TROPOS
Leibniz Institute for Tropospheric Research

ACTRIS

Intercomparison of Mobility Particle Size Spectrometers

Project No.: MPSS-2016-1-7

Basic information:

Location of the quality assurance: TROPOS, lab: 118

Delivery date: January 25, 2016

Setup in the laboratory: January 25, 2016

Comparison period: January 25, 2016 – January 29, 2016

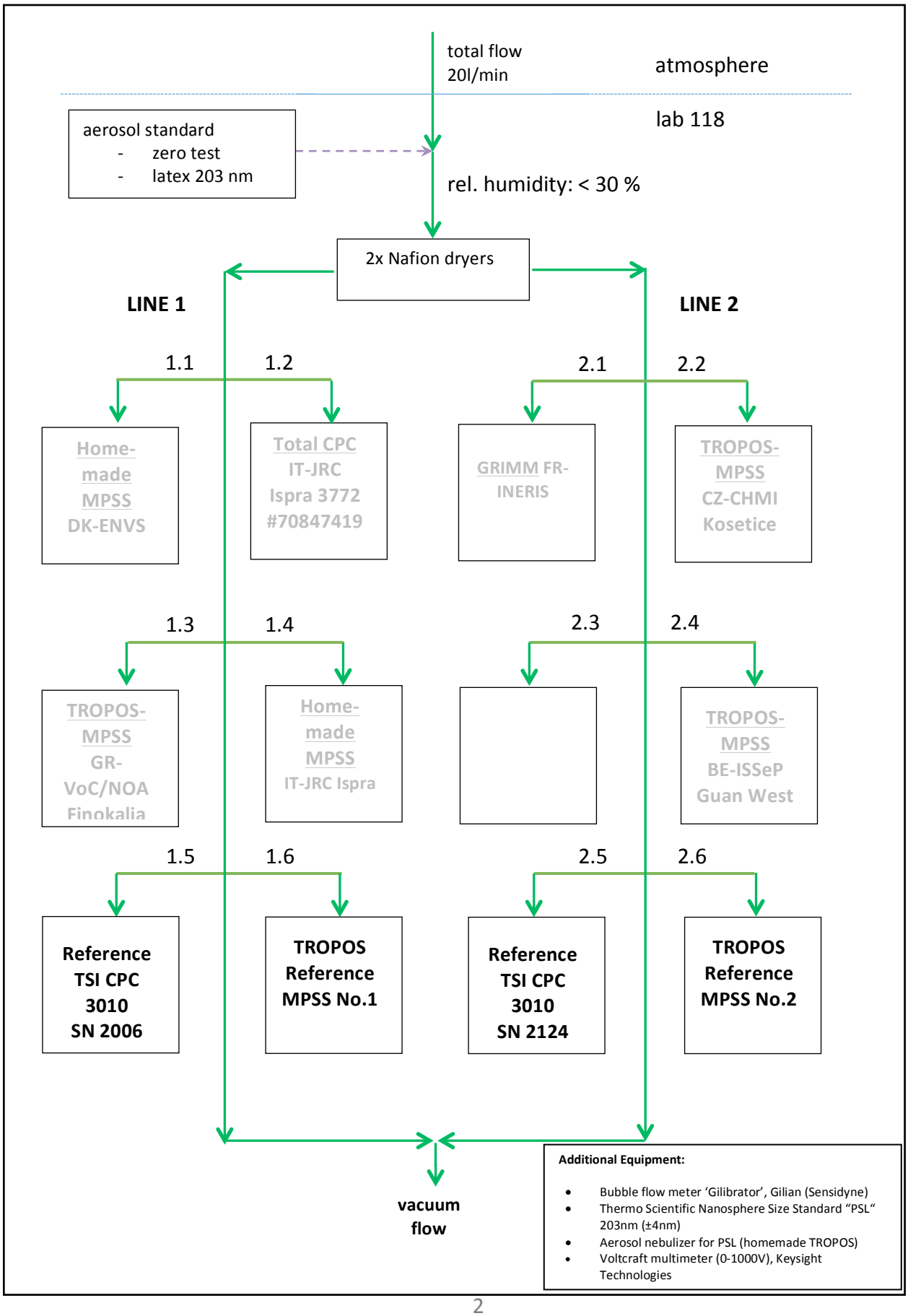
Principal Investigator	Home Institution	Participant	Instrument
Alfred Wiedensohler	TROPOS	-	TROPOS-MPSS: Reference MPSS No.1; Model 3772 SN: 3772141701 Reference MPSS No.2; Model 3772 SN : 70835059

Summary of Intercomparison:

Final status:

The TROPOS-MPSS passed the quality standards of ACTRIS and GAW. During this week there are a lot of ultrafine particles that is the reason why the correlation to the TROPOS total CPC 3010 is sometimes out of the 10% range.

