

## Intercomparison of Mobility Particle Size Spectrometers

*Project No.:* MPSS-2018-2-5

*Principal Investigator:* Vladimir Zdimal

*Home Institution:* ICPF, CAS

*Participant:*

*Candidate:* **CAS-Prague**  
*Made by:* **TSI/TROPOS**  
*Counter (SN):* TSI 3034; SN: 30340423001  
*Software:* TROPOS

*Location of the quality assurance:* TROPOS Leipzig, lab 118

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

*Last Intercomparison (with Project No.):* 30.05.2016 – 03.06.2016

## Summary of Intercomparison:

### Pre-Status:

The instrument arrived with participant. The instrument is a changed TSI MPSS running with a TROPOS Software Version 6.68. During the Pre-Status, the candidate showed a concentration 7% lower than the TROPOS Reference MPSS No.6. The PSL check showed a peak at 200 nm.

### Final-Status:

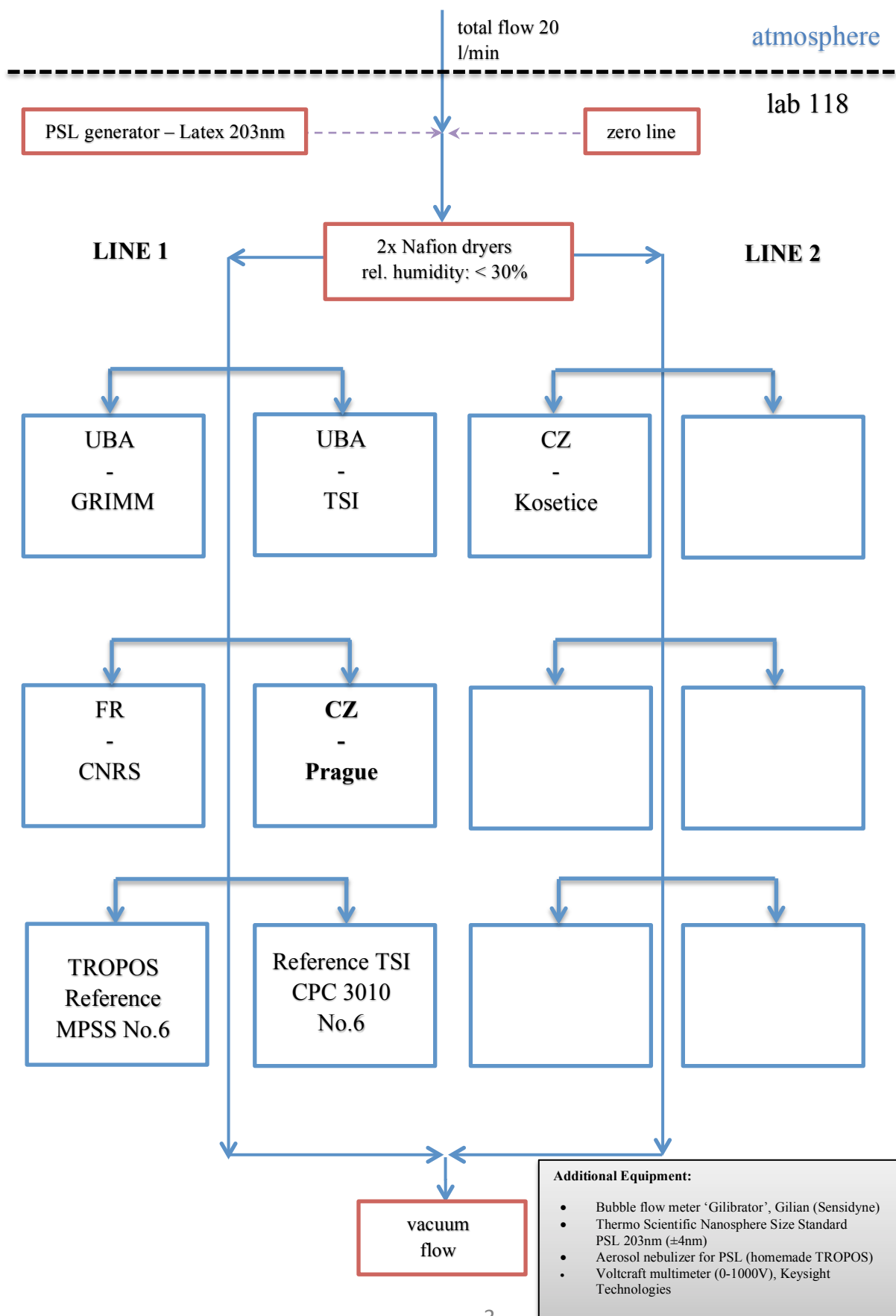
During the Final-Status, the performance of the system was in the range of +/-10% of the TROPOS Reference Instrument No.6. The candidate used the recalibrated TSI CPC efficiency function and their own radioactive source. The candidate passed the quality standards of ACTRIS and GAW.

