Intercomparison of Mobility Particle Size Spectrometers

Project No.:	*MPSS-2018-2-1*
Principal Investigator:	Karine Sellegri
Home Institution:	CNRS-LaMP
Participant:	David Picard
Candidate:	**France Puy de Dôme**
Made by:	**home-made**
Counter (SN):	TSI 3010; SN: 2257
Software:	home-made
Location of the quality assurance:	TROPOS Leipzig, lab 118
Comparison period:	March 12, 2018 – March 16, 2018
Last Intercomparison (with Project No.):	*March 2017*

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Summary of Intercomparison:

Pre-Status:
The instrument arrived with participant. The instrument was running with the own home-made software. During the Pre-Status, the candidate showed a concentration 9% lower than the TROPOS Reference MPSS No.6. The PSL check showed a peak at 202.8 nm.

Final-Status:
During the Pre-Status, the candidate showed a concentration 1% higher than the TROPOS Reference MPSS No.6. The instrument was checked and cleaned. The candidate passed the quality standards of ACTRIS and GAW.

Information about the instruments:
Date of check: March 12, 2018

List of Components	TROPOS Reference MPSS No.6		Candidate
Position	Line 1		Line 1
Company	TROPOS		CNRS-LaMP
Software	TROPOS		CNRS-LaMP
CPC-MPSS	TSI CPC, Model 3772		TSI CPC 3010
CPC-total	TSI CPC, Model 3010		
flow ratio	1.0 : 5.0		1.0:5.0
source	Ni.63		Kr.85
HV power supply	Positive		Positive
DMA	Hauke medium		TSI 3081
aerosol dryer	✓		
aerosol RH- sensor	✓		✓
aerosol T-sensor	✓		✓
sheath RH-sensor	✓		✓
sheath T-sensor	✓		✓
Sheath dryer	✓		✓
pressure sensor	✓		✓
info			

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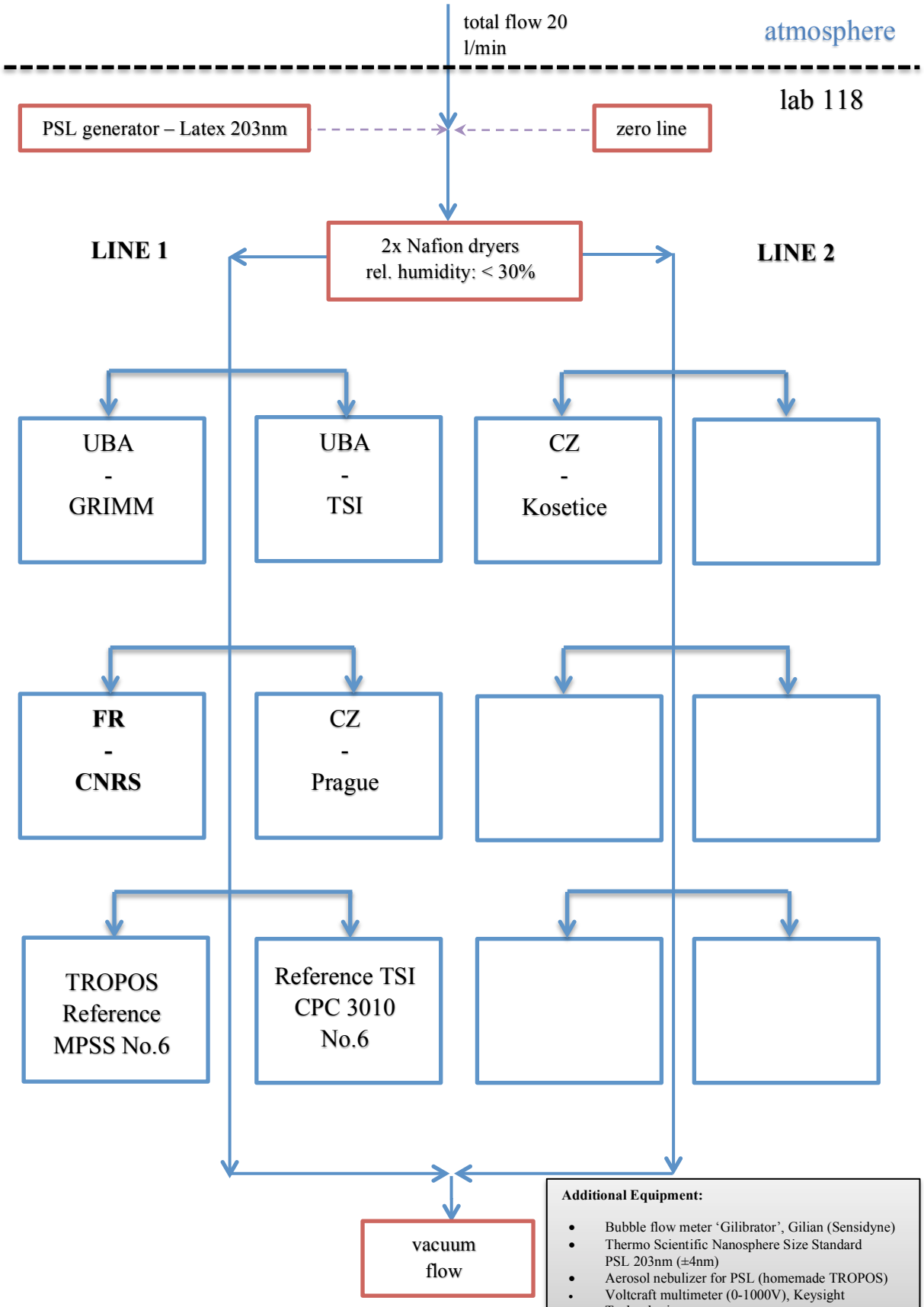
Laboratory setup:



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Status of the instruments:

Date of system checks:

date	12.03.2018	13.03.2018	14.03.2018	15.03.2018	unit
total CPC flow	-	-	-	-	l/min
aerosol flow (DMA)	-	-	-	-	l/min
aerosol flow (UDMA)	-	-	-	-	l/min
aerosol flow (total)	1.025	0.998	0.996	-	l/min
Zero MPSS				-	#/cm³
Zero total CPC			✓		#/cm³
PSL 203 nm			✓		nm
HV check	✓		✓		V

Special Information regarding the Candidate:

Was it necessary to:	yes/no (date)	old part (ID/SN)	new part (ID/SN)	information
clean the aerosol inlet	No	-	-	checked
change aerosol Nafion dryer	No	-	-	checked
change sheath Nafion dryer	No	-	-	checked
check source	No	-	-	checked
change HV power supply	No	-	-	checked
clean/change DMA	No	-	-	checked
change aerosol RH/T-sensor	No	-	-	checked
change sheath RH/T-sensor	No	-	-	checked
change pressure sensor	No	-	-	checked
change inlet Nafion dryer (500)	No	-	-	checked
Change Total filter	No	-	-	checked
NI-card	No			checked

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

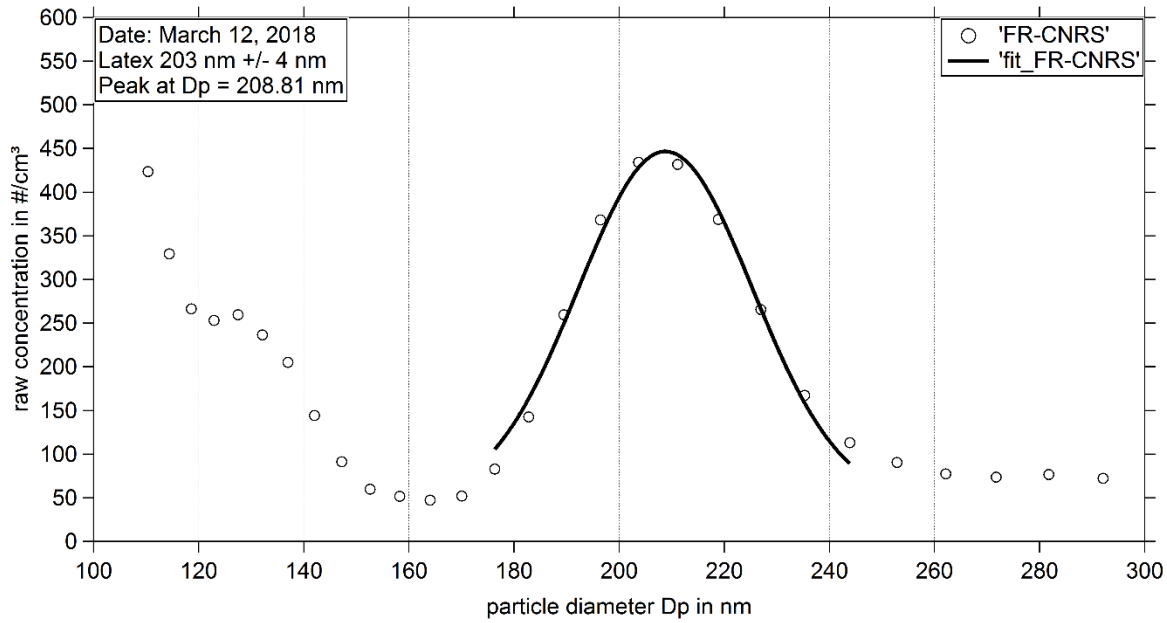

Figure 01: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 12, 2018.