Laboratory Setup



List of Components

	Specification	Reference MPSS No.1	Reference MPSS No.2
Position (Line)		1.6	2.6
Company		TROPOS	TROPOS
Software		TROPOS 5.7	TROPOS 6.1
CPC		Model 3772 SN: 3772141701	Model 3772 SN : 70835059
Flow ratio		1.0 : 5.0	1.0 : 5.0
Source		Kr85	Kr85
HV cassette		positive	positive
DMA		Hauke medium	Hauke medium
Flow meas.	Aerosol	✓	✓
Dryer		✓	✓
RH sensor	Inlet	✓	✓
T sensor		✓	✓
RH sensor	Sheath air	✓	✓
T sensor		✓	✓
Dryer		✓	✓
p sensor		✓	✓

Status of the Candidate

Components and zero check

Institute	System	Components	CPC Model + Serial No.	Line	Flow		Zero	
TROPOS	Ref1	MPSS	3772 SN 3772141701	1.6	**1.034**	l/min	0	# cm^{-3}
TROPOS		Total CPC	3010 SN 2006	1.5	**1.035**	l/min	0	# cm^{-3}
TROPOS	Ref2	MPSS	3772 SN 70835059	2.6	**1.017**	l/min	0	# cm^{-3}
TROPOS		Total CPC	3010 SN 2124	2.5	**1.038**	l/min	0	# cm^{-3}

High voltage calibration

Institute	System	[V]	0 V	4 mV	80 mV	800 mV
TROPOS	Reference MPSS No.1	Pre-status	-	-	-	-
		final	**0**	**5**	**100**	**999**
TROPOS	Reference MPSS No.2	Pre-status	-	-	-	-
		final	**0**	**4.9**	**100**	**1000**

Latex 203nm ±4nm (pressure 1009 hPa, 23.0°C)

Institute	System		Latex 203 [nm]	slope
TROPOS	Reference MPSS No.1	Pre-status	-	-
		final	**202.8**	**4.9**
TROPOS	Reference MPSS No.2	Pre-status	-	-
		final	**203.6**	**4.82**

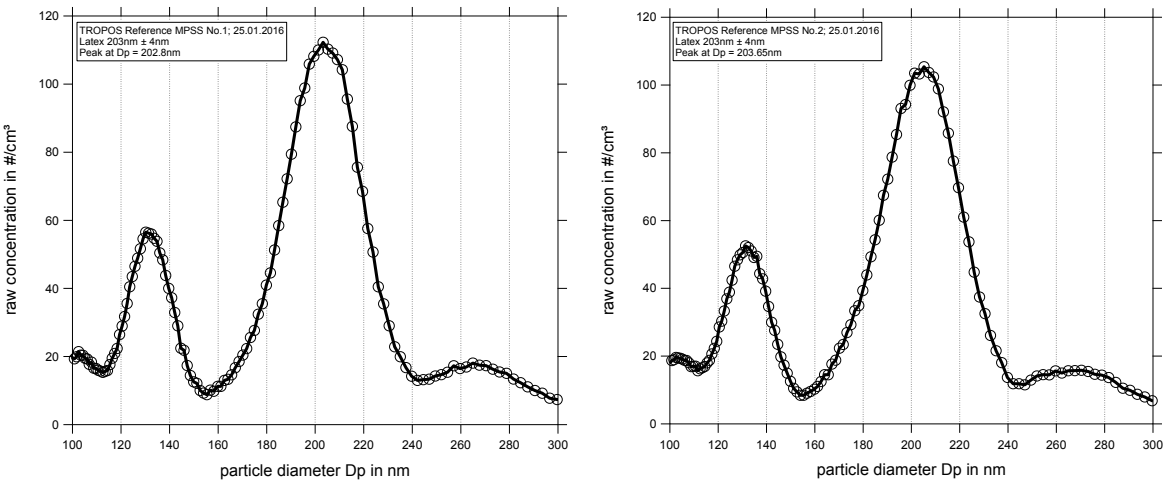


Figure 01: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on January 25th, 2016.

