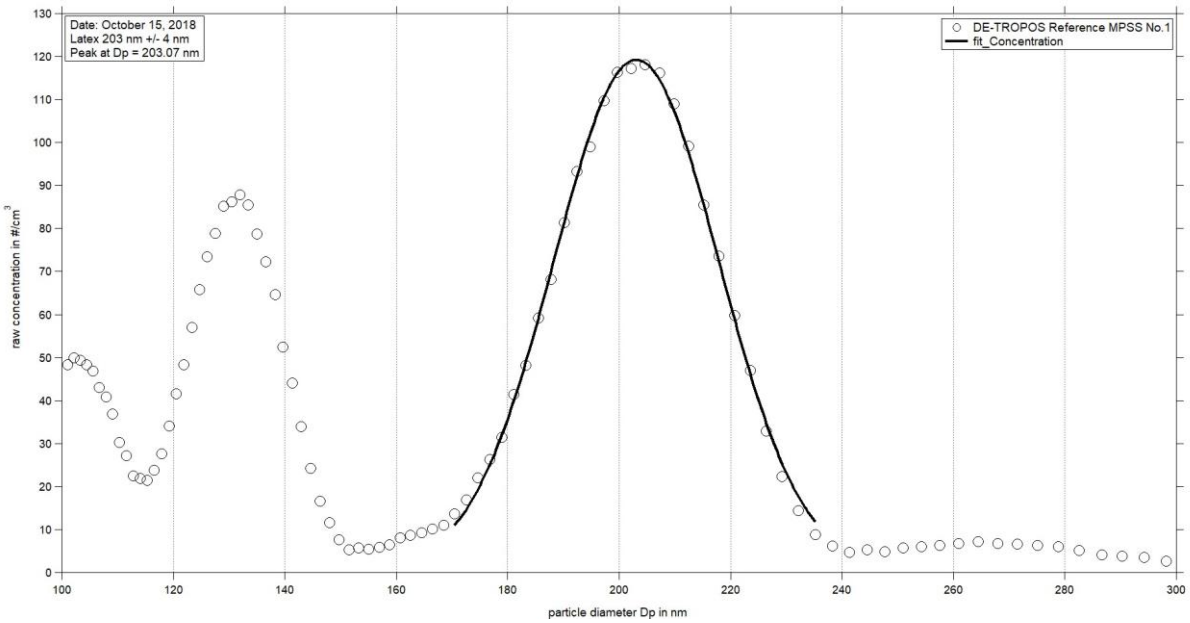


Figure 05: Measurement of latex 203 nm - Reference MPSS No.1: Particle size distribution (raw concentration) for latex 203 nm on October 15th 2018.

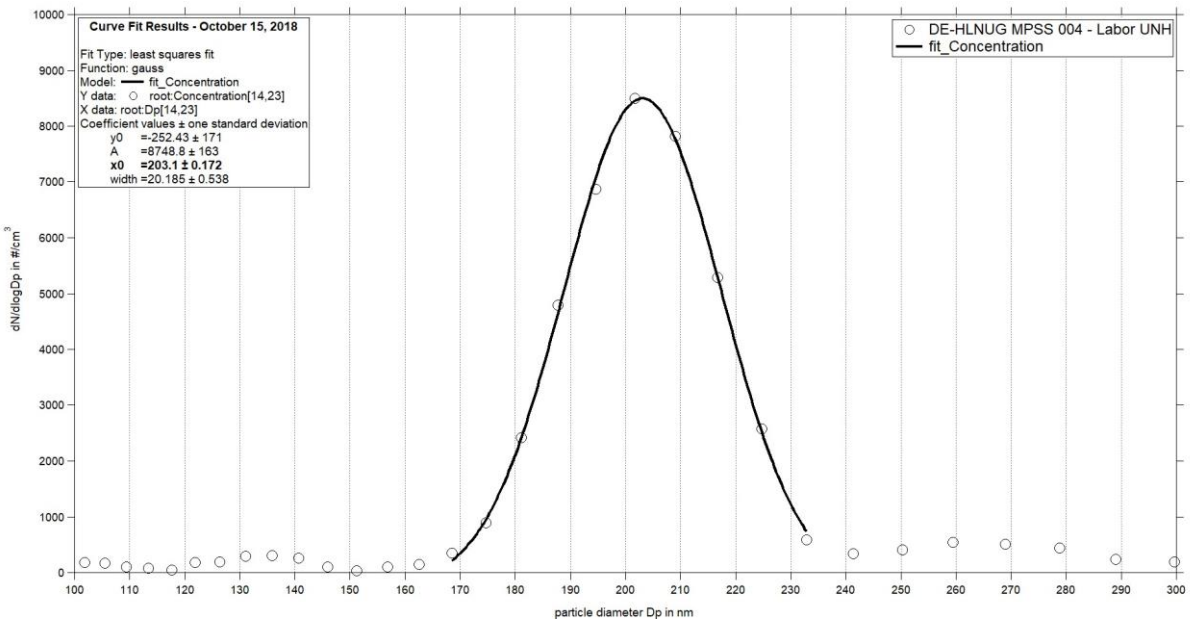


Figure 06: Measurement of latex 203 nm for the candidate DE-HLNUG MPSS 004 – Labor, UNH: Particle size distribution for latex 203 nm on October 15th 2018 with a peak at 203.1 nm.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

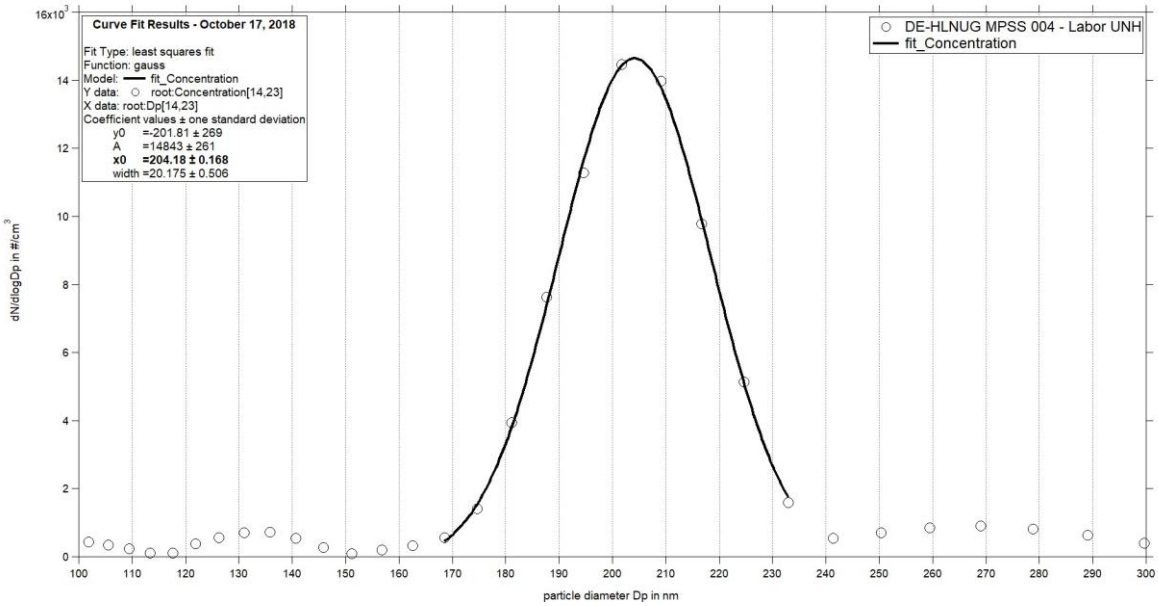


Figure 07: Measurement of latex 203 nm for the candidate DE-HLNUG MPSS 004 – Labor, UNH: Particle size distribution for latex 203 nm on October 17th 2018 with a peak at 204.18 nm.