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

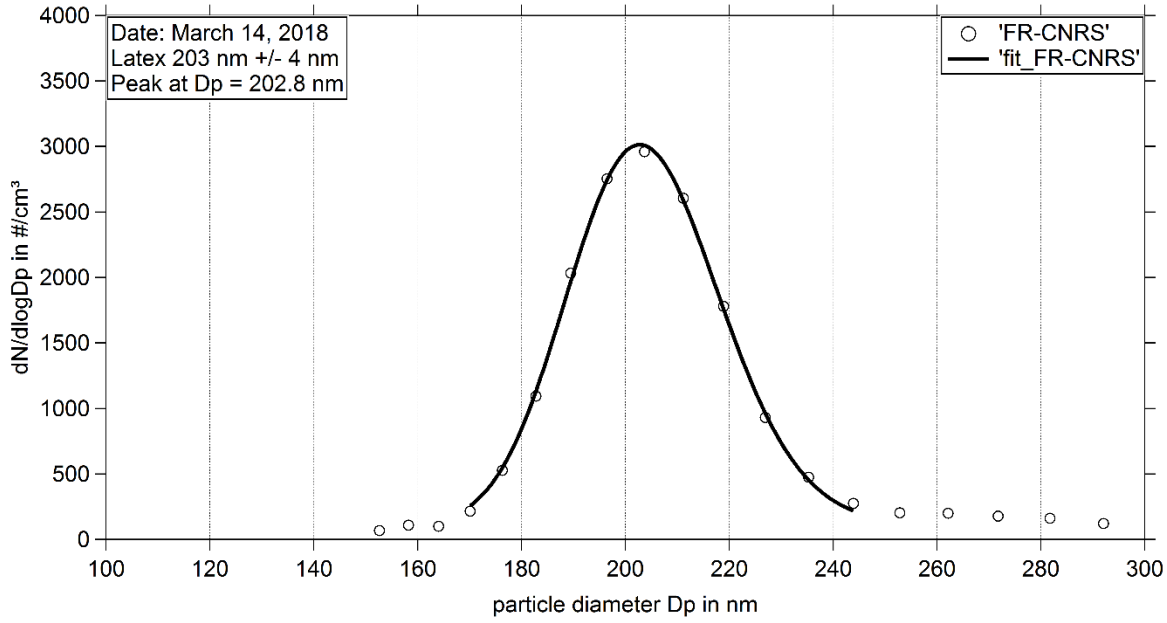

Figure 02: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 14, 2018

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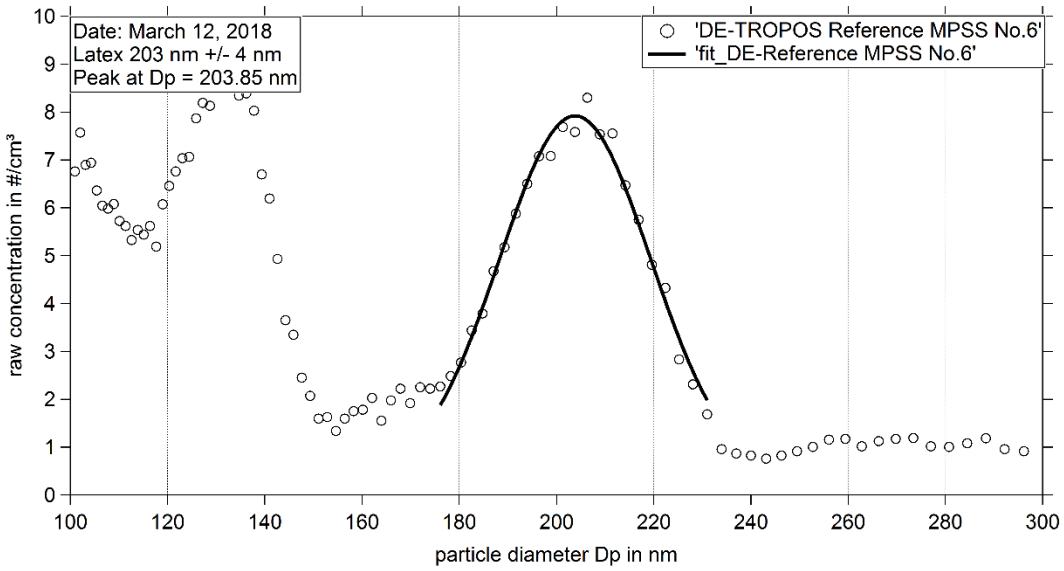

Figure 03: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 12, 2018.

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

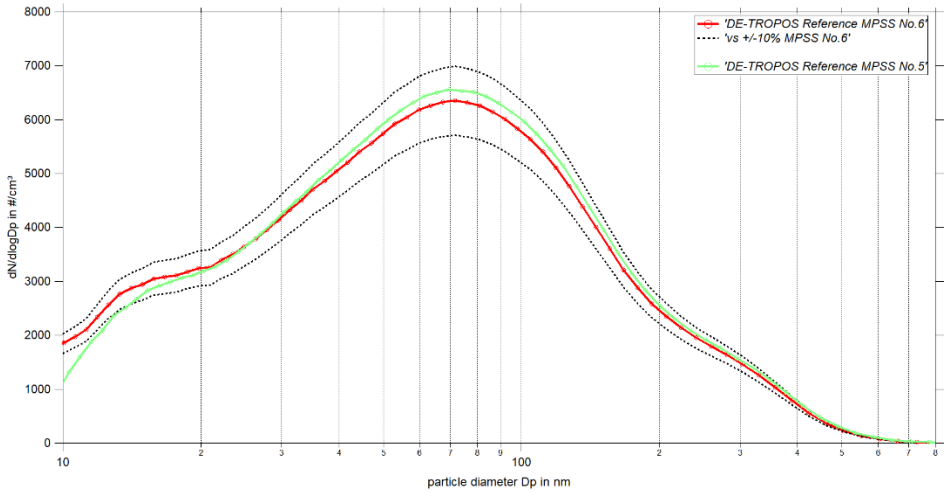

Figure 04: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against TROPOS Reference MPSS No.5 from February 19, 2018 08:00 PM – February 20, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

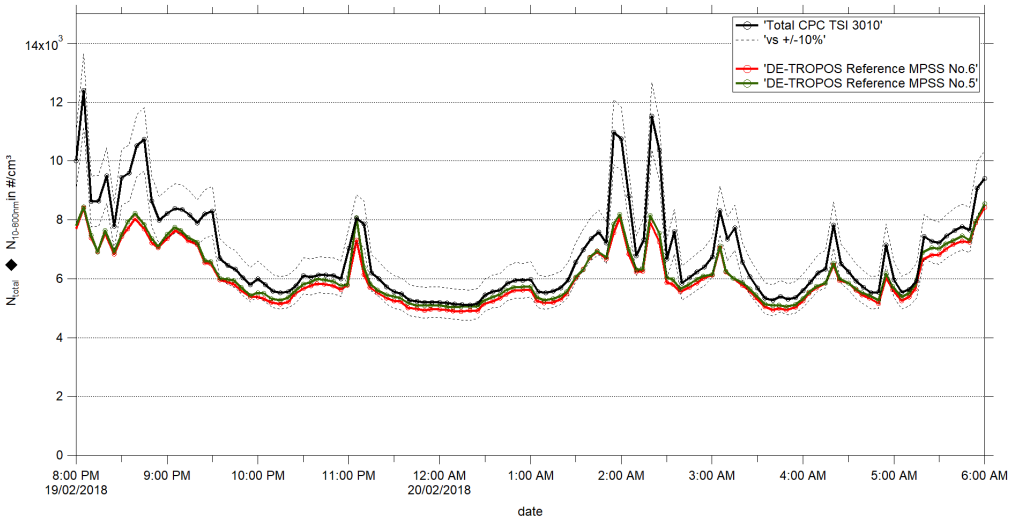

Figure 05: Time series (February 19, 2018 08:00 PM – February 20, 2018 06:00 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