Time Series

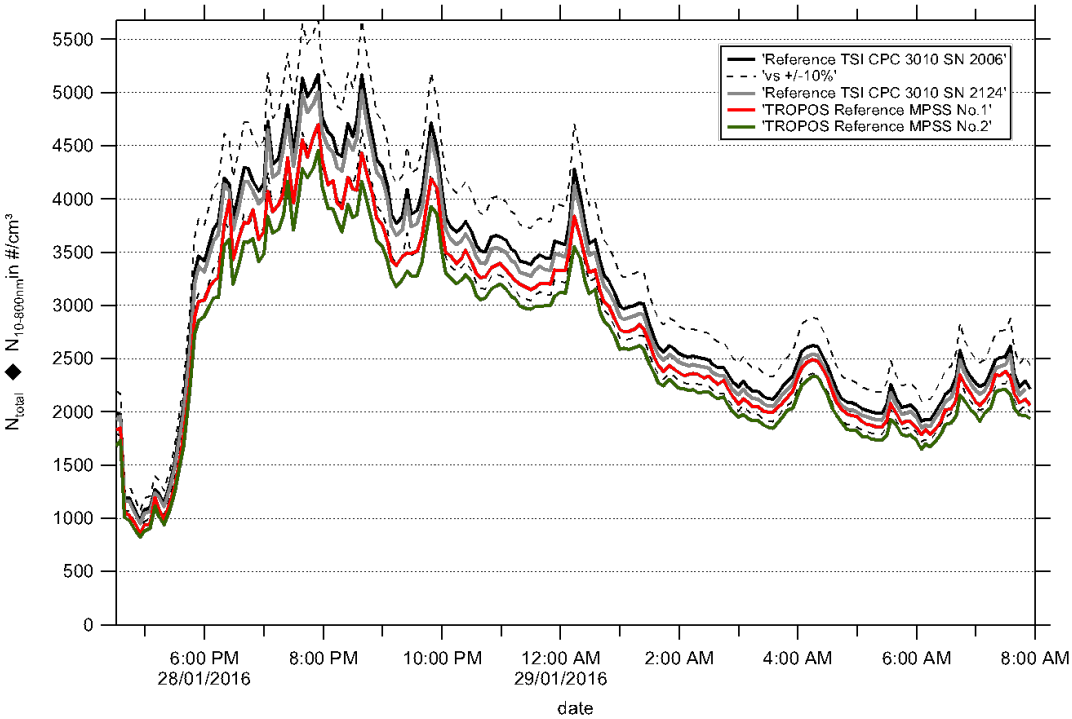


Figure 02: Time series (January 28, 2016 05:00 pm – January 29, 2016 08:00 am) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the TROPOS Reference MPSS and total number concentration (N_{total}) of the Reference TSI CPC 3010. The inversion was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Particle Number Size Distribution

