

Intercomparison of Mobility Particle Size Spectrometers

Project No.: MPSS-2016-2-6

Basic information:

Location of the quality assurance: TROPOS, lab: 118
Delivery date: April 01, 2016
Setup in the laboratory: April 04, 2016
Comparison period: April 04, 2016 – April 08, 2016

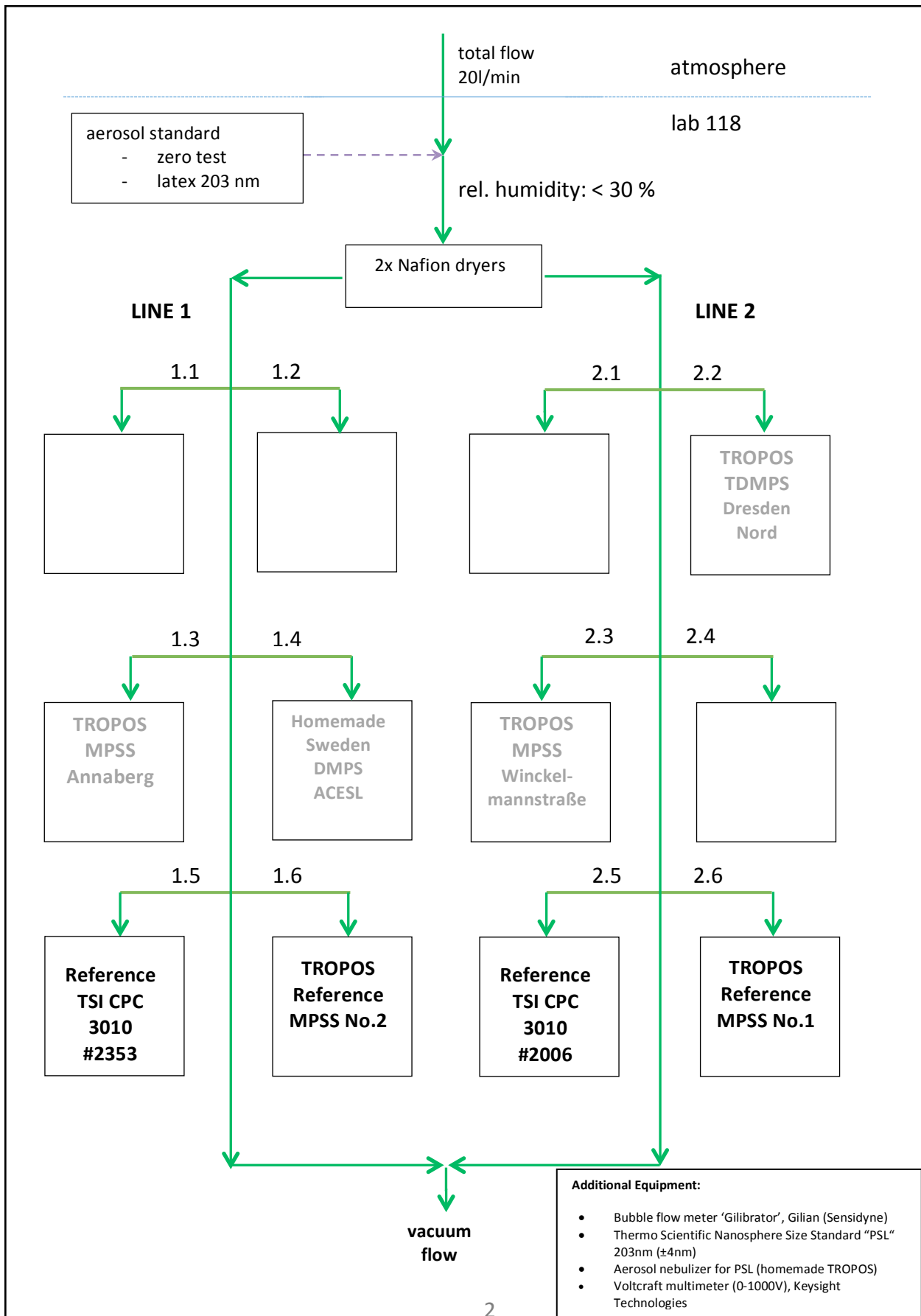
Principal Investigator	Home Institution	Participant	Instrument
Alfred Wiedensohler	TROPOS	-	TROPOS-MPSS: Reference MPSS No.1; Model 3772 SN: 3772141701 Reference MPSS No.2; Model 3772 SN : 70835059