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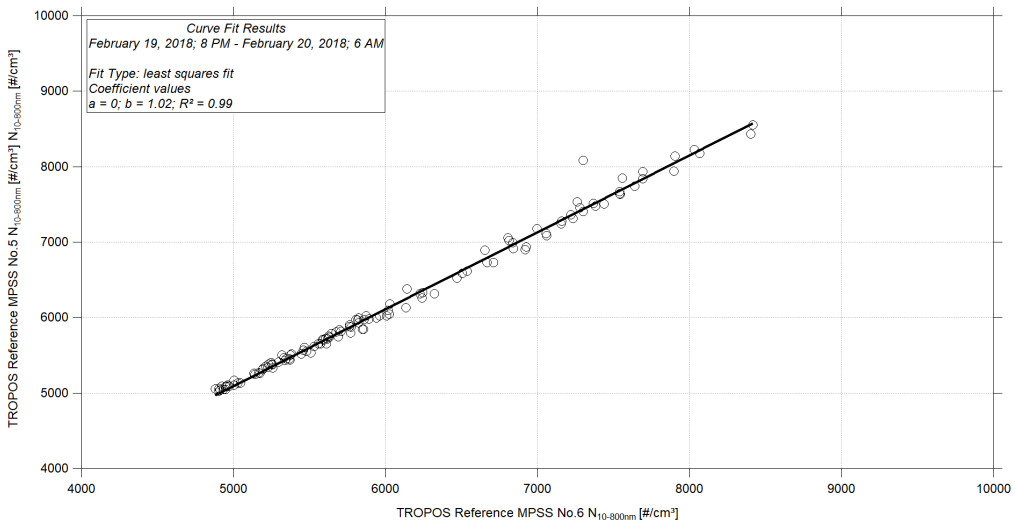

Figure 06: Linear regression between the number concentrations of the TROPOS Reference MPSS No.6 and TROPOS Reference MPSS No.5. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Status of the TROPOS Reference Instruments: Particle Number Size Distribution

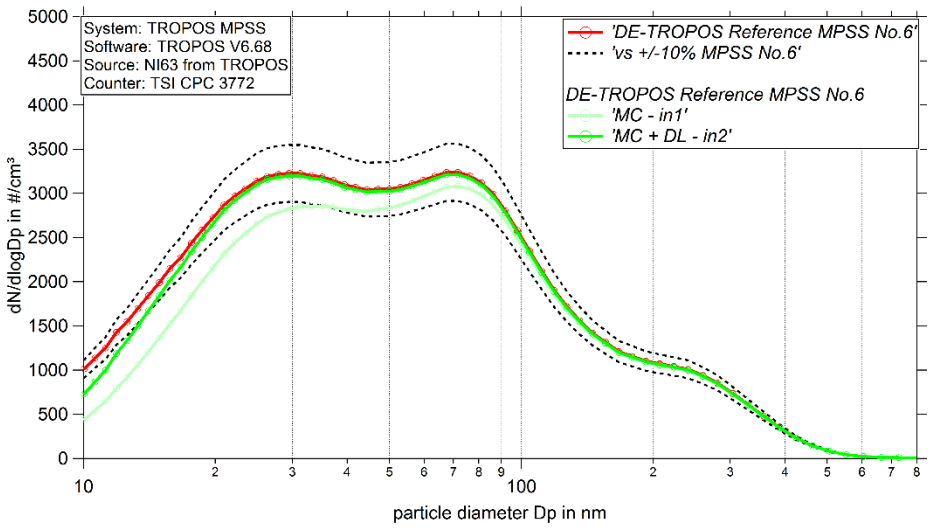

Figure 07: Comparison of mean particle number size distribution of TROPOS Reference TSI CPC Model 3010 Ref 6 against TROPOS Reference MPSS No.6 from March 12, 2018 08:00 PM – March 13, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

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Status of the TROPOS Reference Instruments: Time Series

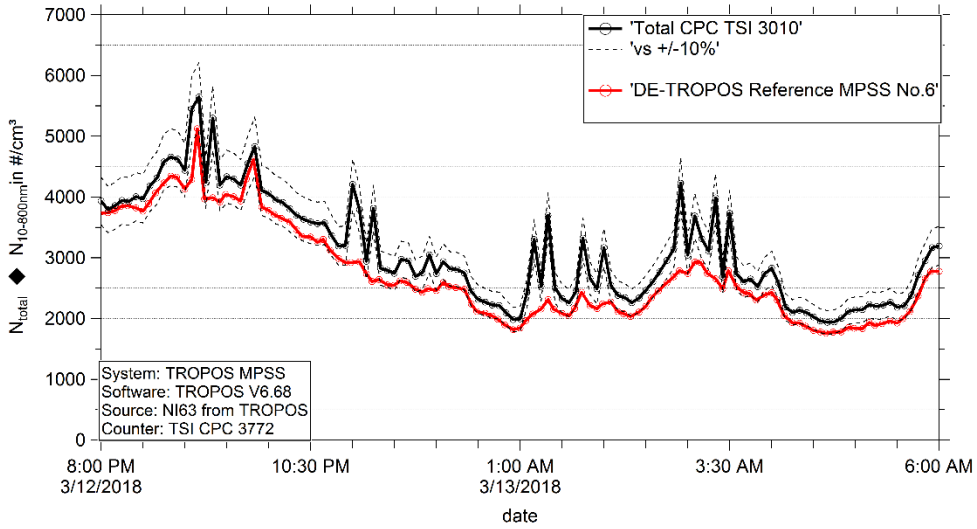

Figure 08: Time series (March 12, 2018 08:00 PM – March 13, 2018 06:00 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion for the candidate was performed using TROPOS software.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