## 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		TSI/TROPOS
Software	TROPOS		TROPOS 6.68
CPC-MPSS	TSI CPC, Model 3772		TSI CPC 3034
CPC-total	TSI CPC, Model 3010		
flow ratio	1.0 : 5.0		1.0:4.0
source	Ni.63		Kr85 (10mCi)
HV power supply	Positive		Positiv
DMA	Hauke medium		TSI
aerosol dryer	✓		✓
aerosol RH- sensor	✓		✓
aerosol T-sensor	✓		✓
sheath RH-sensor	✓		✓
sheath T-sensor	✓		✓
Sheath dryer	✓		✓
pressure sensor	✓		✓
info			

## Laboratory setup:



## Status of the instruments:

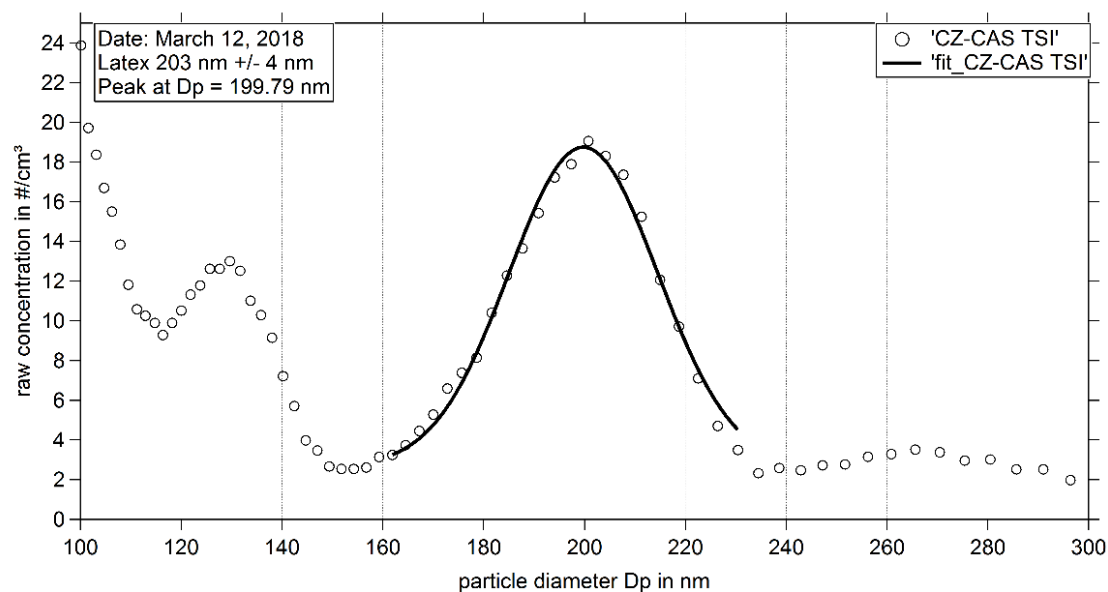
### Date of system checks:

<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>	1.012	1.017	1.013	-	l/min
<i>Zero MPSS</i>				-	#/cm <sup>3</sup>
<i>Zero total CPC</i>	✓		✓		#/cm <sup>3</sup>
<i>PSL 203 nm</i>	✓		✓		nm
<i>HV check</i>	✓		✓		V

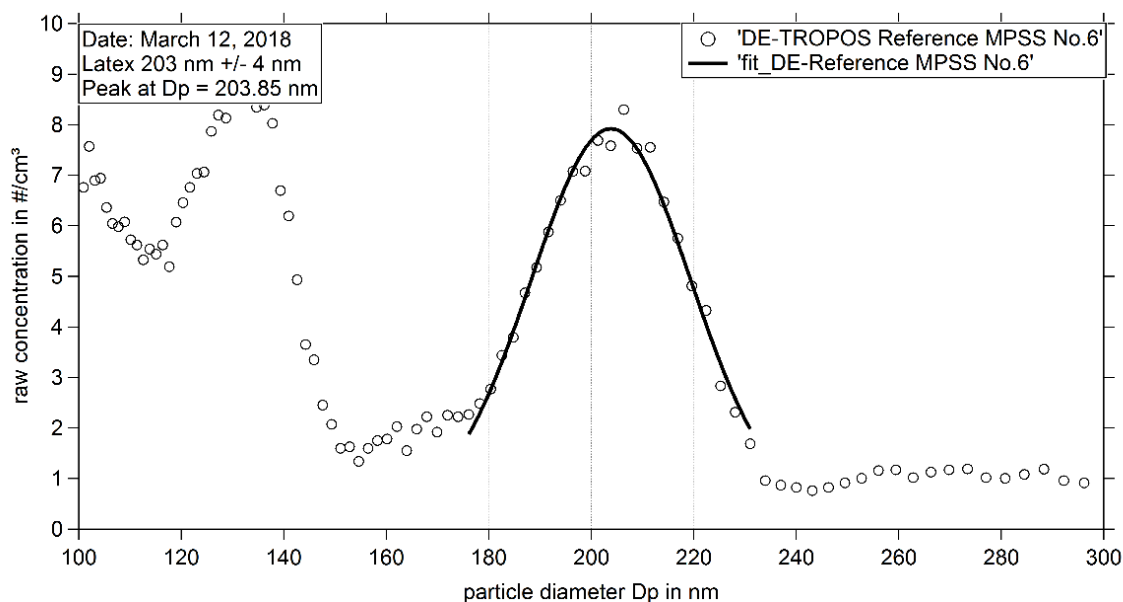
### Special Information regarding the Candidate:

<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	-	-	
<i>change sheath Nafion dryer</i>	No	-	-	
<i>check source</i>	yes 13.03.2018	-	-	
<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 (500)</i>	No	-	-	
<i>Change Total filter</i>	No	-	-	
<i>NI-card</i>	No			

## PSL Scan and calibration: Latex 203 nm $\pm$ 4 nm

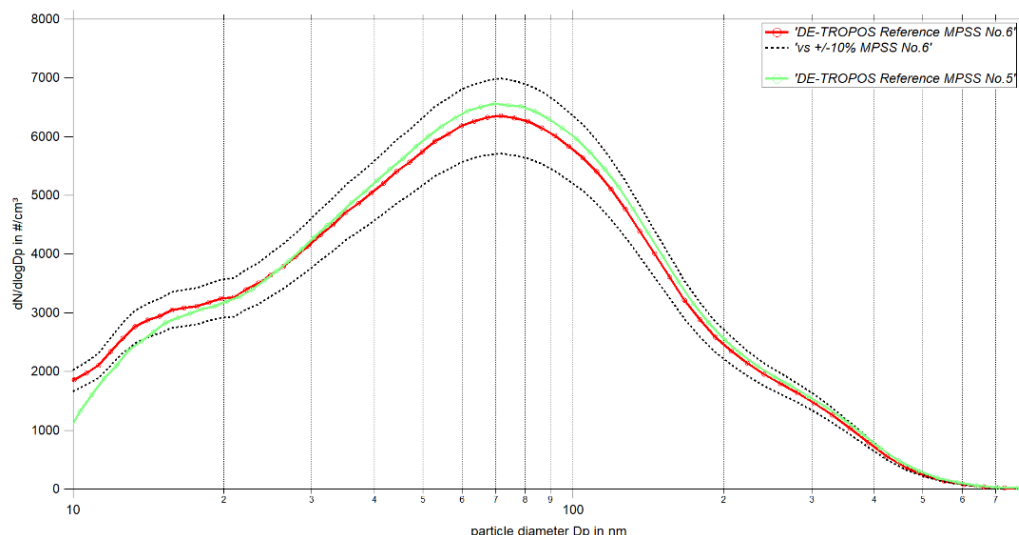


**Figure 01:** Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 12, 2018.

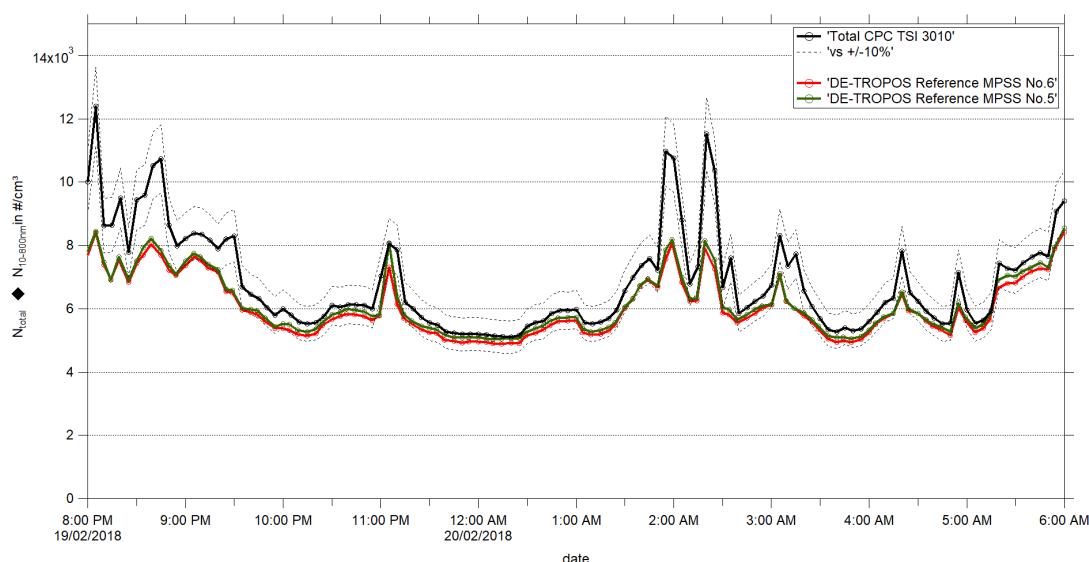


**Figure 02:** Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Mar 12, 2018.

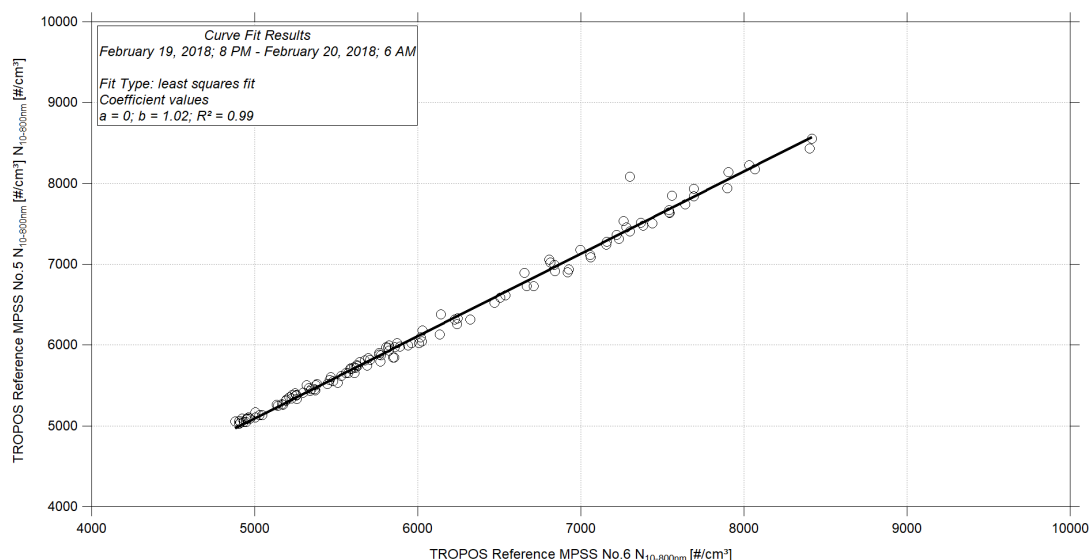