Pre-Status October 15 – 16, 2018

Instrument Settings, Time Series, Particle Number Size Distribution and Correlation

Table No. 1:

Institute: **HLNUG**							
Station: **MPSS 005 – Labor**							
Date of checking list: **October 15, 2019**							
Instrument/ Components	*Info*	*SN*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TSI 3082**	**3082001822003**		*ST*	**39.0**	*OFF*	**0.0**
Firmware Classifier:	**2.2**		**10.09.2018**	*CT*	**22.0**	*5 V*	**4.9**
Firmware Software:	**AIM 10**			*OT*	**40.0**	*10 V*	**9.0**
DMA type:	**TSI 3081A**	**3081A1808001**		*CabT*	**33.2**	*1000 V*	**999.7**
CPC model:	**TSI 3772**	**3772180903**		*AP*	**98.5**	*250 V*	**250.0**
Firmware CPC:	**2.16**		**March 2018**	*OP*	**80.7**	*5 V*	**4.9**
radioactive source:	**Kr.85**	**77A-0758**	**May 2018**	*NP*	**2.8**	*OFF*	**0.0**
Flow CPC (l/min):	**1.021**			*LC*	**44.0**	*400 V*	
Flow Inlet (l/min):	**0.994**					*600 V*	
Flow Display (l/min):	**1.04**					*800 V*	
Zero (#/cm^3):	**0**					*650 V*	
Maintenance							
Aerosol inlet:							
Aerosol Nafion dryer:							
Sheath Nafion dryer:							
Source:							
HV power supply:							
DMA:							
Aerosol/sheath RH/T- sensor:							
Pressure sensor:							
Filter:							
NI-card:							
CPC:							
Impactor:							
Setup settings over night:		**settings like on the station**					

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860
Mitglied der Leibniz-Gemeinschaft

Institute: **TROPOS**							
Station: **Reference Instrument No.1**							
Date of checking list: **October 15, 2019**							
Instrument/ Components	*info*	*Serial Number*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TROPOS**	**No.1**		*ST*	**39.0**	*0 V*	**0**
Firmware Classifier:				*CT*	**22.0**	*5 mV*	**4.98**
Firmware Software:	**TROPOS 6.68**			*OT*	**40.0**	*800 mV*	**999.8**
DMA type:	**Hauke medium**		**142**	*CabT*	**27.3**	*200 mV*	**250.0**
CPC model:	**TSI 3772**	**3772141701**		*AP*	**98.5**	*0 V*	**0**
Firmware CPC:	**2.15**			*OP*	**72.1**		
Radioactive source:	**Kr.85**	**NER 8275**	**002/13**	*NP*	**2.8**		
Flow Inlet (l/min):	**1.031**			*LC*	**50**		
Zero (#/cm³):	**0**						

Institute: **TROPOS**					
Station: **Reference Total CPC**					
Date of checking list: **October 15, 2019**					
Instrument/ Components	*info*	*Serial Number*	*Cut off*	*CPC-Status*	
CPC model:	**TSI 3010**	**2410**	**D_{p50} 10 nm**	*ST*	
Firmware CPC:	**2.15**			*CT*	
Flow Inlet (l/min):	**1.015**			*OT*	
Zero (#/cm³):	**0**			*CabT*	
				AP	
				OP	
				NP	
				LC	

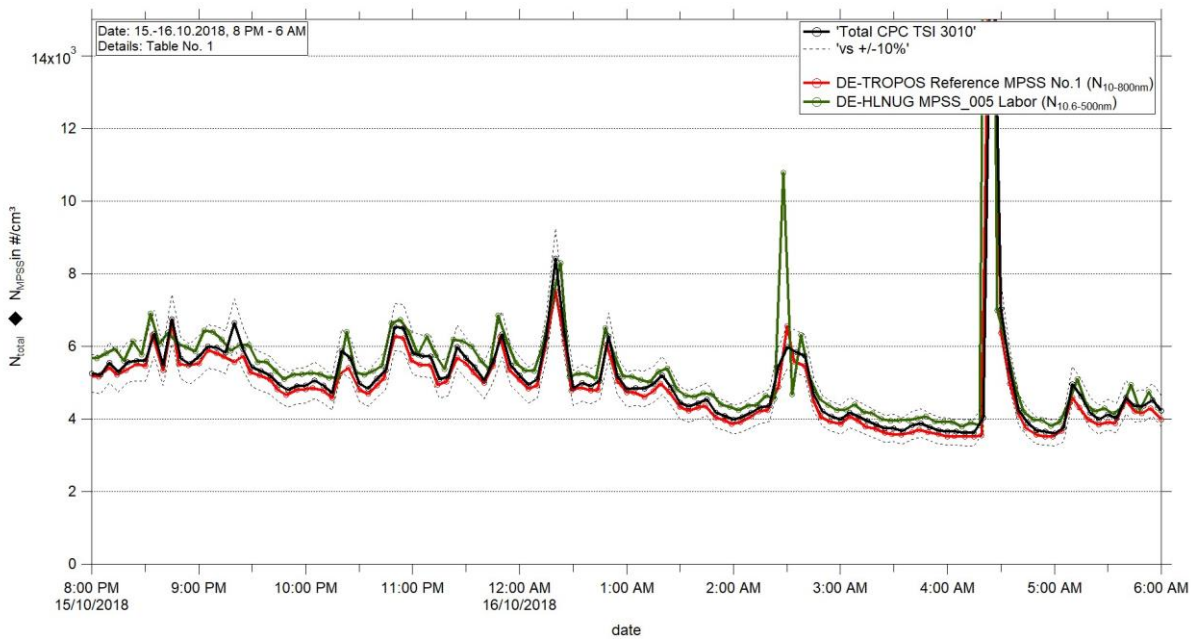


Figure 08: Time series (October 15, 2018 8 PM – October 16, 2018 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$ or $N_{10.6\text{-}500nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included. The candidate is running with the Kr.85 source.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

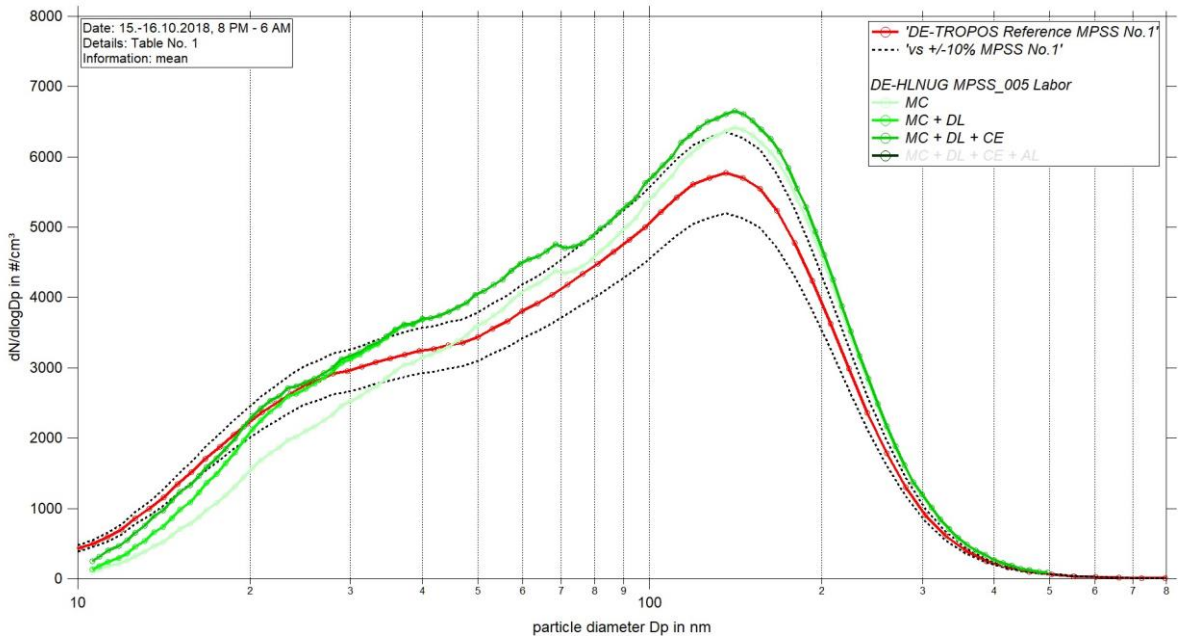


Figure 09: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 15, 2018 8 PM – October 16, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