Status of the TROPOS Reference Instruments: Correlation

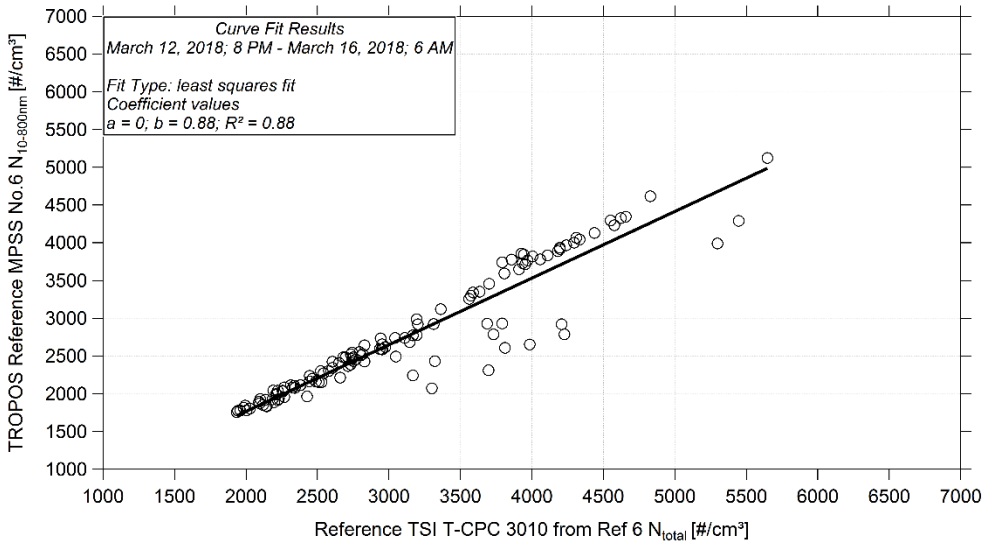

Figure 09: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 Ref 6 and TROPOS Reference MPSS No.6. Multiple charge correction, internal diffusion losses and CPC flow corrections are included

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Pre-Status of the Candidate: Particle Number Size Distribution

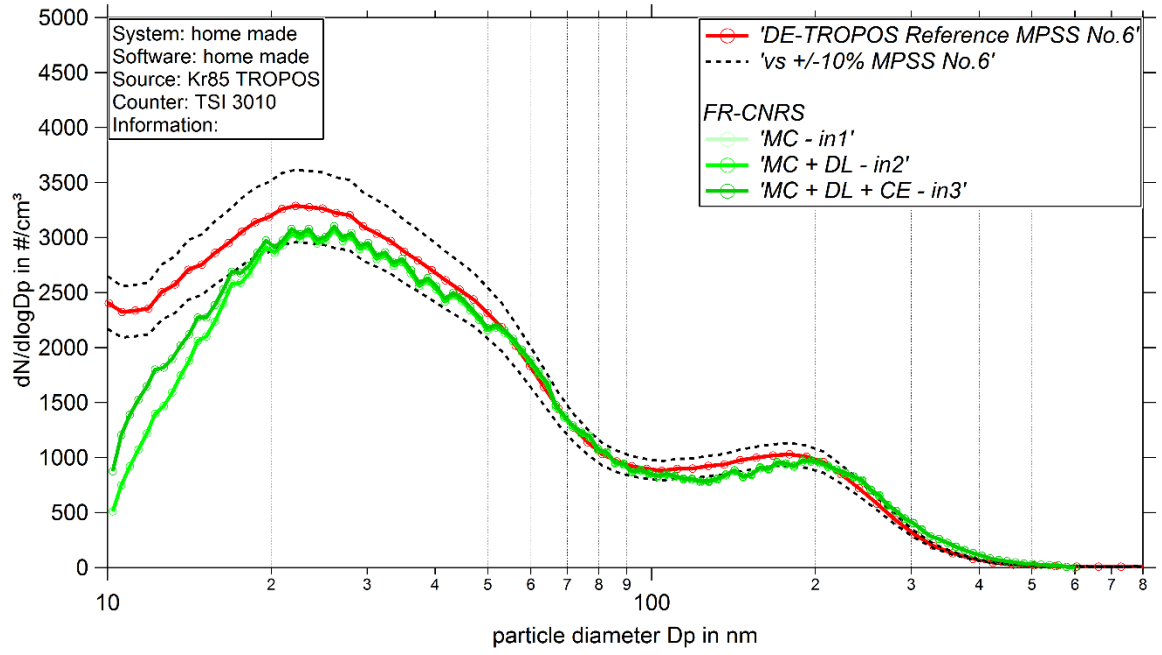

Figure 10: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 CZ-CAS Kosetice from March 12, 2018 08:00 PM – March 13, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Pre-Status of the Candidate: Time Series and Correlation