## Status of the TROPOS Reference Instruments in February: Particle Number Size Distribution, Time Series and Correlation



**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.

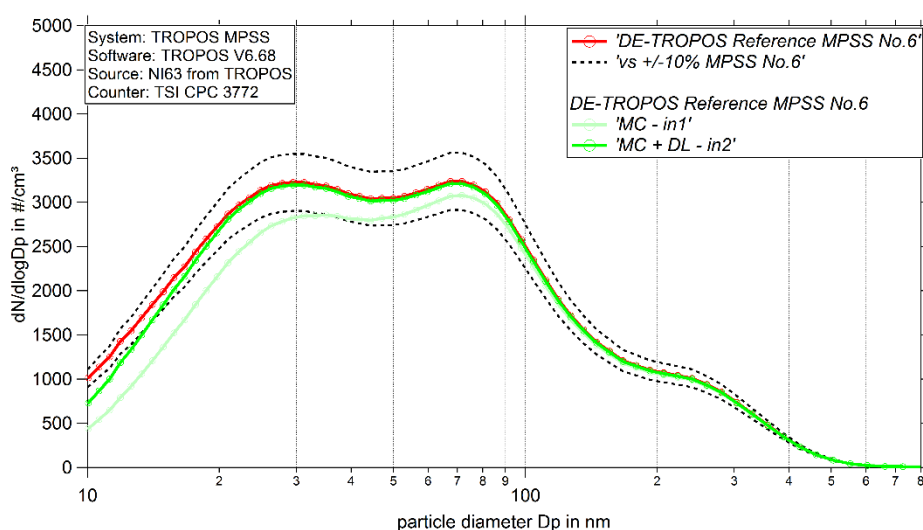


**Figure 04:** Time series (February 19, 2018 08:00 PM – February 20, 2018 06:00 AM) of the integrated particle number concentration ( $N_{10-800nm}$ ) of the MPSS and total number concentration ( $N_{total}$ ) of the Reference TSI-CPC Model 3010. The inversion for the candidate was performed using TROPOS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



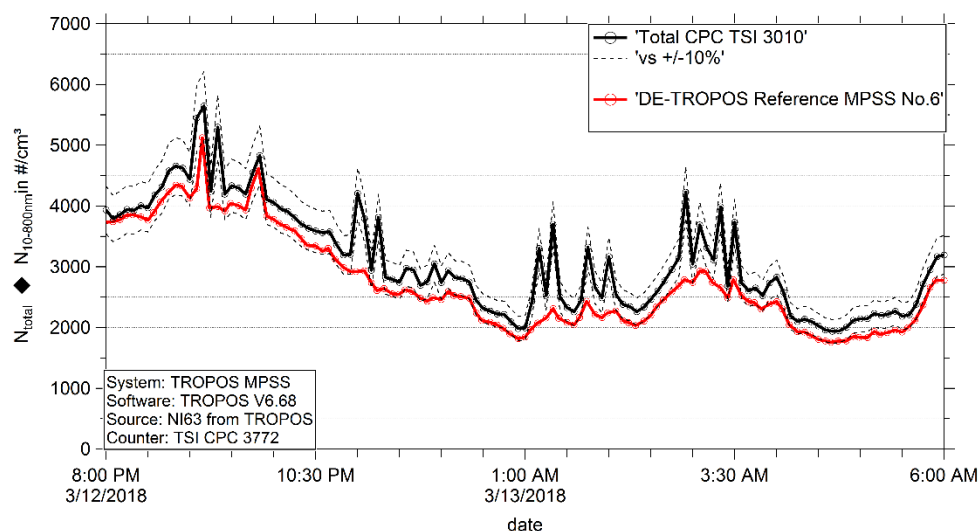
**Figure 05:** Linear regression between the number concentrations of the TROPOS Reference MPSS No.6 and TROPOS Reference MPSS No.5. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