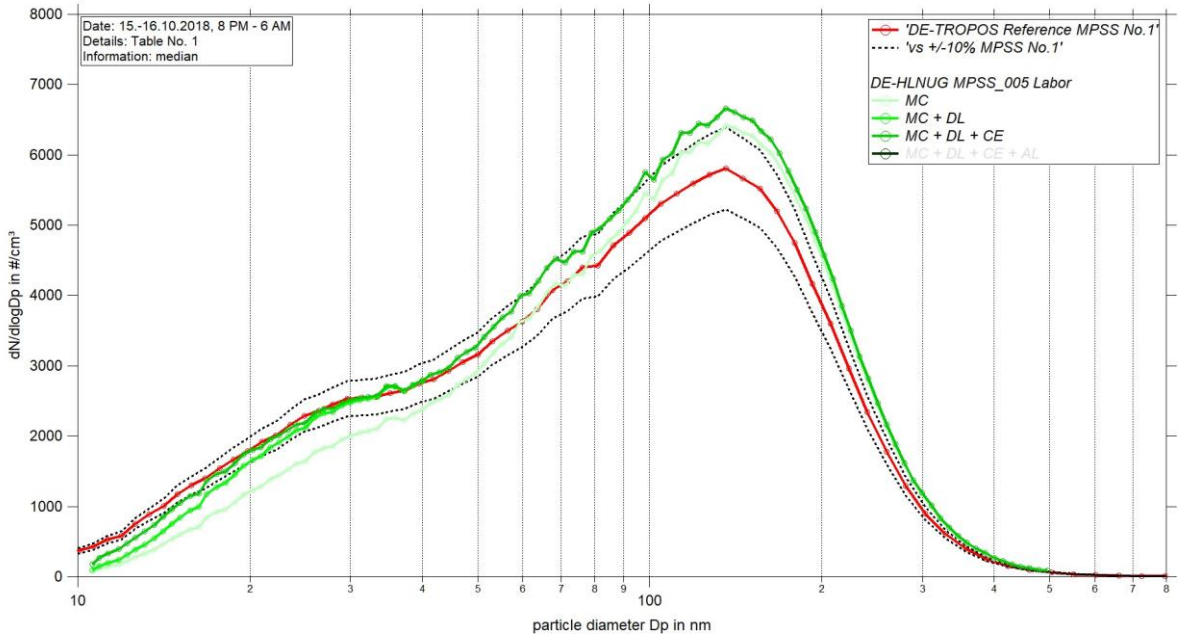


Figure 10: Comparison of median particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 15, 2018 8 PM – October 16, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

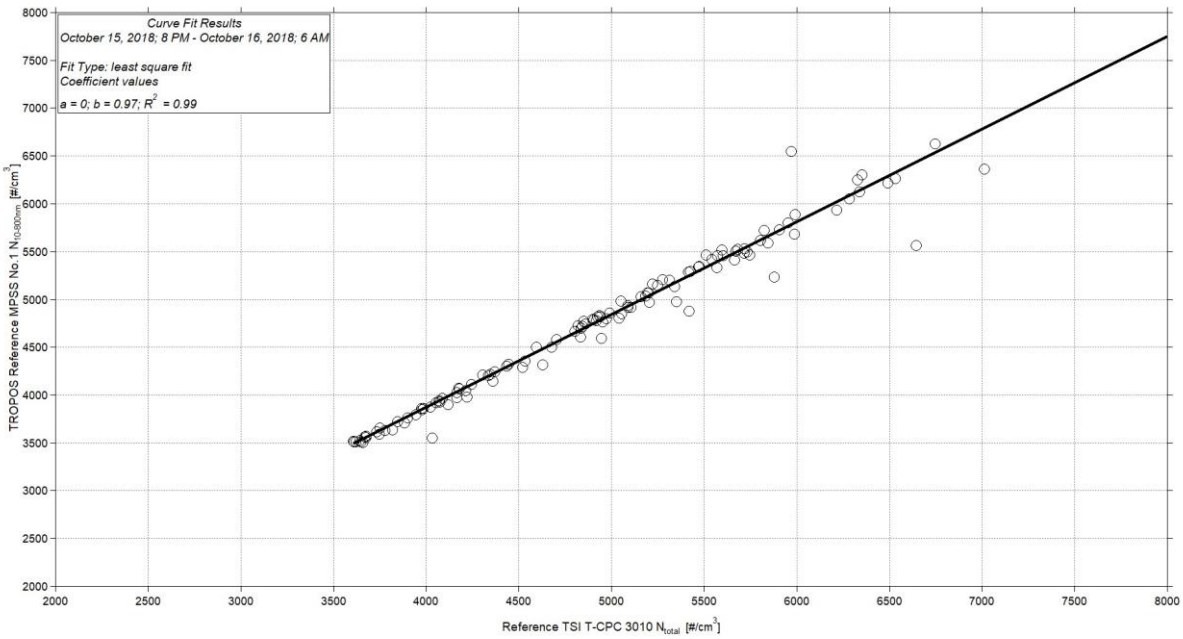


Figure 11: Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and TROPOS Reference MPSS No.1. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

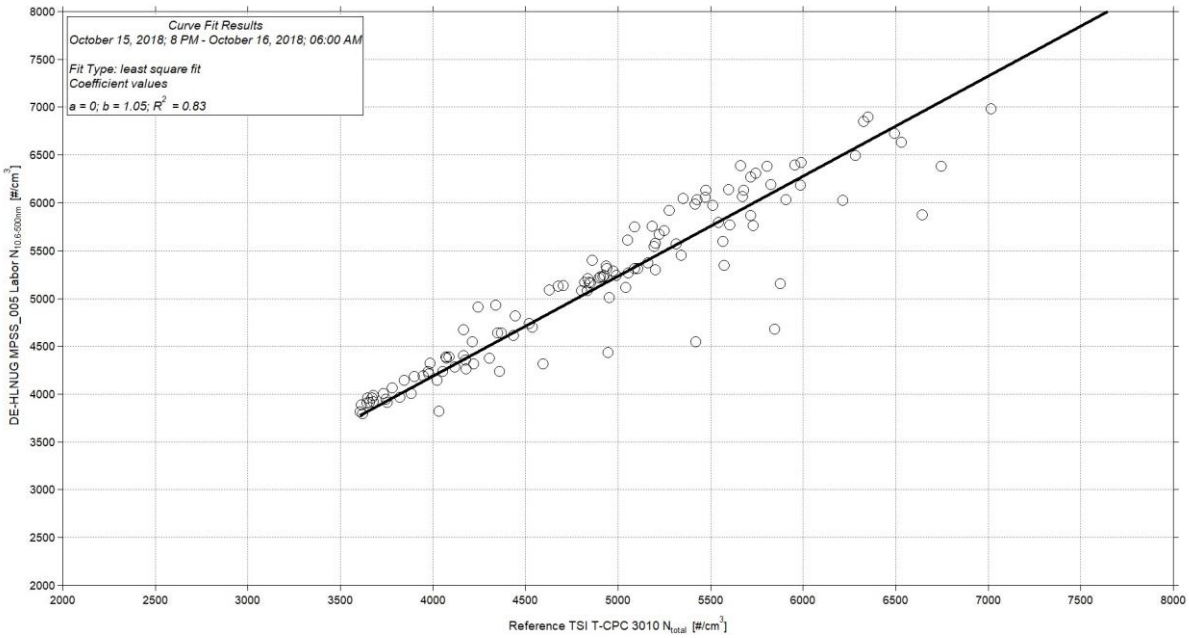


Figure 12: Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and DE-HLNUG MPSS_005 Labor. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

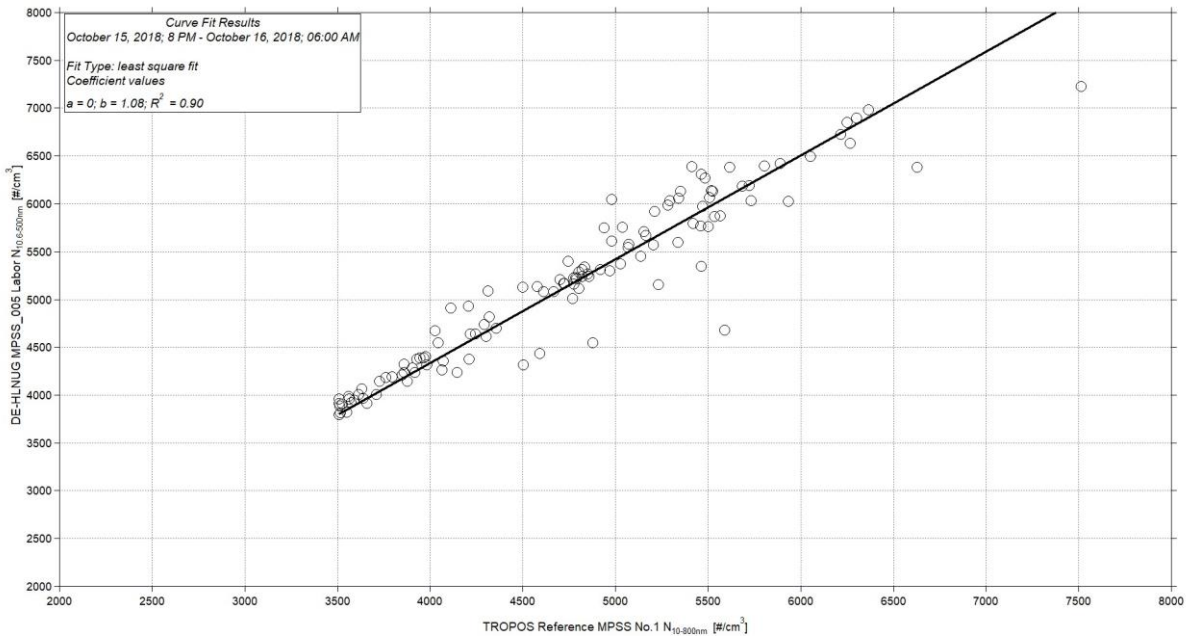


Figure 13: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and DE-HLNUG MPSS_005 Labor. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Status October 16 – 17, 2018