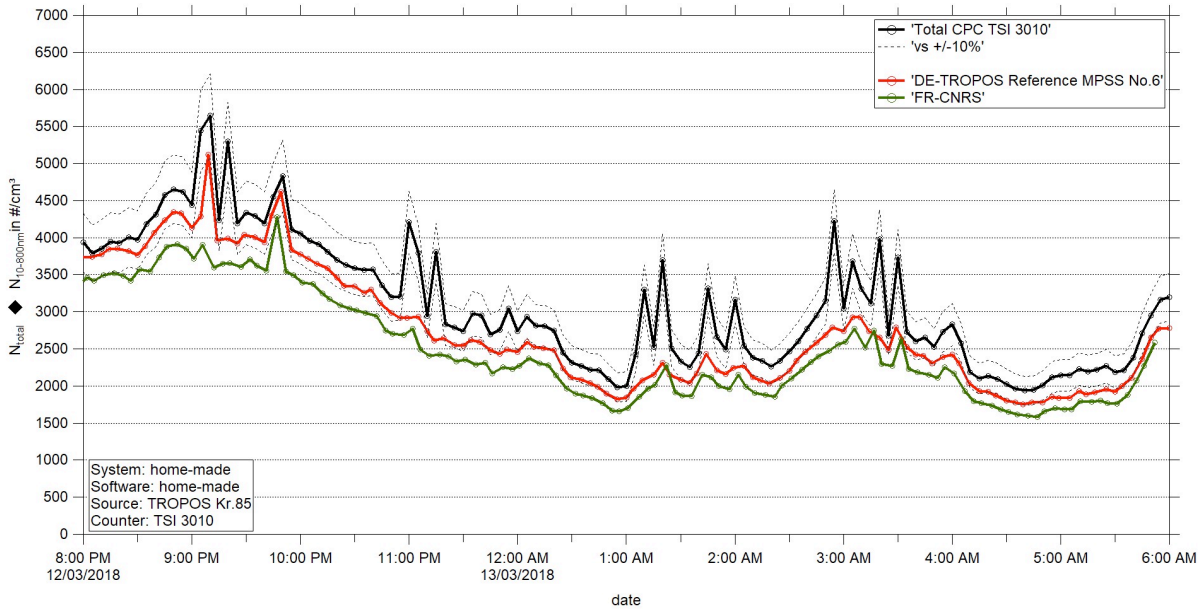

Figure 11: Time series (March 12, 2018 08:00 PM – March 13, 2018 06:00 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion and corrections for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

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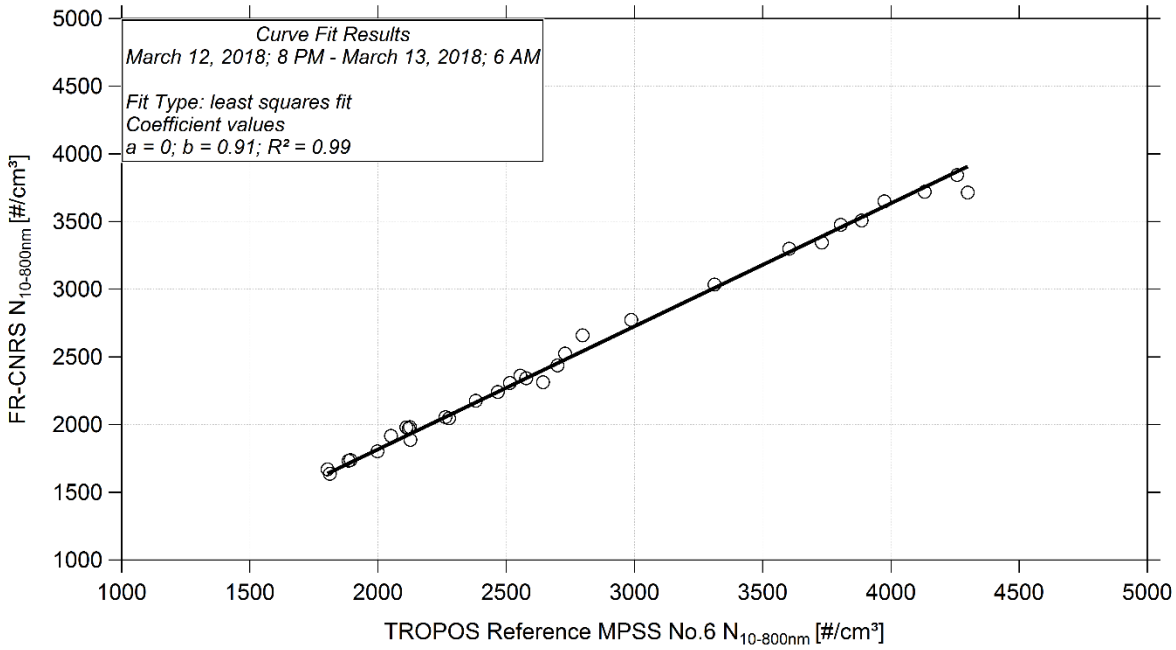

Figure 12: Linear regression between the number concentrations of the TROPOS Reference MPSS No. 6 and CZ-CAS Kosetice. The inversion and corrections for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Final-Status of the Candidate: Particle Number Size Distribution