Summary of Intercomparison:

Final status:

The TROPOS-MPSS passed the quality standards of ACTRIS and GAW.

Laboratory setup



List of Components

	Specification	Reference MPSS No.1	Reference MPSS No.2
Position (Line)		2.6	1.6
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		✓	✓

CPC Status total CPC SN: 2353

Institute	CPC	Variable	Status	Comments
TROPOS Total CPC 3010, #2353		Power	okay	
		Laser	okay	
		Flow	okay	
		Liquid level	okay	

CPC Status total CPC SN: 2006

Institute	CPC	Variable	Status	Comments
	TROPOS Total CPC 3010, #2006	Power	okay	
		Laser	okay	
		Flow	okay	
		Liquid level	okay	

CPC Status Reference Instrument No.1

Institute	CPC	Variable	Status	Comments
	TROPOS Reference Instrument No.1, 3772 #3772141701	Saturator Temp	39.0°C	
		Condenser Temp	22.0°C	
		Optics Temp	40.0°C	
		Cabinet Temp	31.4°C	
		Ambient Pressure	98.7 kPa	
		Orifice Pressure	69.7 kPa	
		Nozzle Pressure	2.8 kPa	
		Laser Current	50 mA	

CPC Status Reference Instrument No.2

Institute	CPC	Variable	Status	Comments
	TROPOS Reference Instrument No.2, 3772 #70835059	Saturator Temp	39.1°C	
		Condenser Temp	22.0°C	
		Optics Temp	40.0°C	
		Cabinet Temp	32.7°C	
		Ambient Pressure	99.6 kPa	
		Orifice Pressure	67.0 kPa	
		Nozzle Pressure	2.7 kPa	
		Laser Current	47 mA	

Status of the Candidate

Components and zero check, 11:10; 04.04.2016 to 04.04.2016;12:25

Institute	System	Components	Line	Flow		Zero	
TROPOS	Ref1	MPSS	2.6	1.012	l/min	0	# cm ⁻³
TROPOS	Ref1	Total CPC 3010	2.5	1.016	l/min	0	# cm ⁻³
TROPOS	Ref2	MPSS	1.6	1.015	l/min	0	# cm ⁻³
TROPOS	Ref2	Total CPC 3010	1.5	1.001	l/min	0	# cm ⁻³

High voltage calibration

Institute	System	[V]	0 V	4 mV	80 mV	800 mV
TROPOS	Reference MPSS No.1	final	0.1	4.9	100.5	999.9
TROPOS	Reference MPSS No.2	final	0.1	5.1	99.7	1000.3

Latex 203nm ±4nm (pressure 988.5 hPa, 23.0°C) -> 05.04.2016: 15:20 – 16:00

Institut	System		Latex 203 [nm]	slope
TROPOS	Reference MPSS No.1	final	203.13	5.1
TROPOS	Reference MPSS No.2	final	203	5.01