## Status of the TROPOS Reference Instruments: Particle Number Size Distribution



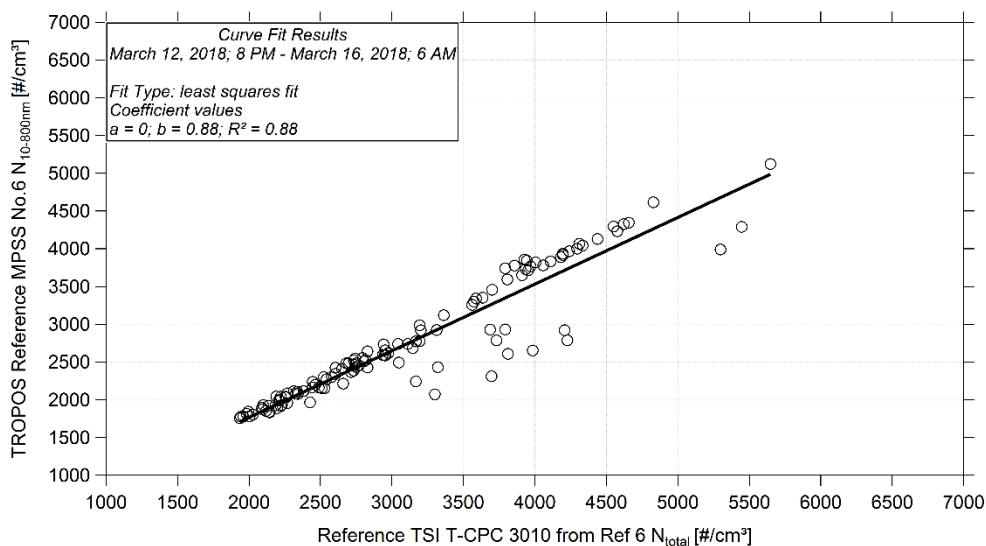
**Figure 06:** Comparison of mean particle number size distribution of TROPOS Reference TSI CPC Model 3010 Ref 6 against TROPOS Reference MPSS No.6 from March 12, 2018 08:00 PM – March 13, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

## 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 ( $N_{\text{total}}$ ) 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.

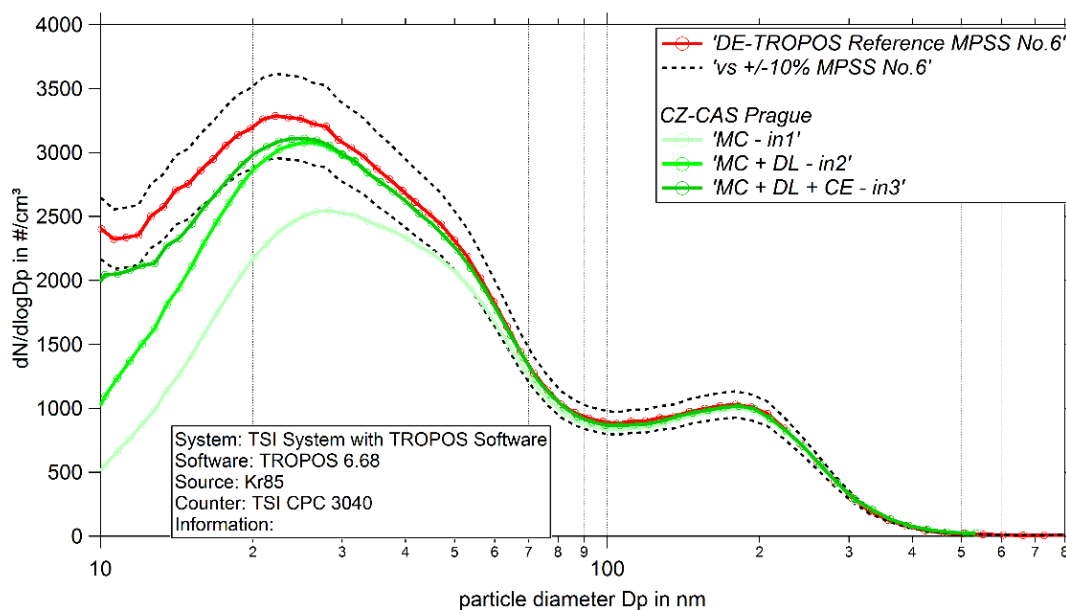
## Status of the TROPOS Reference Instruments: Correlation