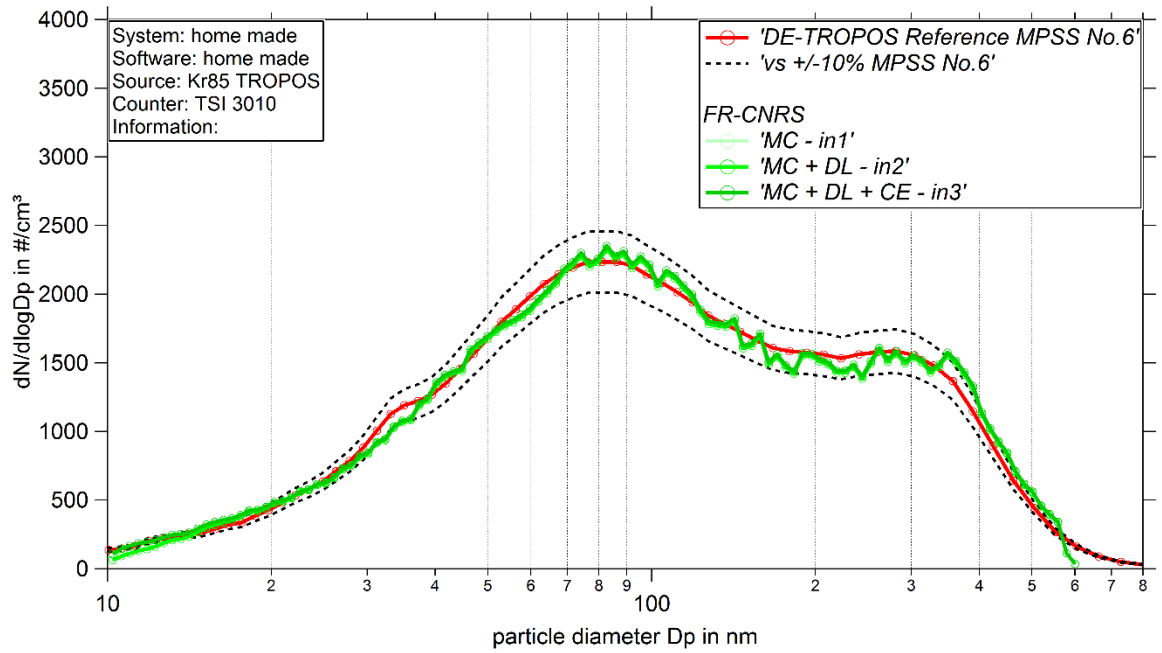

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Figure 13: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against CZ-CAS Kosetice from March 15, 2018 08:00 PM – March 16, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Final-Status of the Candidate: Time Series and Correlation

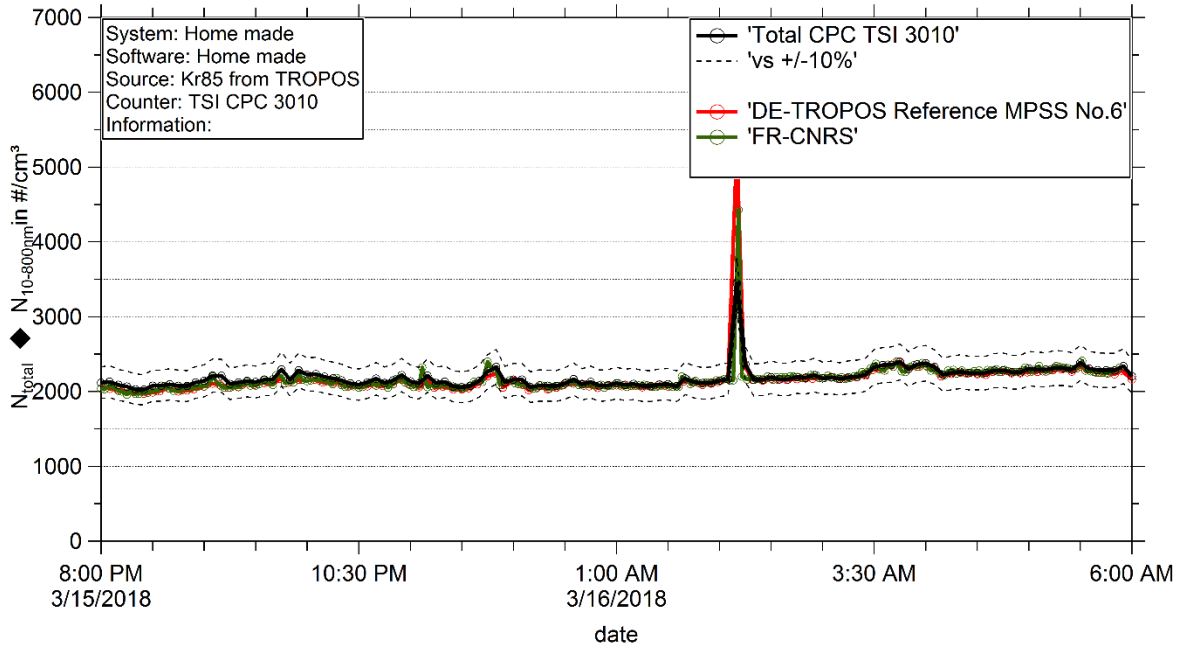

Figure 14: Time series (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3010. The inversion and correction for the candidate was performed using TROPOS software.

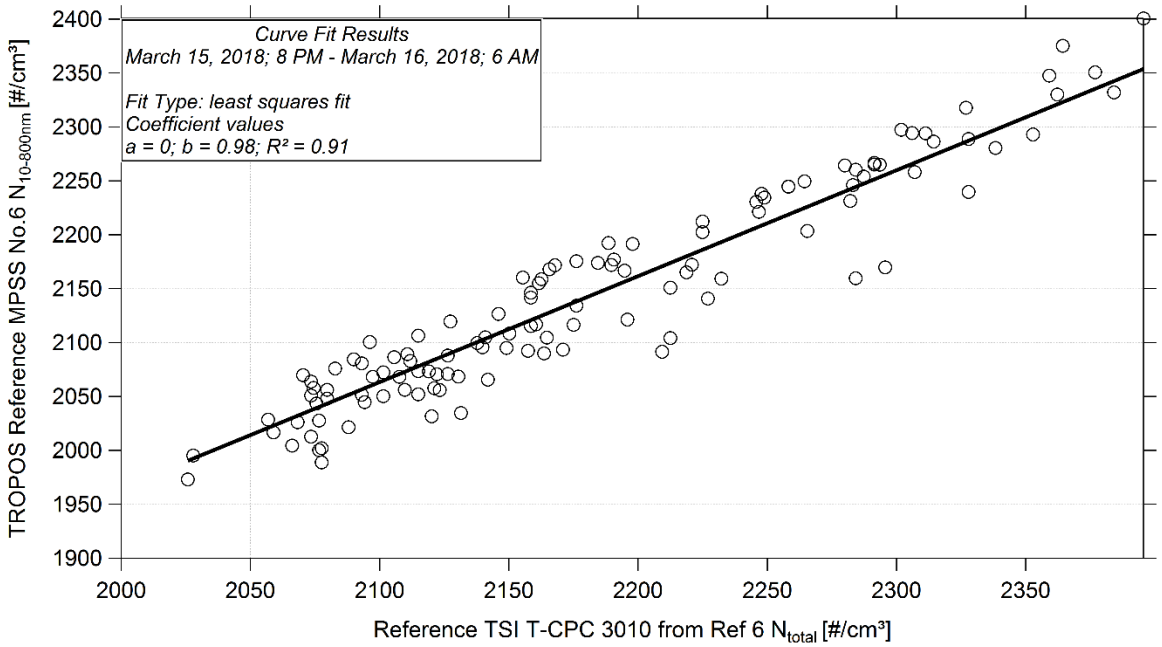

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Figure 15: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 Ref 6 and TROPOS Reference MPSS Ref 6 (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM). All corrections are included.

