

## Intercomparison of Mobility Particle Size Spectrometers

*Project No.:* MPSS-2019-3-4

*Principal Investigator:* JP Putaud

*Home Institution:* JRC

*Participant:* Sebastiao Martins dos Santos

*Candidate:* SMPS JRC

*Made by:* **JRC Homemade**

*Counter (SN):* TSI CPC 3772 SN47419

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

*Comparison period:* June 03, 2019 – June 07, 2019

*Last Intercomparison (with Project No.):*

## Summary of Intercomparison:

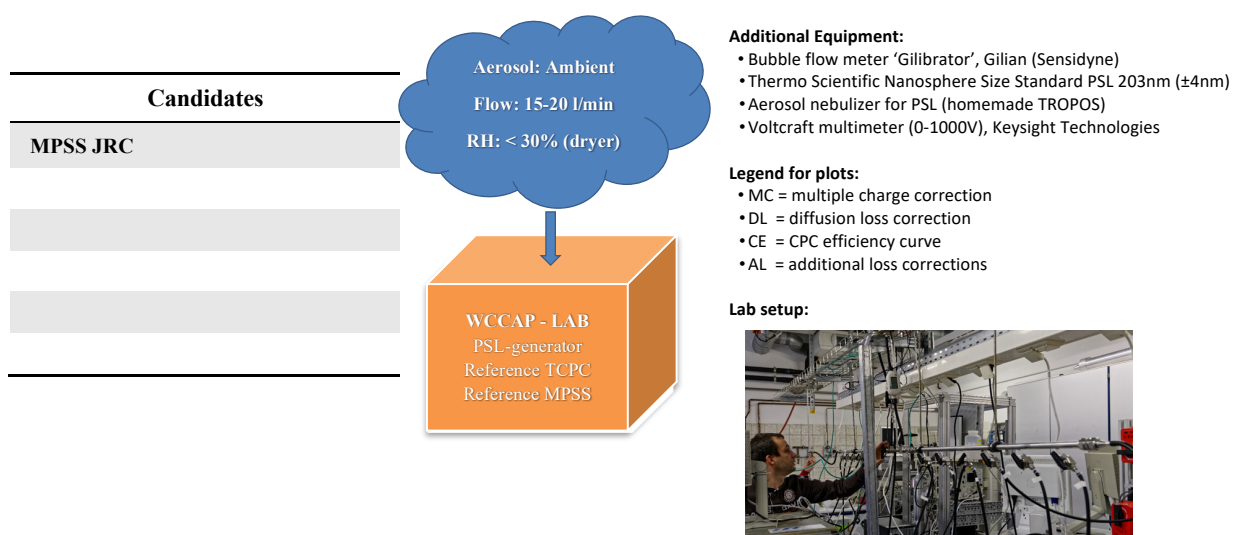
### Pre-Status:

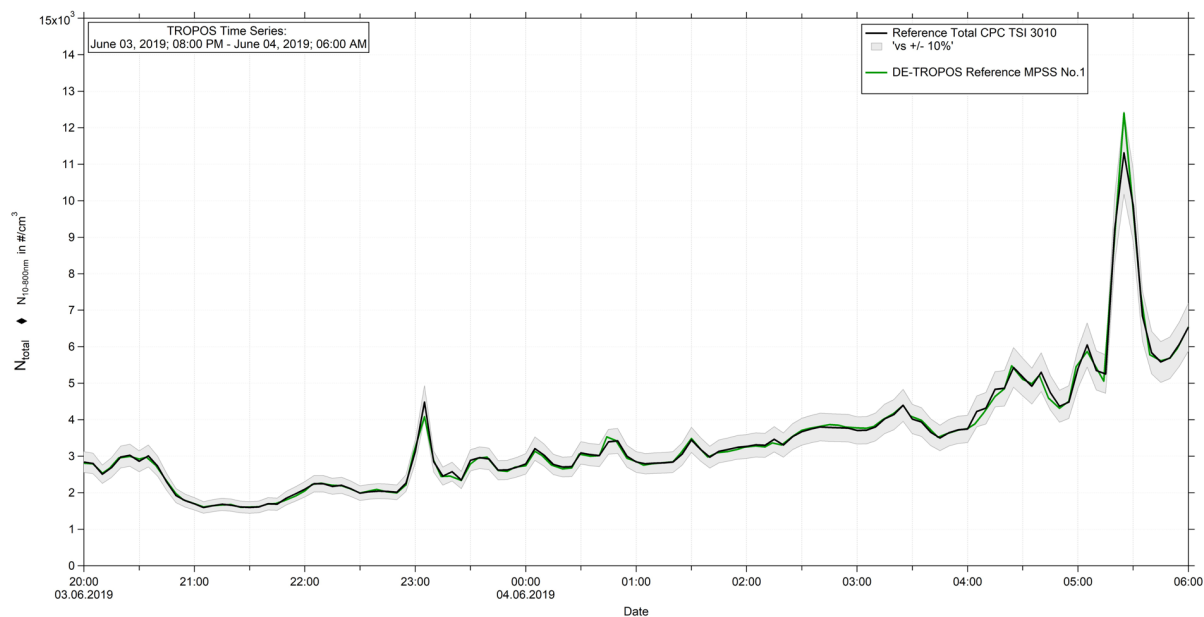
The candidate from JRC-Ispira MPSS participated in the ACTRIS workshop from June 03, 2019 to June 04, 2019 with the participant. The setup of the candidate was done on Monday, June 03<sup>rd</sup>, afternoon. During the Pre-Status the candidate was running under the same settings, with their own TSI Kr.85 source, like on the Institute. The performance of the candidate showed a concentration 10% lower than the TROPOS Reference Instrument No.1. On Tuesday, June 04<sup>th</sup>, 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. 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:

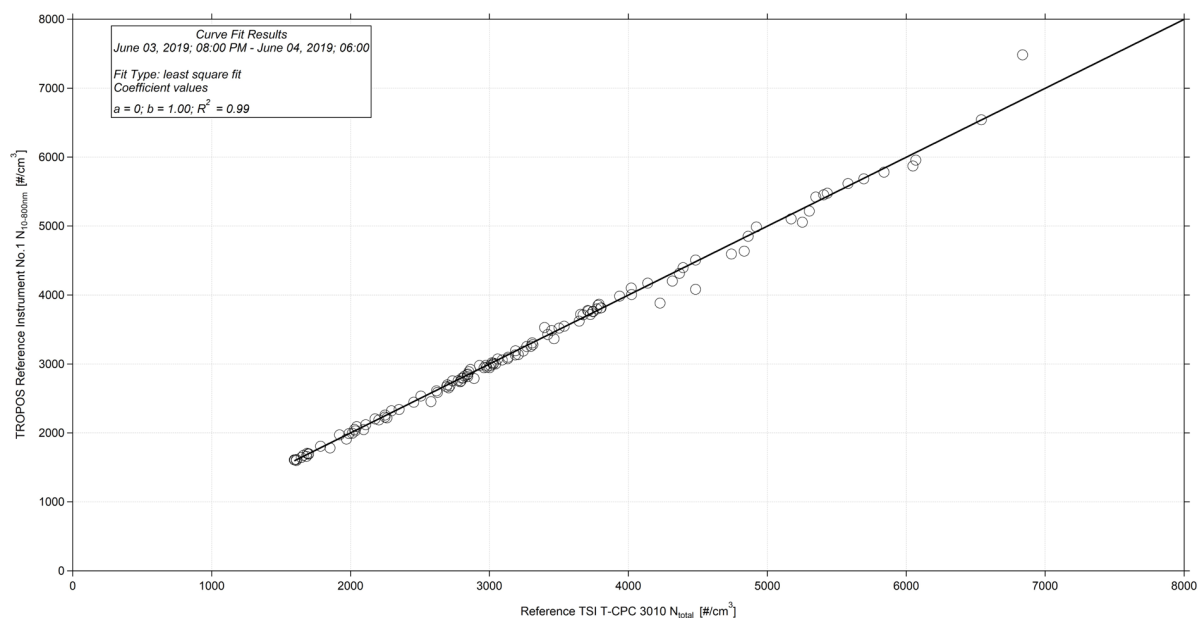
The final run took place from June 06 to June 07, 2019. Running the candidate using the original source Kr.85 and the TROPOS Reference CPC No.1 the performance showed a concentration 1% lower than the TROPOS Reference Instrument No.1. The DMA from JRC-Ispira MPSS had to be cleaned and the electrode had to be polished, also the slit of the DMA was adjusted back to 0.5. The candidate passed the standards of ACTRIS and GAW under the conditions, using the TROPOS Reference CPC No.1.