Instrument Settings, Time Series, Particle Number Size Distribution and Correlation

Table No. 2:

Institute: **HLNUG**							
Station: **MPSS 005 – Labor**							
Date of checking list: **October 16, 2019**							
Instrument/ Components	*Info*	*SN*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TSI 3082**	**3082001822003**		*ST*		*OFF*	
Firmware Classifier:	**2.2**		**10.09.2018**	*CT*		*5 V*	
Firmware Software:	**AIM 10**			*OT*		*10 V*	
DMA type:	**TSI 3081A**	**3081A1808001**		*CabT*		*1000 V*	
CPC model:	**TSI 3772**	**3772180903**		*AP*		*250 V*	
Firmware CPC:	**2.16**		**March 2018**	*OP*		*5 V*	
radioactive source:	**Kr.85**	**77A-0758**	**May 2018**	*NP*		*OFF*	
Flow CPC (l/min):	**1.02**			*LC*		*400 V*	
Flow Inlet (l/min):	**1.00**					*600 V*	
Flow Display (l/min):	**0.99**					*800 V*	
Zero (#/cm³):	**0**					*650 V*	
Maintenance							
Aerosol inlet:		**Checked**					
Aerosol Nafion dryer:							
Sheath Nafion dryer:							
Source:							
HV power supply:		**Checked**					
DMA:		**Checked**					
Aerosol/sheath RH/T- sensor:							
Pressure sensor:							
Filter:							
NI-card:							

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860
Mitglied der Leibniz-Gemeinschaft

CPC:	**CPC Workshop -> have a look at the CPC-Report** **CPC was checked and cleaned -> CPC okay**
Impactor:	
Setup settings over night:	**settings like on the station**

Institute: **TROPOS**							
Station: **Reference Instrument No.1**							
Date of checking list: **October 16, 2019**							
Instrument/ Components	*info*	*Serial Number*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TROPOS**	**No.1**		*ST*		*0 V*	
Firmware Classifier:				*CT*		*5 mV*	
Firmware Software:	**TROPOS 6.68**			*OT*		*800 mV*	
DMA type:	**Hauke medium**		**142**	*CabT*		*200 mV*	
CPC model:	**TSI 3772**	**3772141701**		*AP*		*0 V*	
Firmware CPC:	**2.15**			*OP*			
Radioactive source:	**Kr.85**	**NER 8275**	**002/13**	*NP*			
Flow Inlet (l/min):	**1.02**			*LC*			
Zero (#/cm³):	**0**						

Institute: **TROPOS**					
Station: **Reference Total CPC**					
Date of checking list: **October 16, 2019**					
Instrument/ Components	*info*	*Serial Number*	*Cut off*	*CPC-Status*	
CPC model:	**TSI 3010**	**2410**	**D_{p50} 10 nm**	*ST*	
Firmware CPC:	**2.15**			*CT*	
Flow Inlet (l/min):	**1.01**			*OT*	
Zero (#/cm³):	**0**			*CabT*	
				AP	
				OP	
				NP	
				LC	

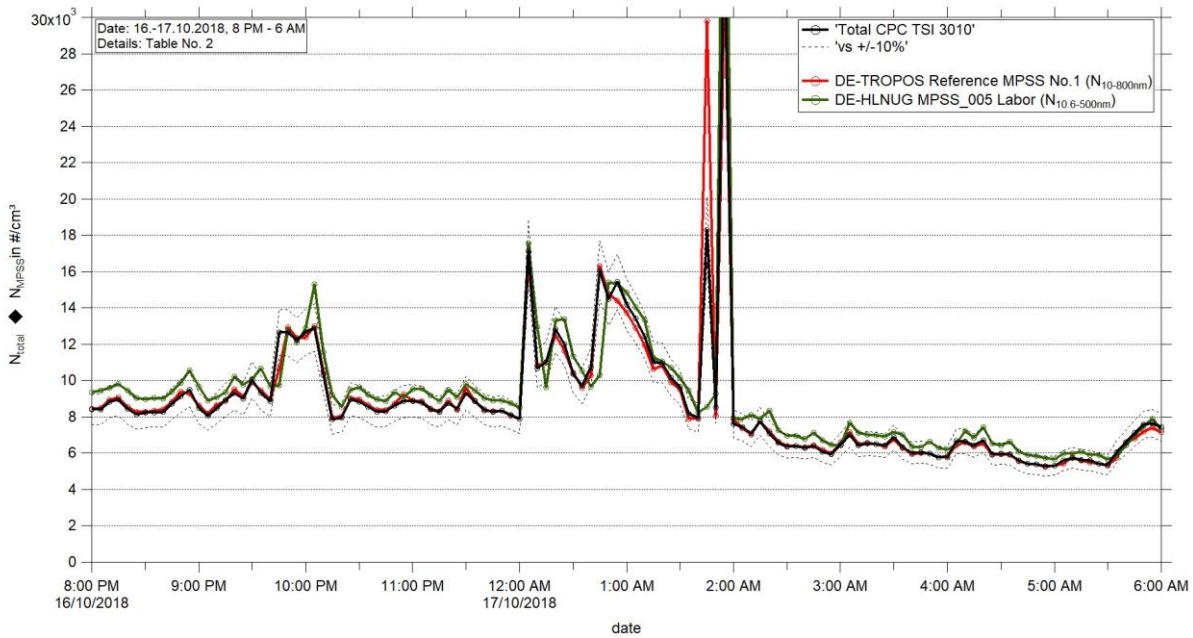


Figure 14: Time series (October 16, 2018 8 PM – October 17, 2018 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$ or $N_{10.6\text{-}500nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

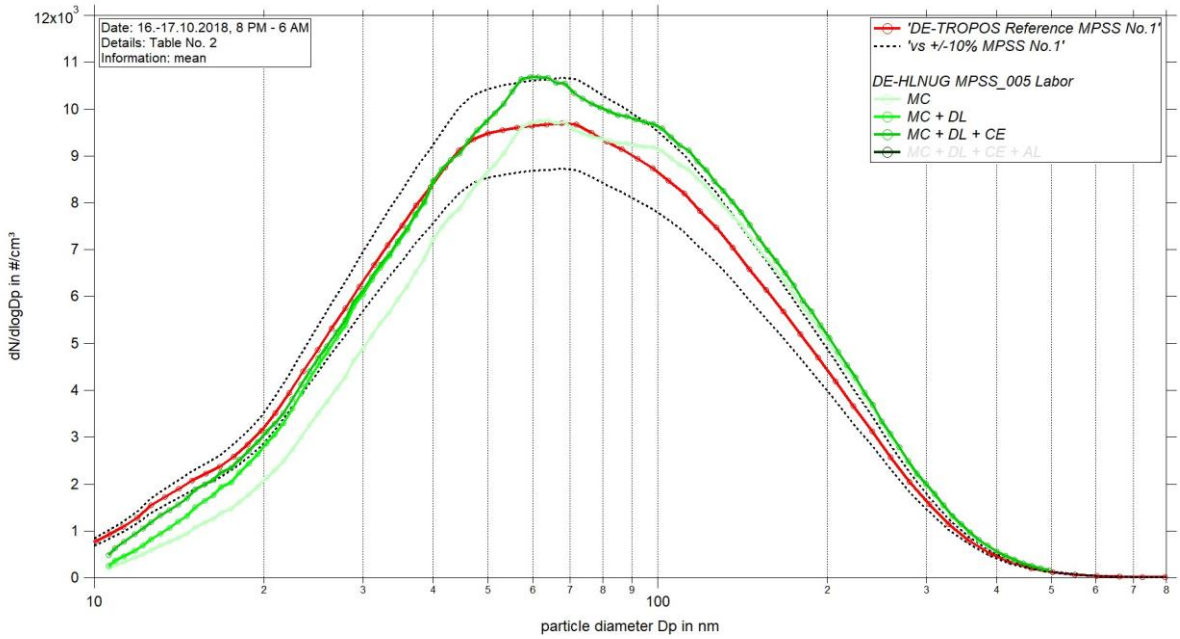


Figure 15: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 16, 2018 8 PM – October 17, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