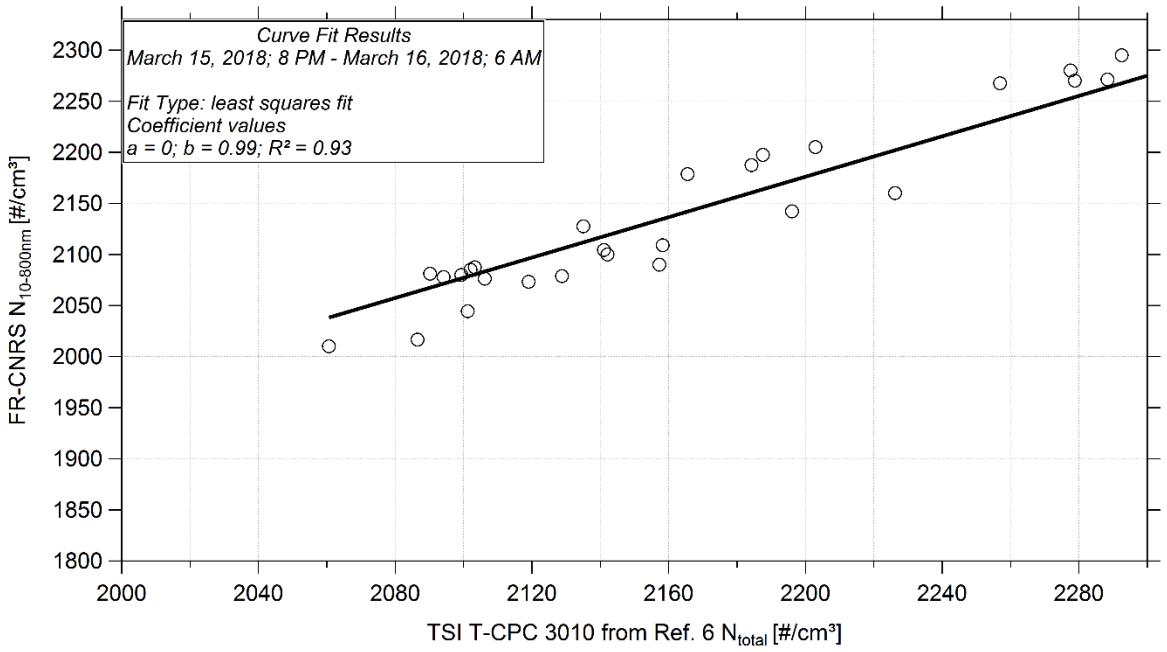

Figure 16: Linear regression between the number concentrations of the TROPOS Reference TSI CPC Model 3010 Ref 6 and CZ-CAS Kosetice (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM). All corrections are included.

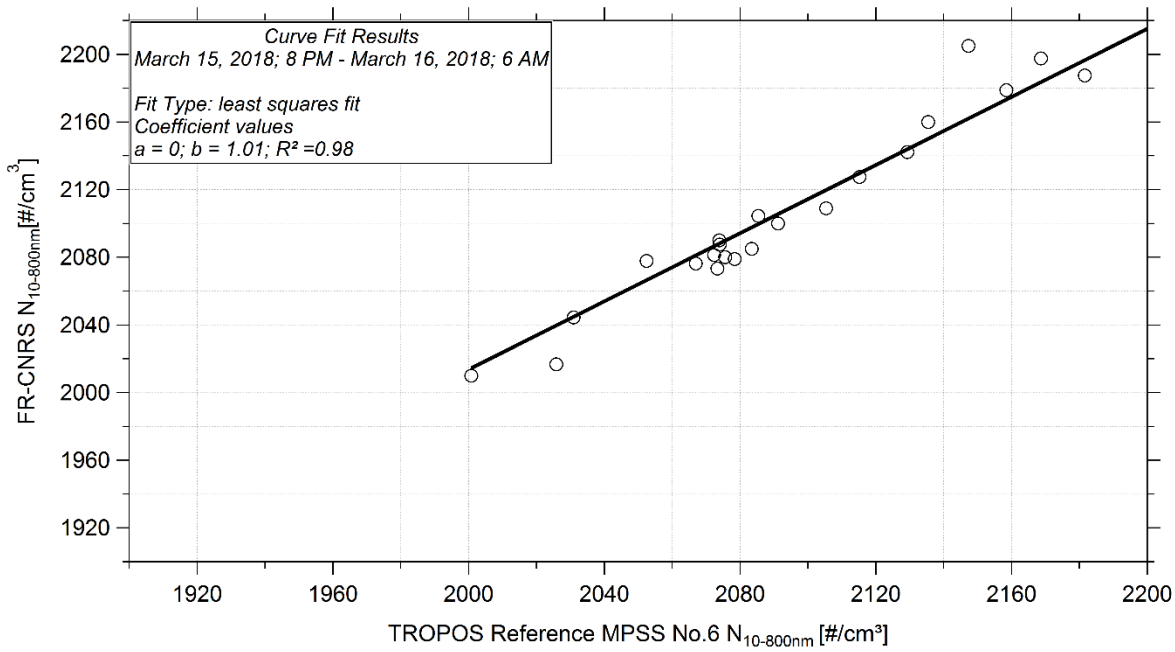

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Figure 17: Linear regression between the number concentrations of the TROPOS Reference MPSS Ref 6 and CZ-CAS Kosetice (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM). All corrections are included.

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