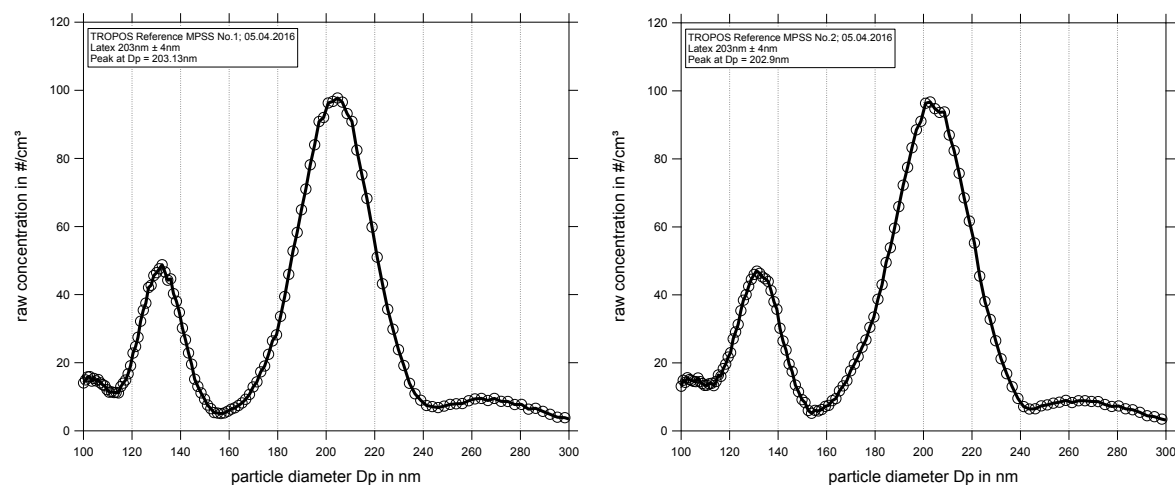


Figure 01: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on April 05th, 2016.

Time Series

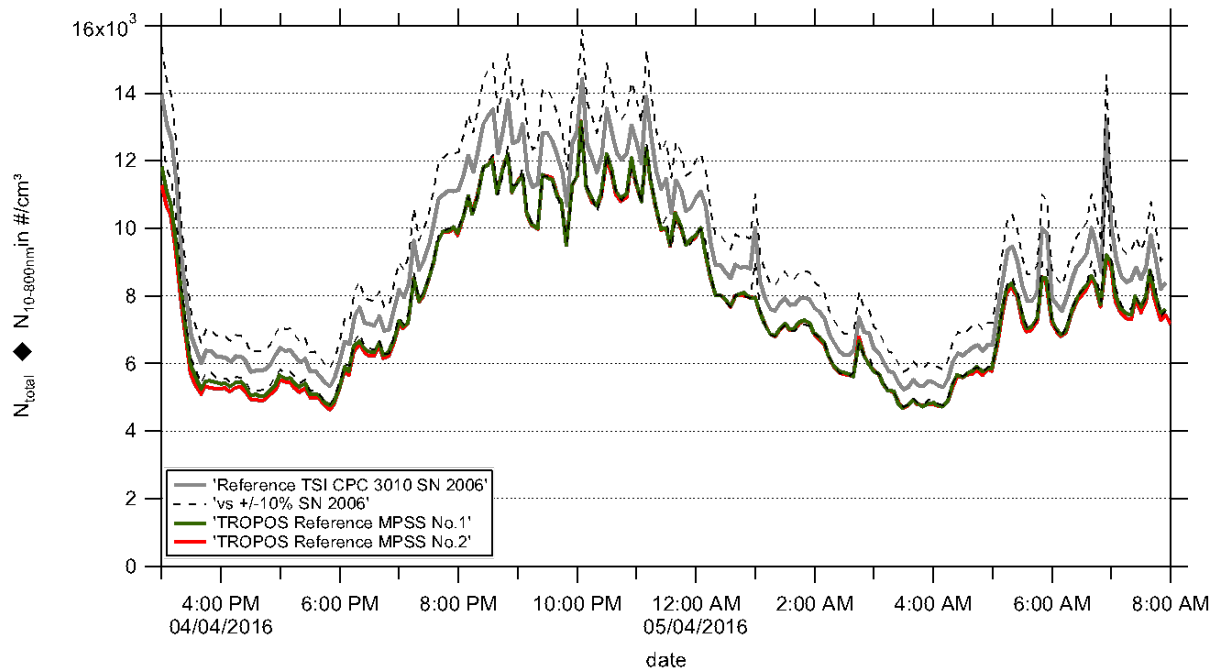


Figure 02: Time series (April 04, 2016 15:00 pm – April 05, 2016 08:00 am) of the integrated particle number concentration ($N_{10-800nm}$) of the TROPOS Reference MPSS and total number concentration (N_{total}) of the Reference TSI CPC 3010. The inversion was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