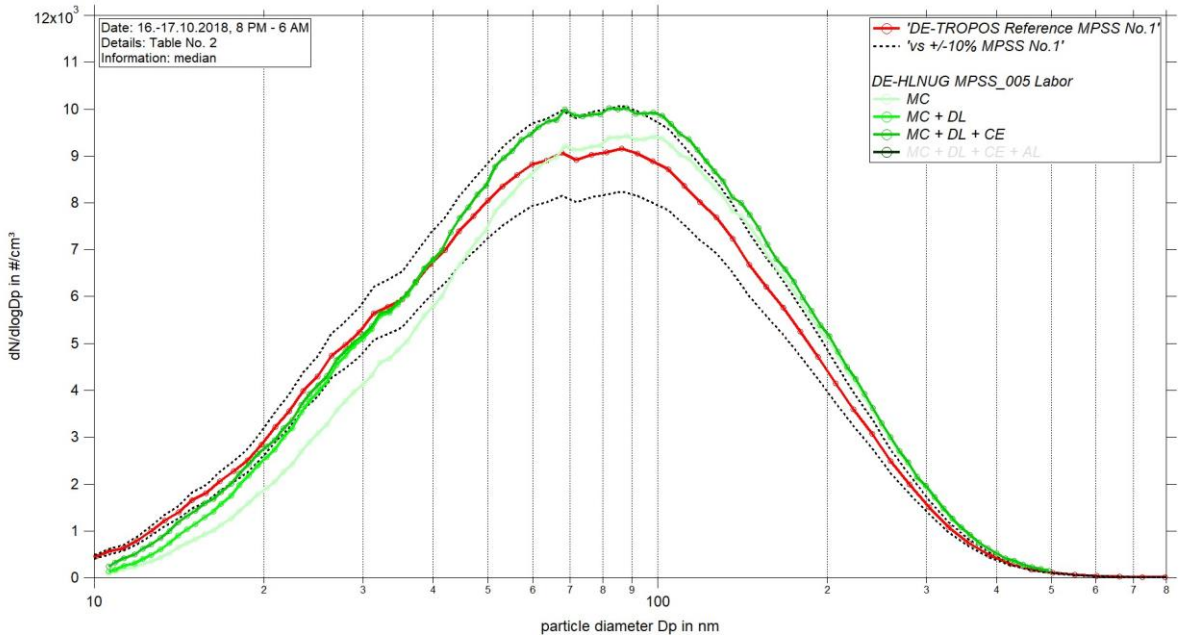


Figure 16: Comparison of median particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 16, 2018 8 PM – October 17, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

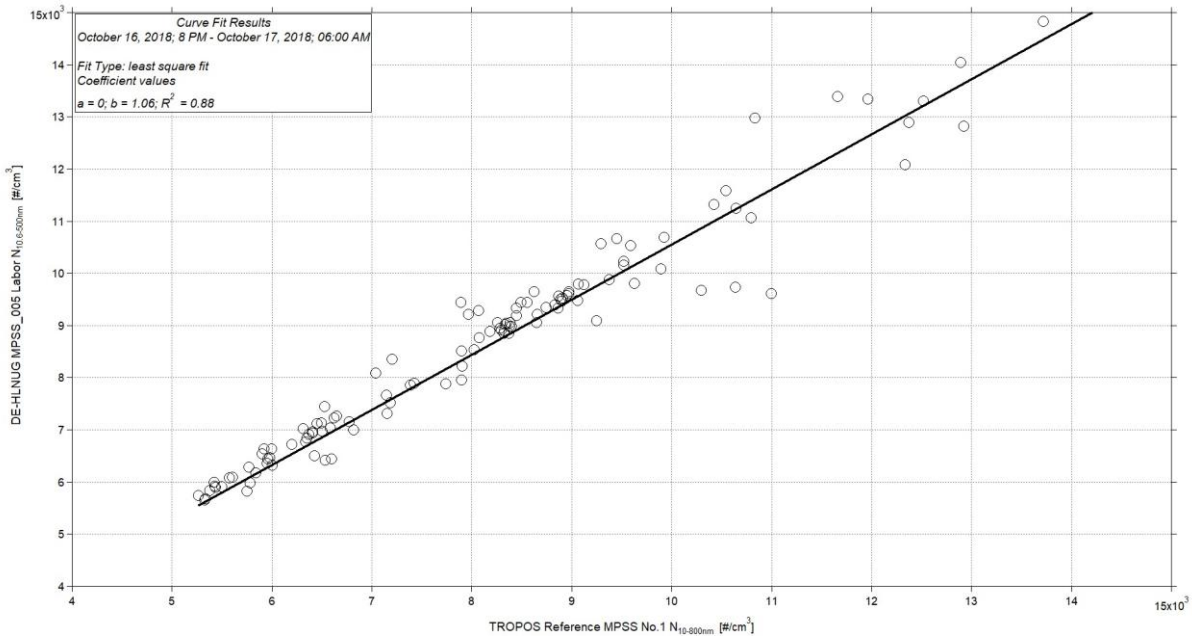


Figure 17: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and DE-HLNUG MPSS_005 Labor. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Status October 17 – 18, 2018

Instrument Settings, Time Series, Particle Number Size Distribution and Correlation

Table No. 3:

Institute: **HLNUG**							
Station: **MPSS 005 – Labor**							
Date of checking list: **October 17, 2019**							
Instrument/ Components	*Info*	*SN*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TSI 3082**	**3082001822003**		*ST*		*OFF*	
Firmware Classifier:	**2.2**		**10.09.2018**	*CT*		*5 V*	
Firmware Software:	**AIM 10**			*OT*		*10 V*	
DMA type:	**TSI 3081A**	**3081A1810001**		*CabT*		*1000 V*	
CPC model:	**TSI 3772**	**3772180903**		*AP*		*250 V*	
Firmware CPC:	**2.16**		**March 2018**	*OP*		*5 V*	
radioactive source:	**Kr.85**	**77A-0758**	**May 2018**	*NP*		*OFF*	
Flow CPC (l/min):				*LC*		*400 V*	
Flow Inlet (l/min):						*600 V*	
Flow Display (l/min):						*800 V*	
Zero (#/cm³):	**0**					*650 V*	
Maintenance							
Aerosol inlet:							
Aerosol Nafion dryer:							
Sheath Nafion dryer:							
Source:							
HV power supply:							
DMA:		**Running with DMA_003**					
Aerosol/sheath RH/T- sensor:							
Pressure sensor:							
Filter:							
NI-card:							

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860
Mitglied der Leibniz-Gemeinschaft

CPC:	
Impactor:	
Setup settings over night:	**No changes**

Institute: **TROPOS**							
Station: **Reference Instrument No.1**							
Date of checking list: **October 17, 2019**							
Instrument/ Components	*info*	*Serial Number*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TROPOS**	**No.1**		*ST*		*0 V*	
Firmware Classifier:				*CT*		*5 mV*	
Firmware Software:	**TROPOS 6.68**			*OT*		*800 mV*	
DMA type:	**Hauke medium**		**142**	*CabT*		*200 mV*	
CPC model:	**TSI 3772**	**3772141701**		*AP*		*0 V*	
Firmware CPC:	**2.15**			*OP*			
Radioactive source:	**Kr.85**	**NER 8275**	**002/13**	*NP*			
Flow Inlet (l/min):	**1.02**			*LC*			
Zero (#/cm³):	**0**						

Institute: **TROPOS**					
Station: **Reference Total CPC**					
Date of checking list: **October 17, 2019**					
Instrument/ Components	*info*	*Serial Number*	*Cut off*	*CPC-Status*	
CPC model:	**TSI 3010**	**2410**	**D_{p50} 10 nm**	*ST*	
Firmware CPC:	**2.15**			*CT*	
Flow Inlet (l/min):	**1.01**			*OT*	
Zero (#/cm³):	**0**			*CabT*	
				AP	
				OP	
				NP	
				LC	