**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

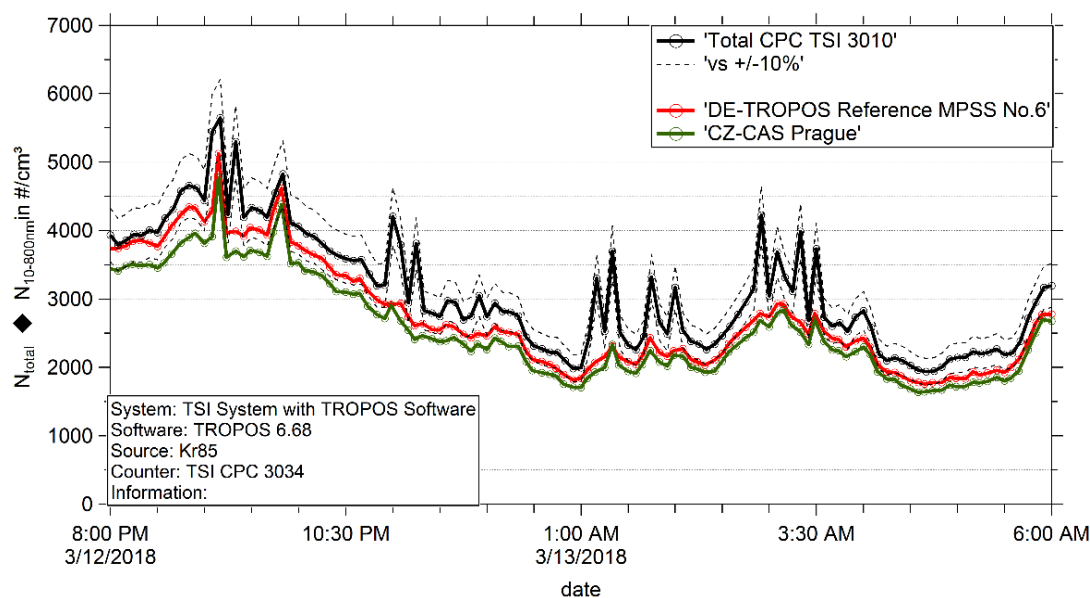


## Pre-Status of the Candidate: Particle Number Size Distribution

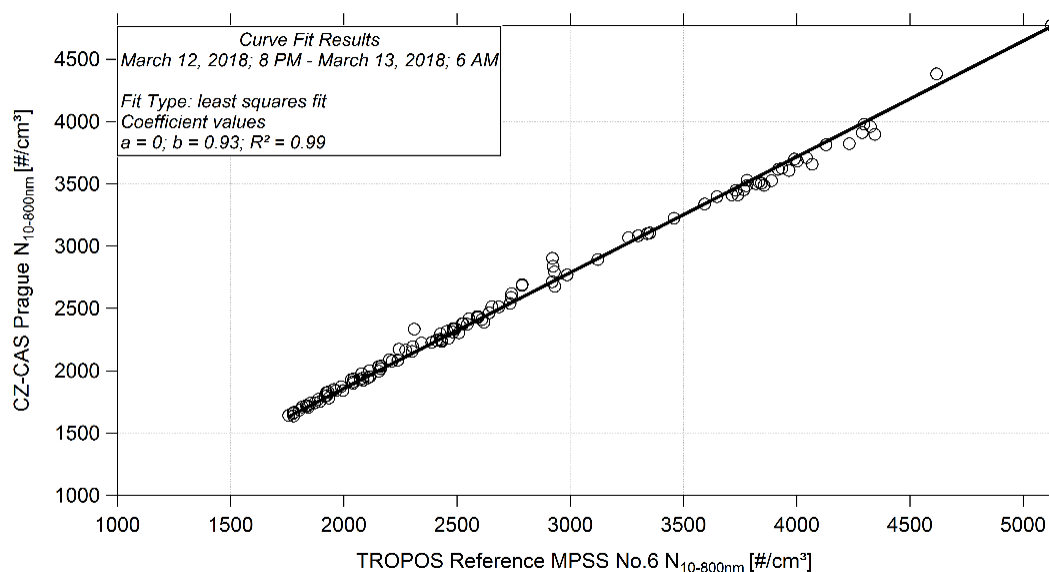


**Figure 09:** Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 CZ-CAS Prague from March 12, 2018 08:00 PM – March 13, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