Particle Number Size Distribution

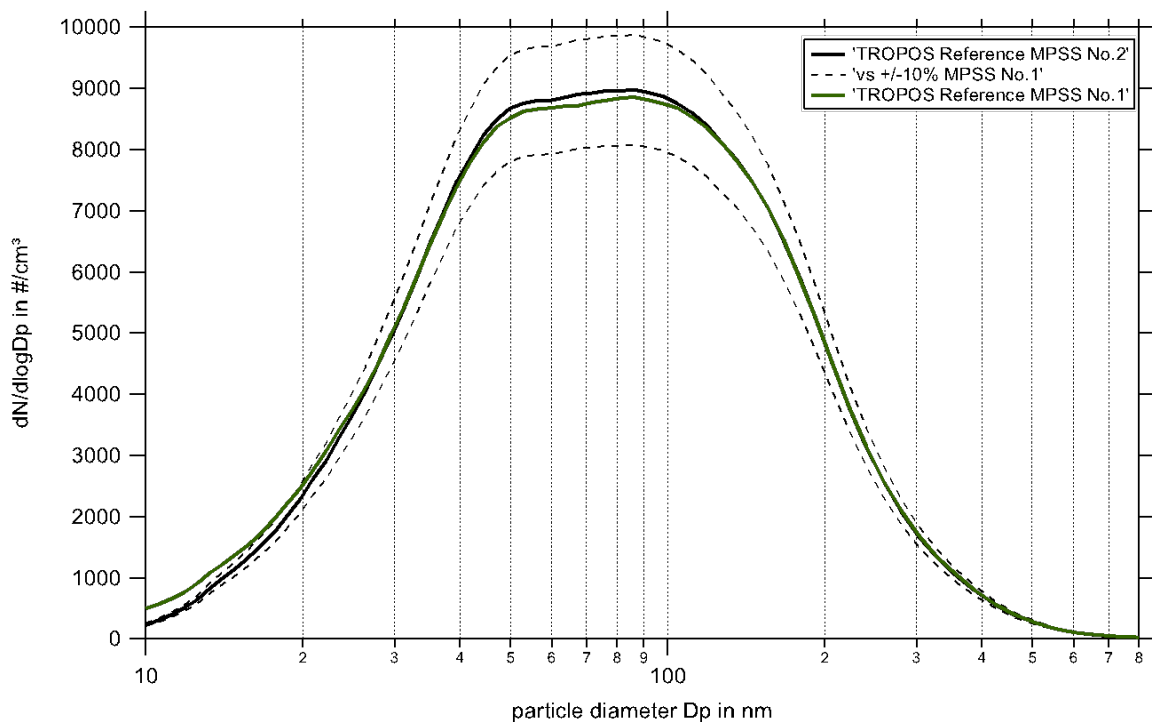


Figure 03: Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 and TROPOS Reference MPSS No.2 from April 04, 2016 21:00 pm until April 05, 2016 05:00 am. The inversion was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Correlation