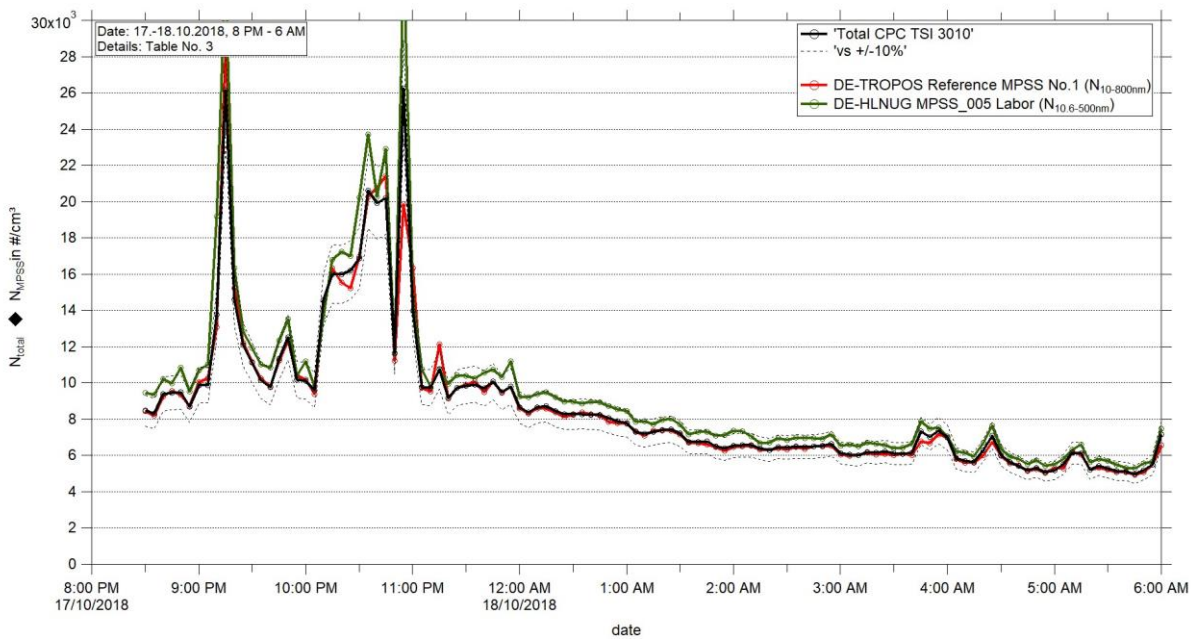


Figure 18: Time series (October 17, 2018 8 PM – October 18, 2018 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$ or $N_{10.6\text{-}500nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860
Mitglied der Leibniz-Gemeinschaft

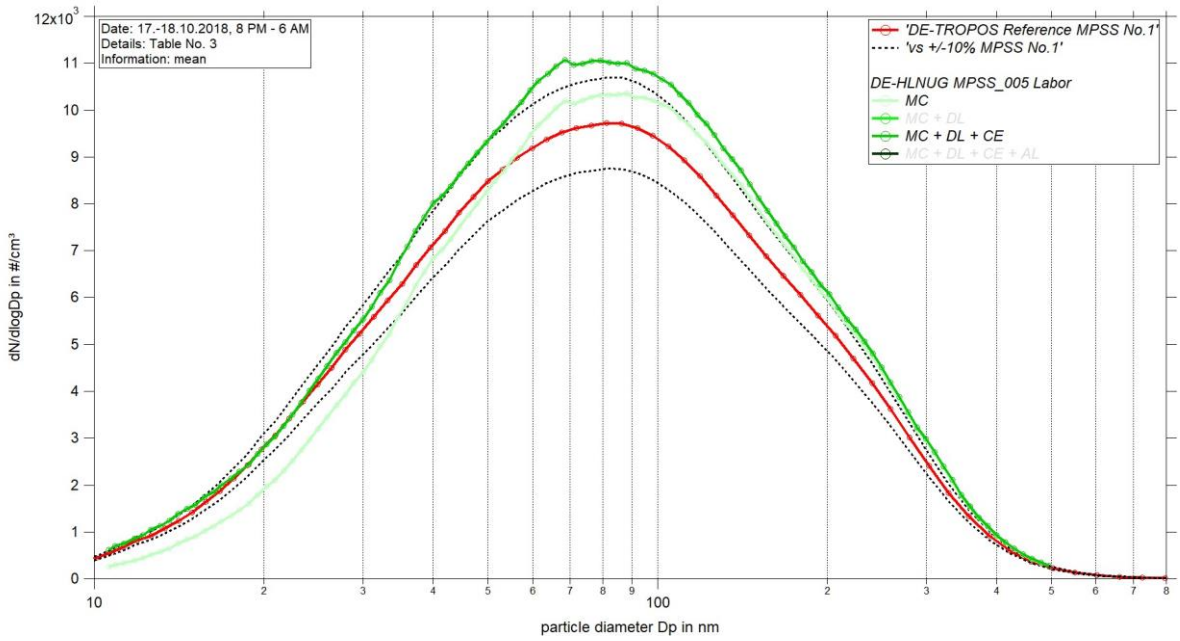


Figure 19: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 17, 2018 8 PM – October 18, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

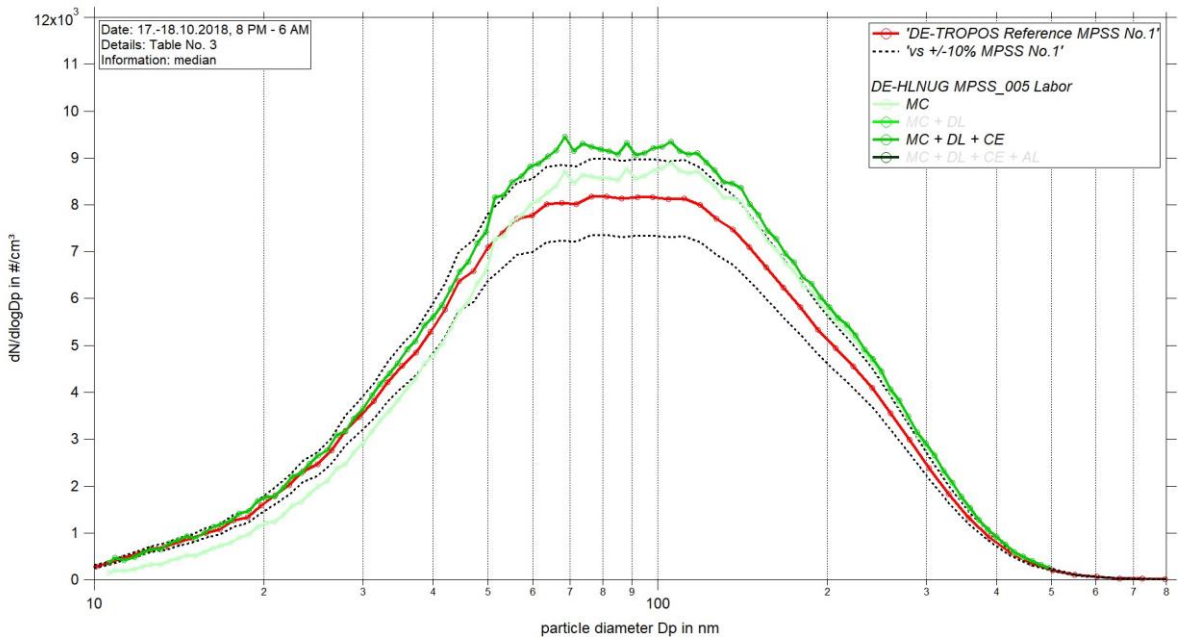


Figure 20: Comparison of median particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 17, 2018 8 PM – October 18, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