## Pre-Status of the Candidate: Time Series and Correlation

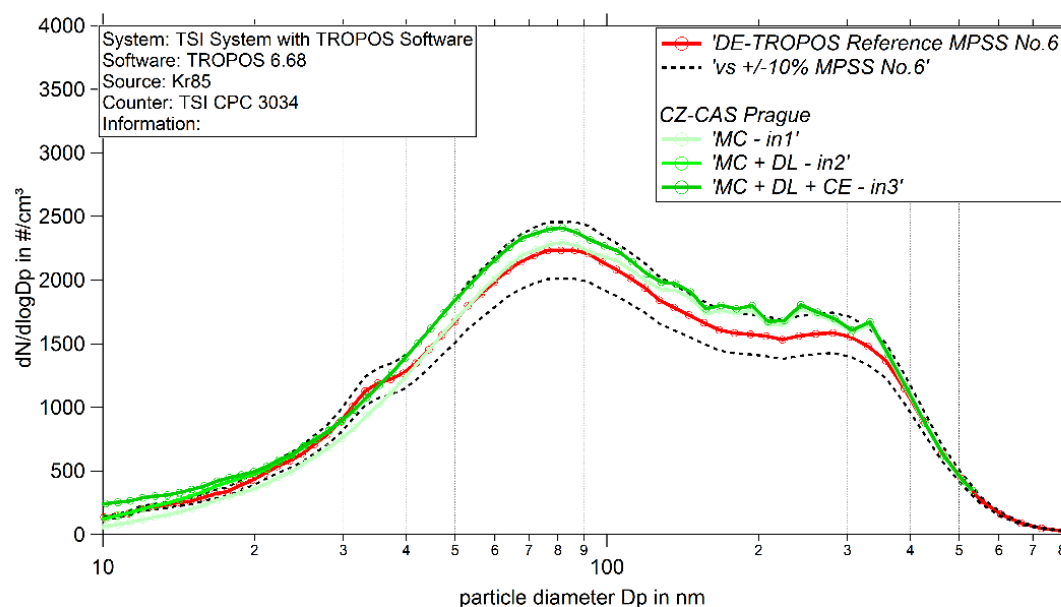


**Figure 10:** Time series (March 12, 2018 08:00 PM – March 13, 2018 06:00 AM) of the integrated particle number concentration ( $N_{10-800nm}$ ) of the MPSS and total number concentration ( $N_{total}$ ) of the Reference TSI-CPC Model 3010. The inversion and corrections for the candidate was performed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



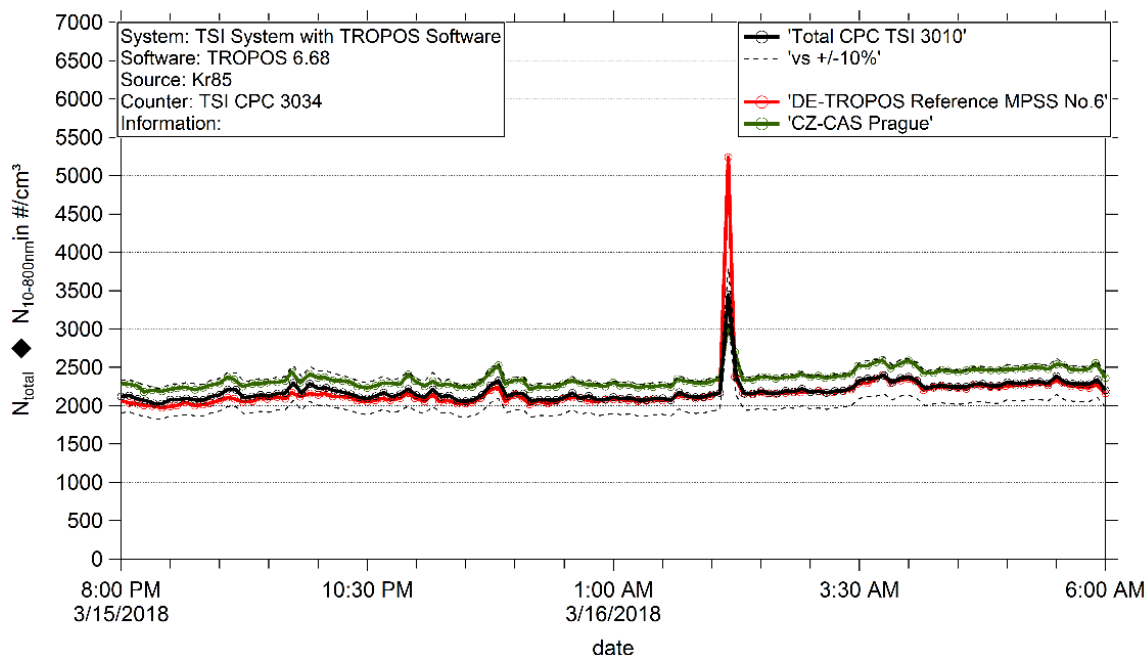
**Figure 11:** Linear regression between the number concentrations of the TROPOS Reference MPSS No. 6 and CZ-CAS Prague. The inversion and corrections for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

## Final-Status of the Candidate: Particle Number Size Distribution

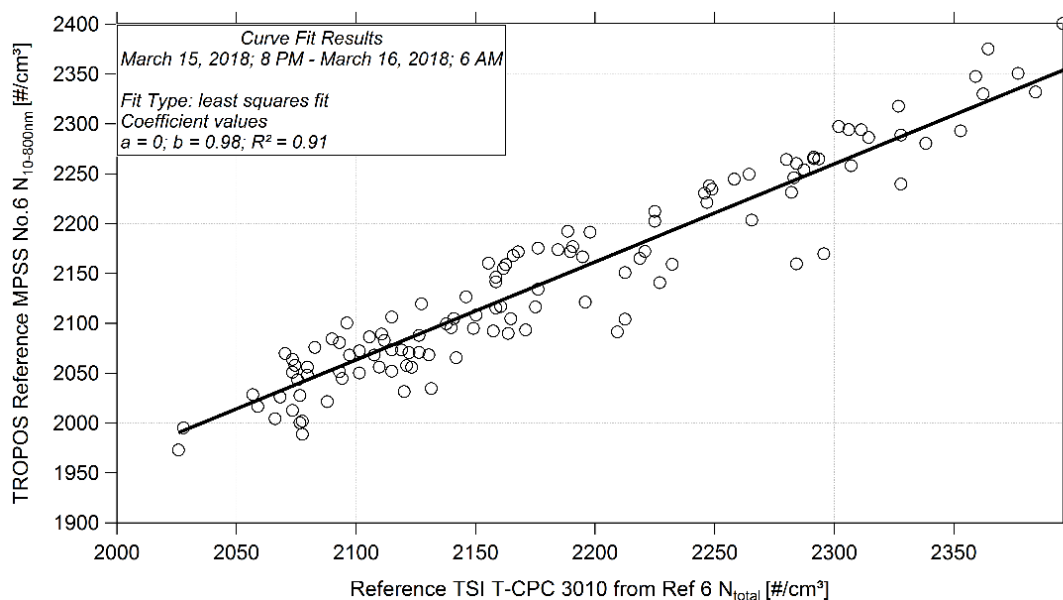


**Figure 12:** Comparison of mean particle number size distribution of TROPOS Reference MPSS No.6 against CZ-CAS Prague from March 15, 2018 08:00 PM – March 16, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