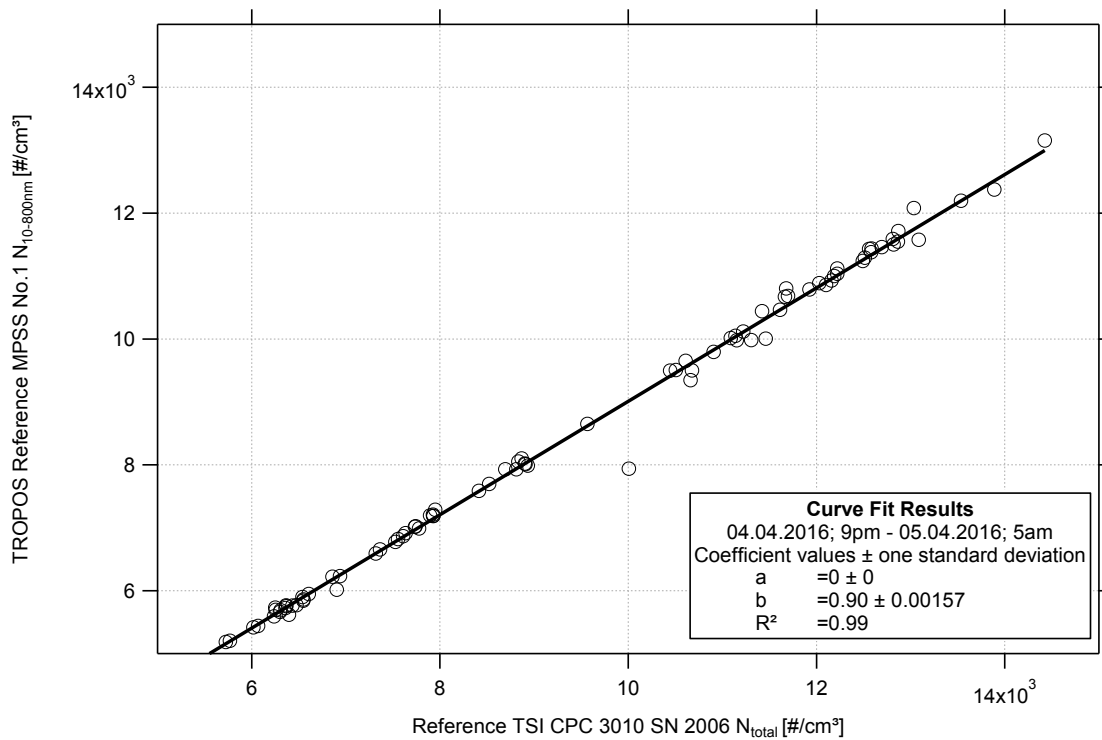


Figure 04: Linear regression between the number concentrations of the Reference TSI CPC 3010 SN 2006 and TROPOS Reference MPSS No.1. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