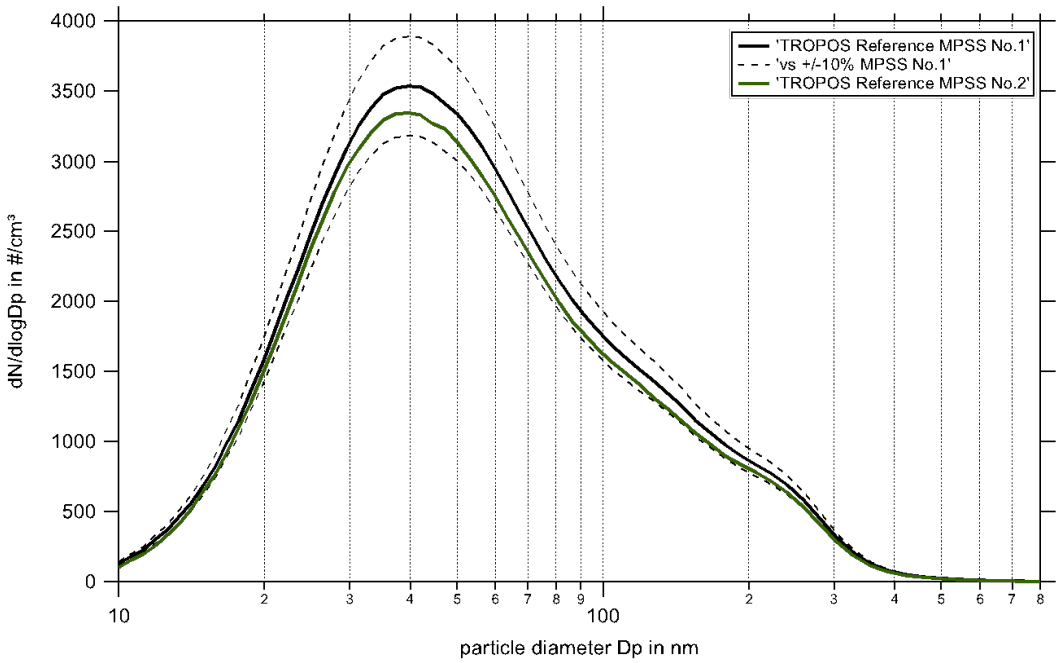


Figure 03: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 and TROPOS Reference MPSS No.2 from January 28, 2016 18:00 pm until January 29, 2016 08:00 am. The inversion was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Correlation

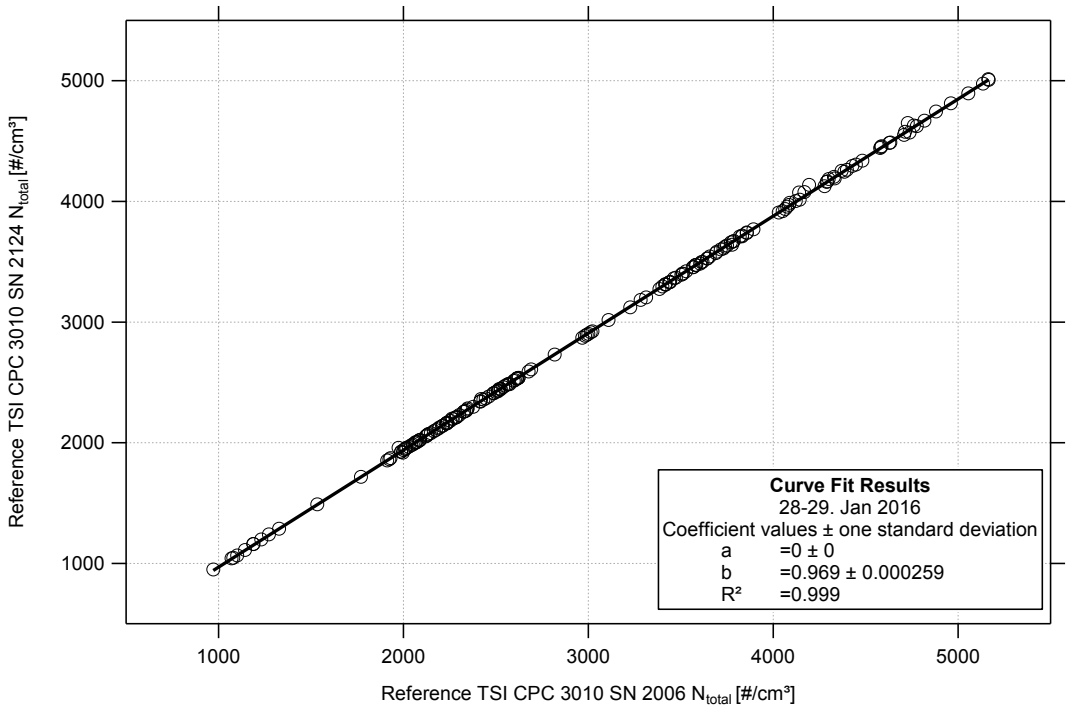


Figure 04: Linear regression between the number concentrations of the Reference TSI CPC 3010 SN 2006 and Reference TSI CPC 3010 SN 2124. CPC flow corrections are included.