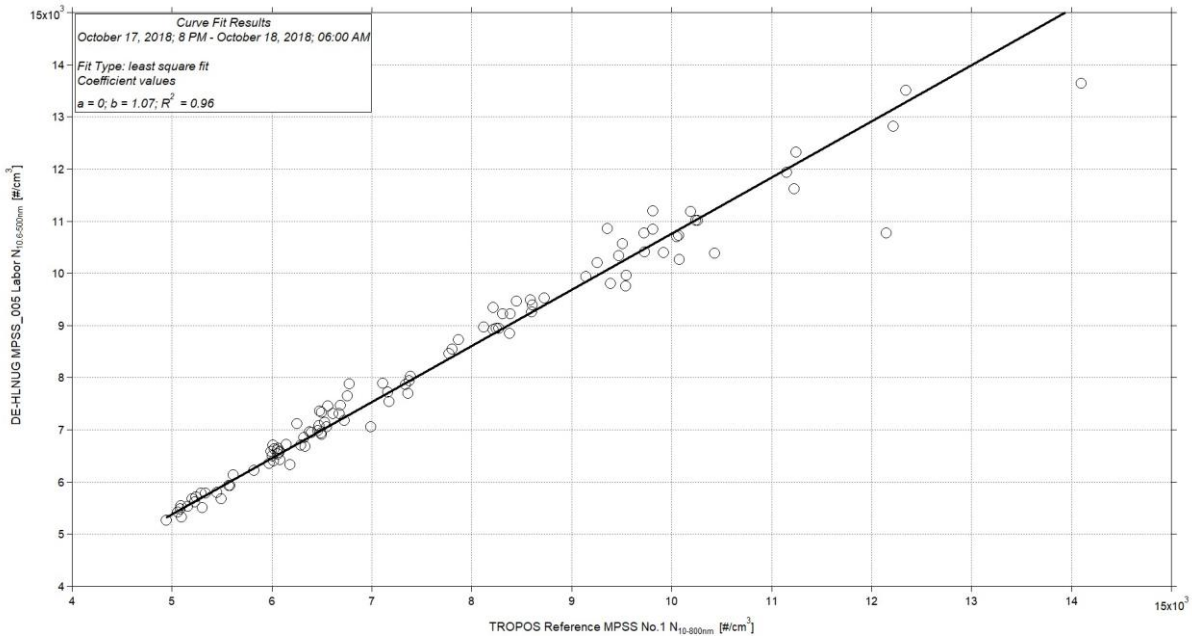


Figure 21: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and DE-HLNUG MPSS_005 Labor. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Final-Status October 18 – 19, 2018

Instrument Settings, Time Series, Particle Number Size Distribution and Correlation

Table No. 4:

Institute: **HLNUG**							
Station: **MPSS 005 – Labor**							
Date of checking list: **October 18, 2019**							
Instrument/ Components	*Info*	*SN*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TSI 3082**	**3082001822003**		*ST*		*OFF*	
Firmware Classifier:	**2.2**		**10.09.2018**	*CT*		*5 V*	
Firmware Software:	**AIM 10**			*OT*		*10 V*	
DMA type:	**TSI 3081A**	**3081A1808001**		*CabT*		*1000 V*	
CPC model:	**TSI 3772**	**3772180903**		*AP*		*250 V*	
Firmware CPC:	**2.16**		**March 2018**	*OP*		*5 V*	
radioactive source:	**Kr.85**	**77A-0758**	**May 2018**	*NP*		*OFF*	
Flow CPC (l/min):				*LC*		*400 V*	
Flow Inlet (l/min):						*600 V*	
Flow Display (l/min):						*800 V*	
Zero (#/cm^3):	**0**					*650 V*	
Maintenance							
Aerosol inlet:							
Aerosol Nafion dryer:							
Sheath Nafion dryer:							
Source:							
HV power supply:							
DMA:		**Original DMA**					
Aerosol/sheath RH/T- sensor:							
Pressure sensor:							

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Filter:	
NI-card:	
CPC:	
Impactor:	
Setup settings over night:	**Original settings** **Scan 120s**

Institute: **TROPOS**							
Station: **Reference Instrument No.1**							
Date of checking list: **October 18, 2019**							
Instrument/ Components	*info*	*Serial Number*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TROPOS**	**No.1**		*ST*		*0 V*	
Firmware Classifier:				*CT*		*5 mV*	
Firmware Software:	**TROPOS 6.68**			*OT*		*800 mV*	
DMA type:	**Hauke medium**		**142**	*CabT*		*200 mV*	
CPC model:	**TSI 3772**	**3772141701**		*AP*		*0 V*	
Firmware CPC:	**2.15**			*OP*			
Radioactive source:	**Kr.85**	**NER 8275**	**002/13**	*NP*			
Flow Inlet (l/min):	**1.02**			*LC*			
Zero (#/cm^3):	**0**						

Institute: **TROPOS**					
Station: **Reference Total CPC**					
Date of checking list: **October 18, 2019**					
Instrument/ Components	*info*	*Serial Number*	*Cut off*	*CPC-Status*	
CPC model:	**TSI 3010**	**2410**	**D_{p50} 10 nm**	*ST*	
Firmware CPC:	**2.15**			*CT*	
Flow Inlet (l/min):	**1.01**			*OT*	
Zero (#/cm^3):	**0**			*CabT*	
				AP	
				OP	
				NP	
				LC	

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

Mitglied der Leibniz-Gemeinschaft

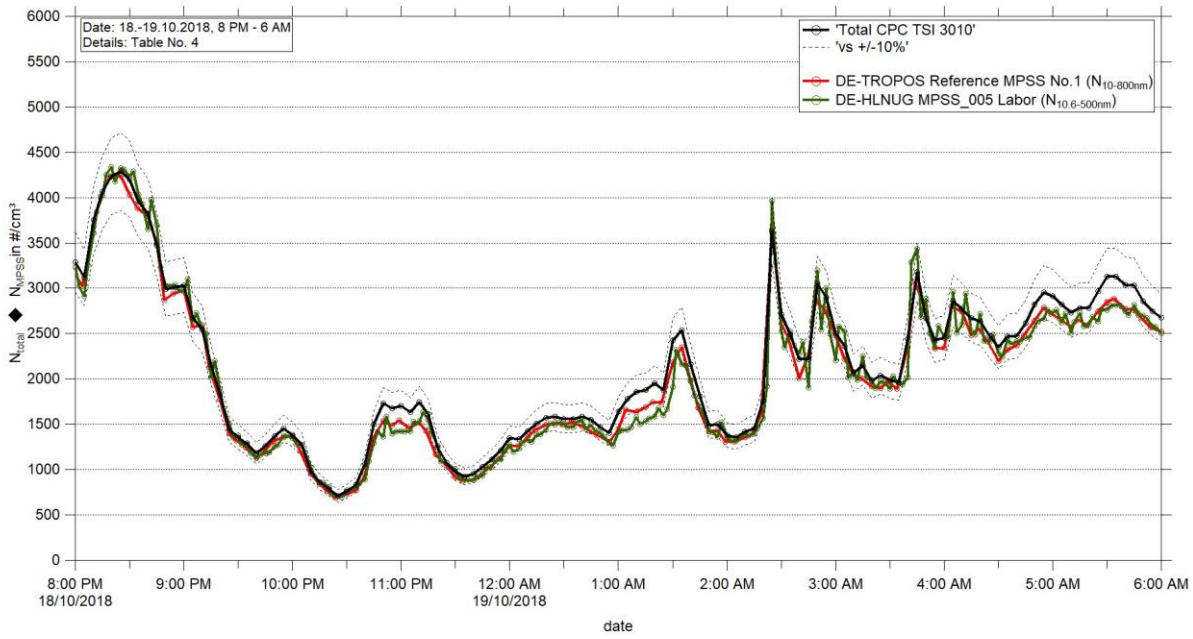


Figure 22: Time series (October 18, 2018 8 PM – October 19, 2018 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$ or $N_{10.6\text{-}500nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

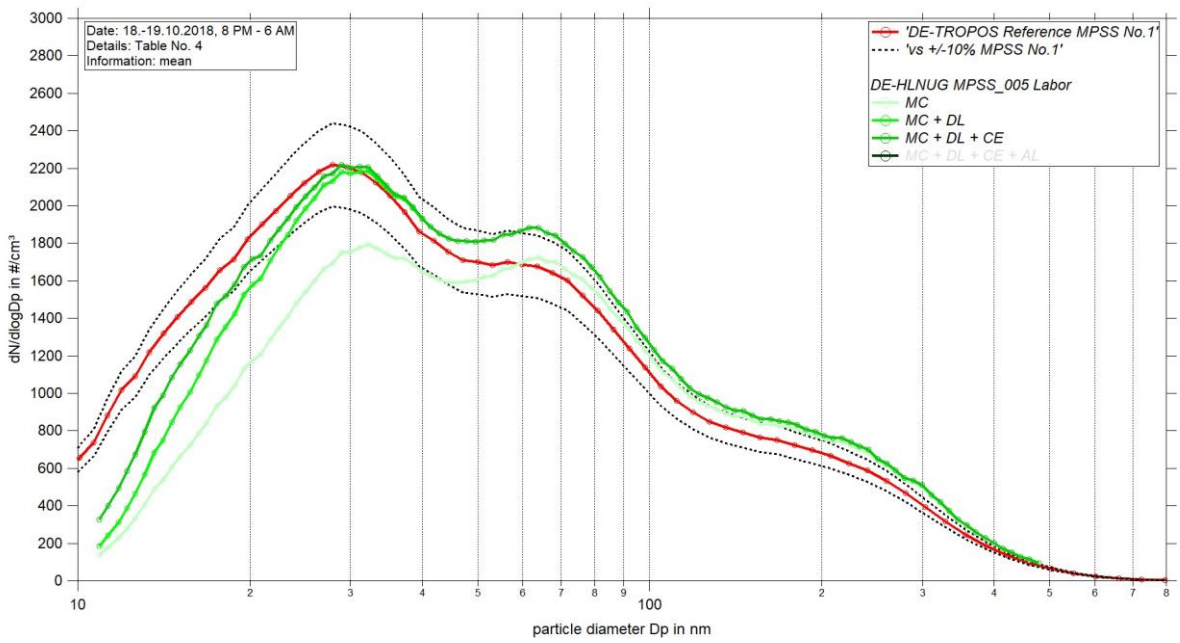


Figure 23: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against DE-HLNUG MPSS_005 Labor from October 18, 2018 8 PM – October 19, 2018 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de
Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860
Mitglied der Leibniz-Gemeinschaft