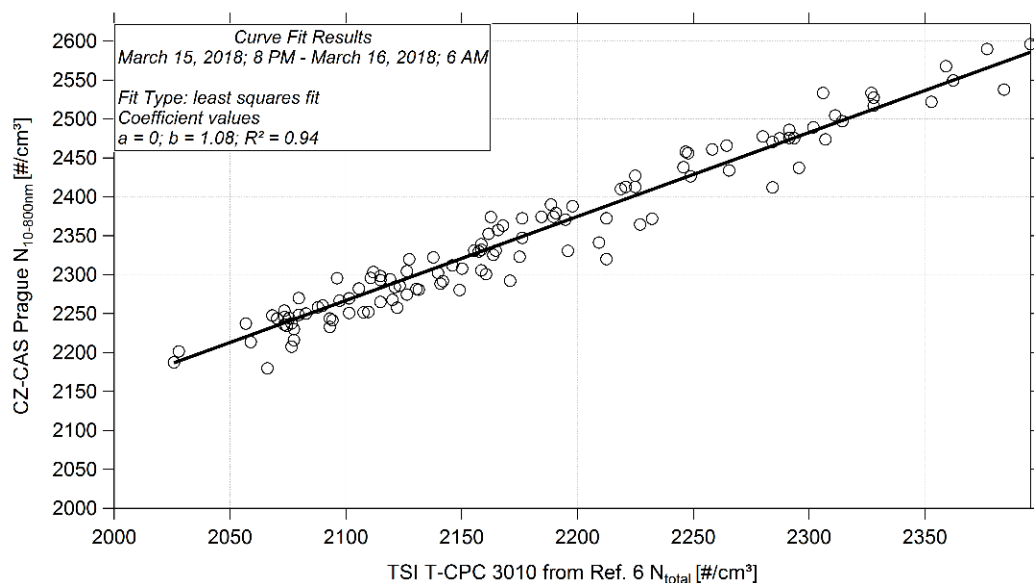
## Final-Status of the Candidate: Time Series and Correlation



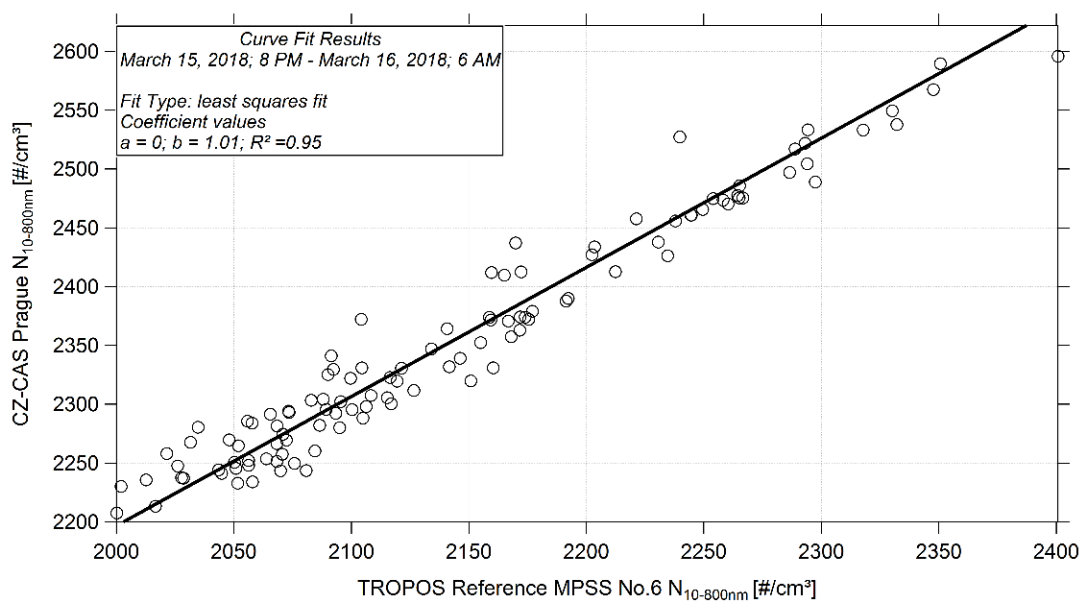
**Figure 13:** Time series (March 15, 2018 08:00 PM – March 16, 2018 06:00 AM) of the integrated particle number concentration ( $N_{10-800nm}$ ) of the MPSS and total number concentration ( $N_{total}$ ) of the Reference TSI-CPC Model 3010. The inversion and correction for the candidate was performed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