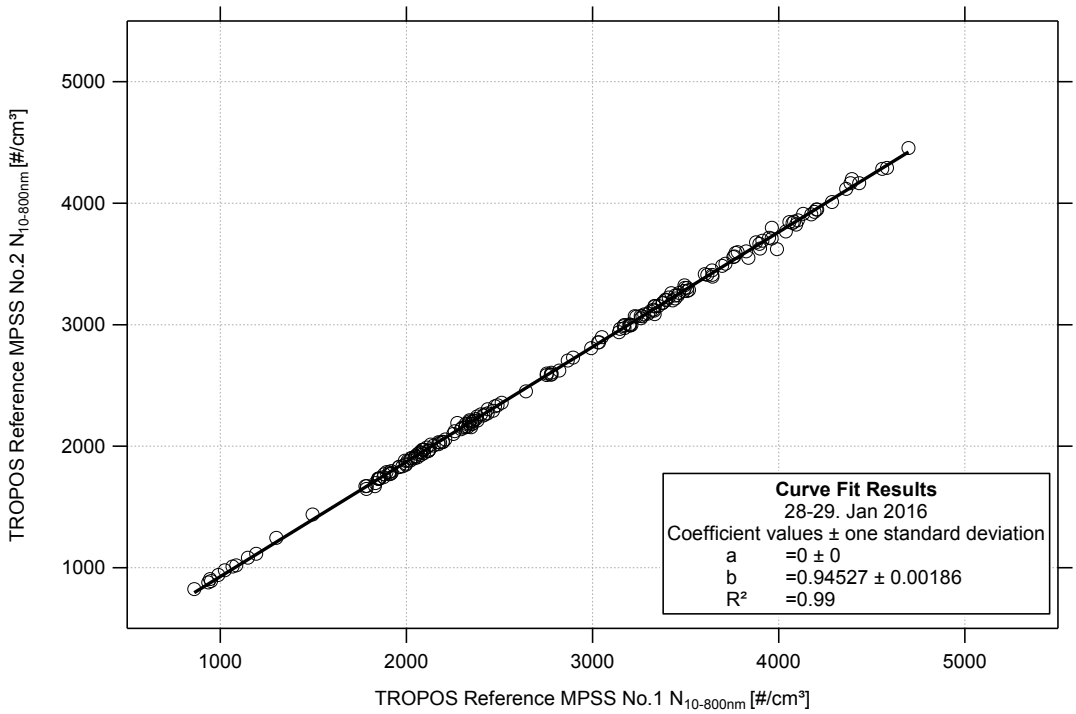


Figure 05: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and TROPOS Reference MPSS No.2. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