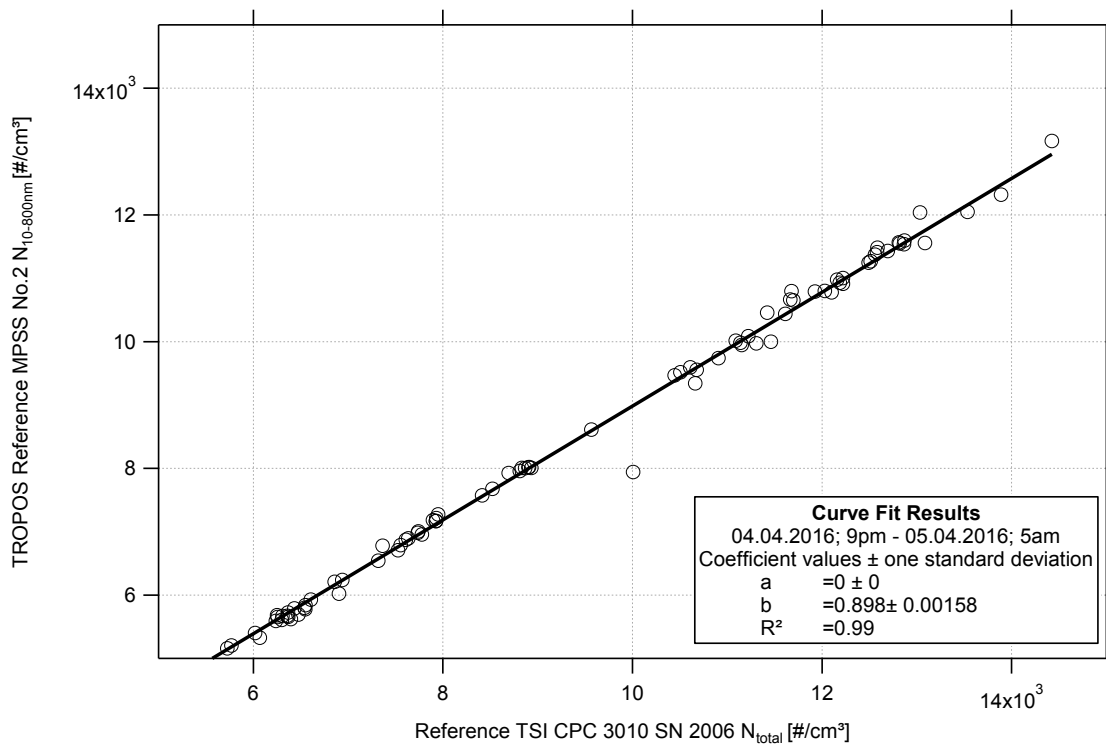


Figure 05: Linear regression between the number concentrations of the Reference TSI CPC 3010 SN 2006 and TROPOS Reference MPSS No.2. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

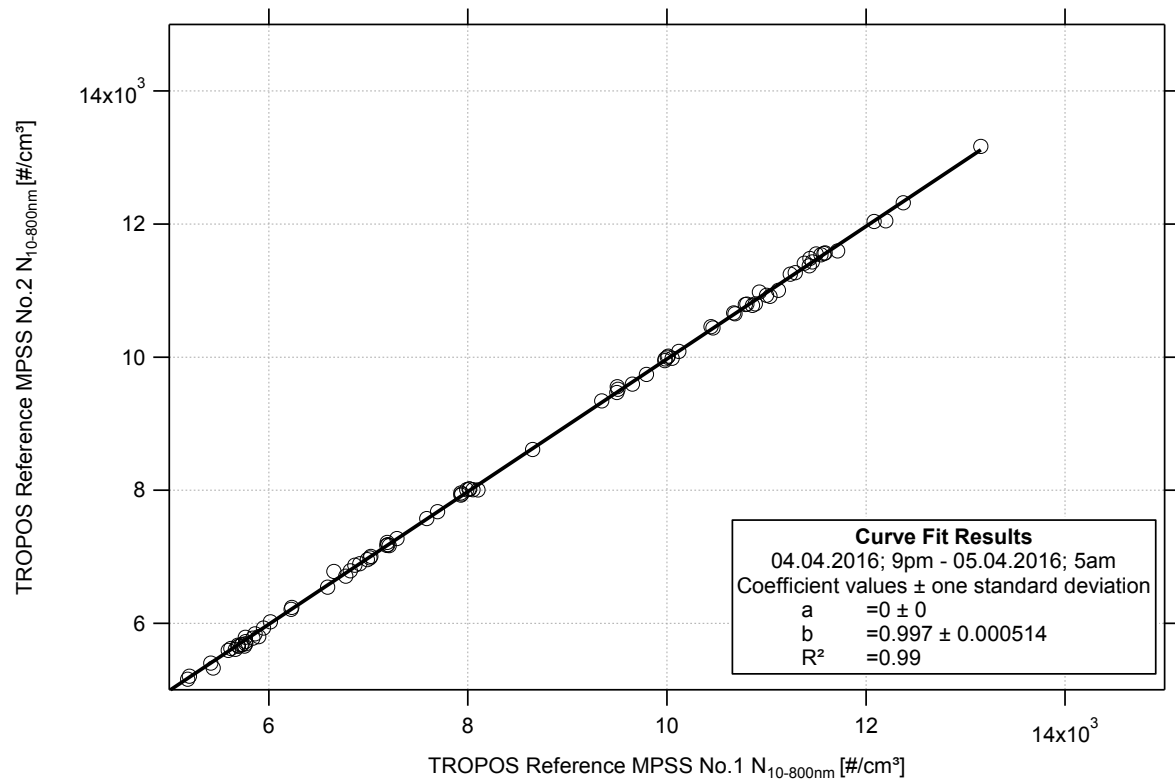


Figure 06: Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and TROPOS Reference MPSS No.2. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.