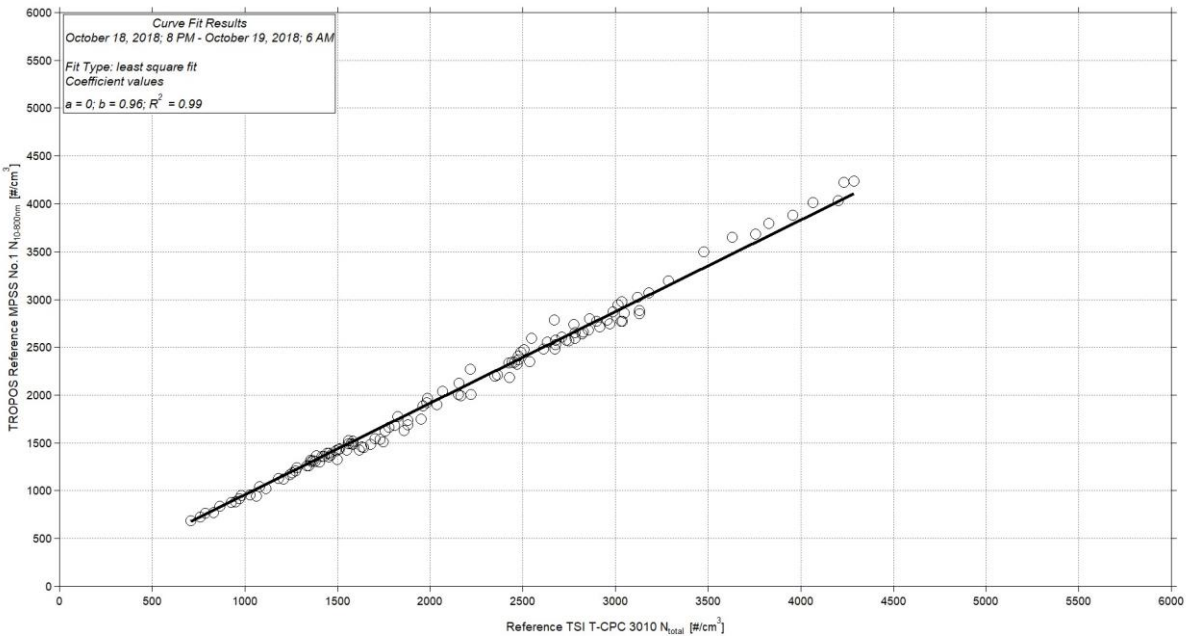


Figure 24 Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and TROPOS Reference MPSS No.1. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

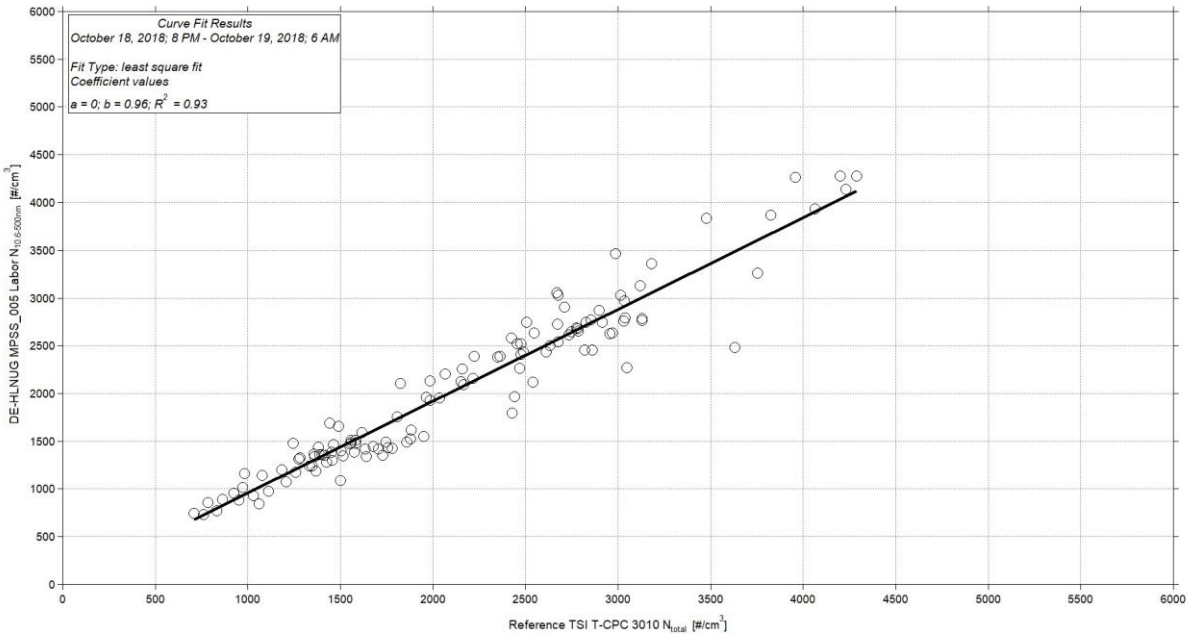


Figure 25: Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and DE-HLNUG MPSS_005 Labor. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

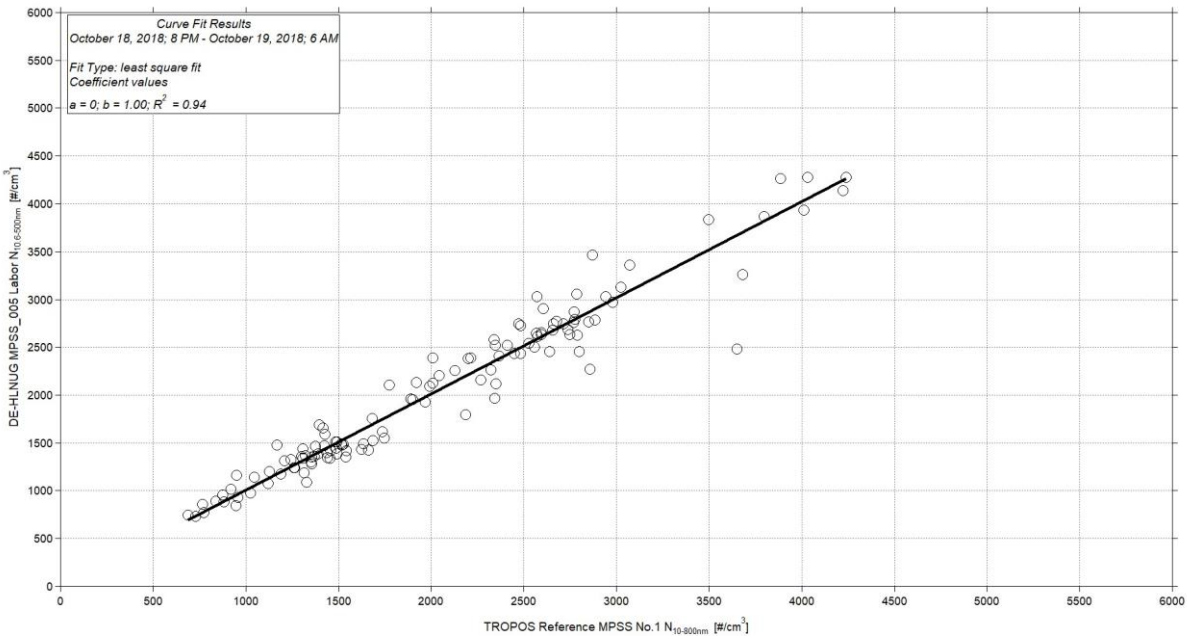


Figure 26: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and DE-HLNUG MPSS_005 Labor. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860