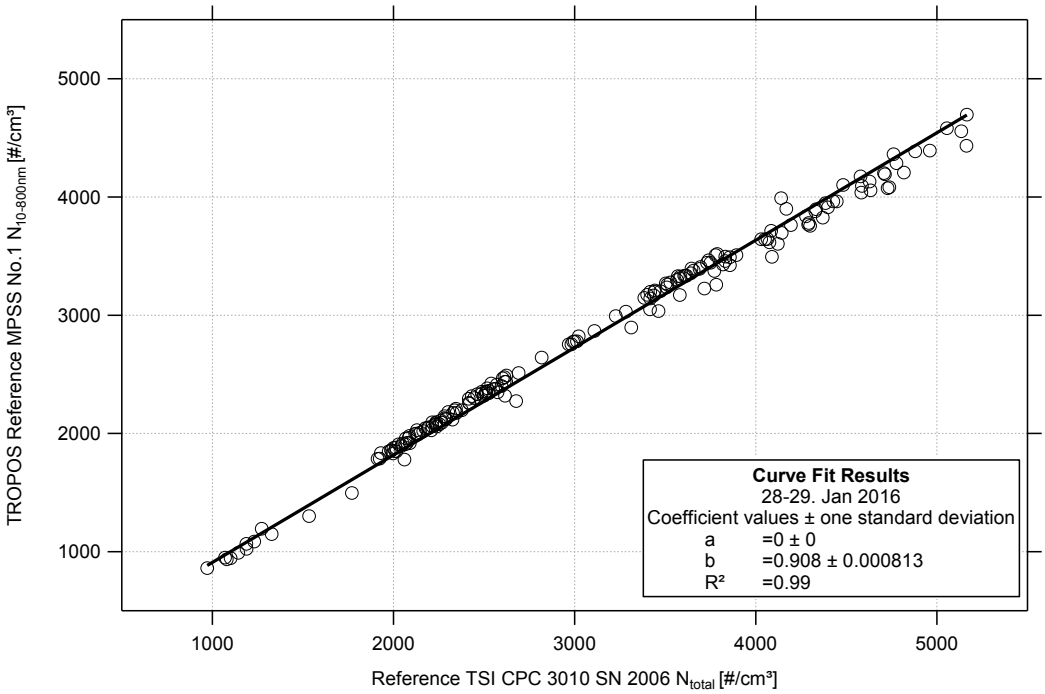


Figure 06: Linear regression between the number concentrations of the Reference TSI CPC 3010 SN 2006 and TROPOS Reference MPSS No.1. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

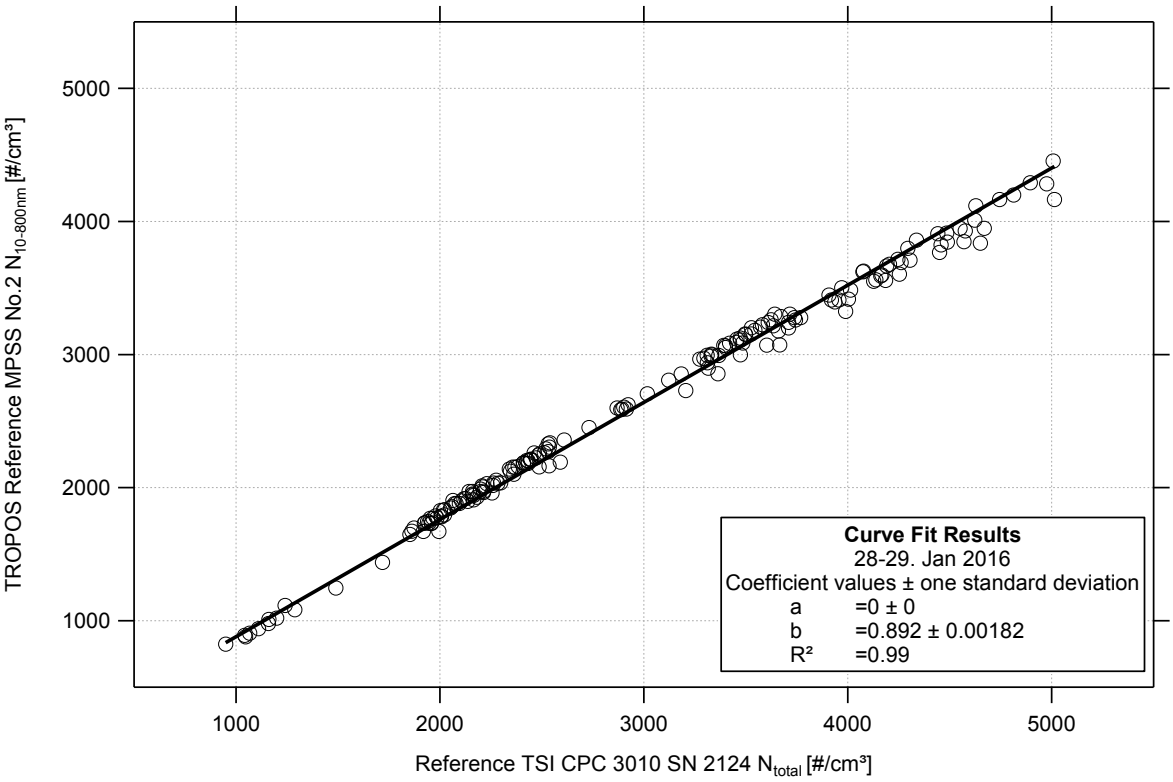


Figure 07: Linear regression between the number concentrations of the Reference TSI CPC 3010 SN 2124 and TROPOS Reference MPSS No.2. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.