## Laboratory Setup and Legend

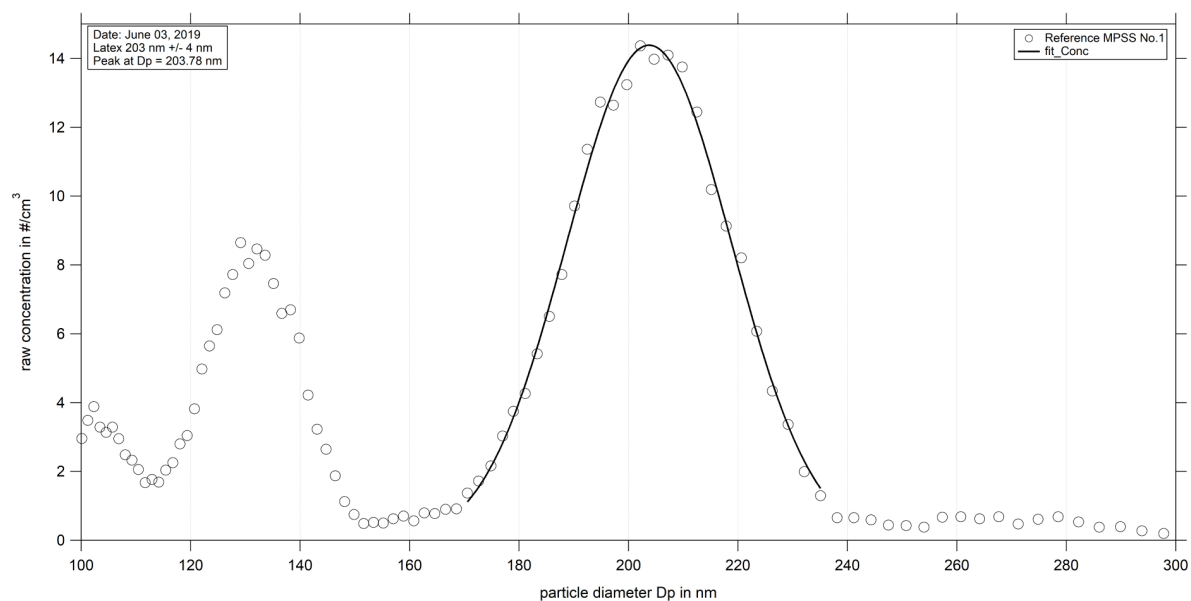


**TROPOS Reference Instruments No. 1 and TROPOS Reference T-CPC TSI 3010****June 03 – June 04, 2019: Time Series, Particle Number Size Distribution and Correlation**

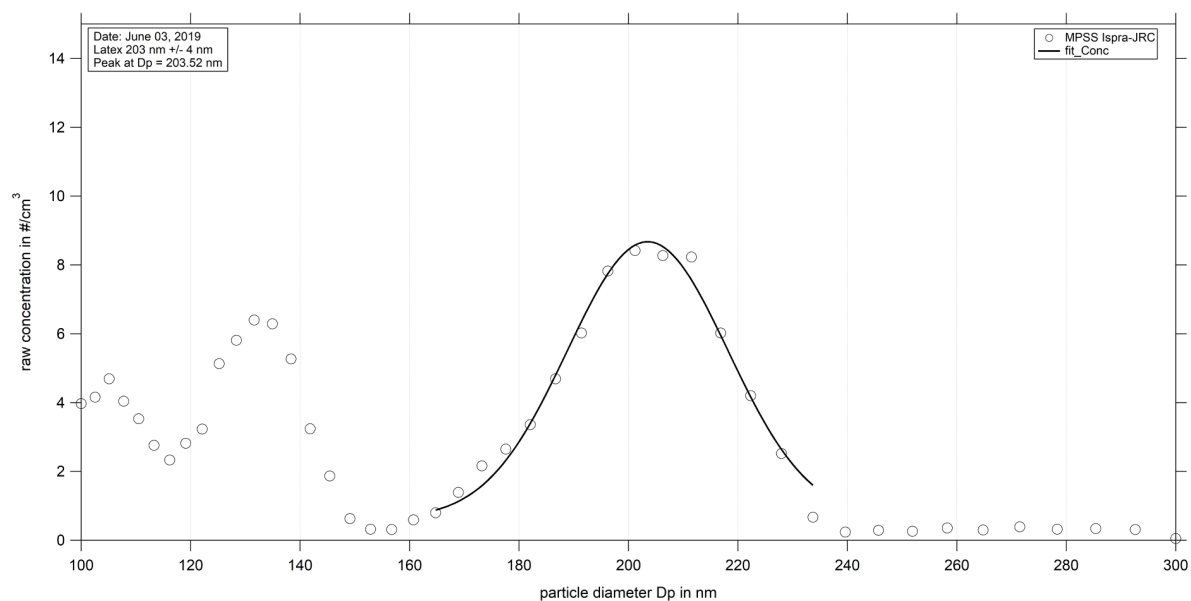
**Figure 01:** Time series (June 03, 2019 8 PM – June 04, 2019 6 AM) of the integrated particle number concentration ( $N_{10-800nm}$ ) of the TROPOS Reference MPSS and total number concentration ( $N_{total}$ ) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.



**Figure 02:** 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.

**PSL Scan: Latex 203 nm +/- 4 nm**

**Figure 03:** Measurement of latex 203 nm - Reference MPSS No.1: Particle size distribution (raw concentration) for latex 203 nm on June 03<sup>rd</sup> 2019.



**Figure 04:** Measurement of latex 203 nm for the candidate JRC-Ispra MPSS: Particle size distribution for latex 203 nm on June 03<sup>rd</sup> 2019 with a peak at 203.52 nm.



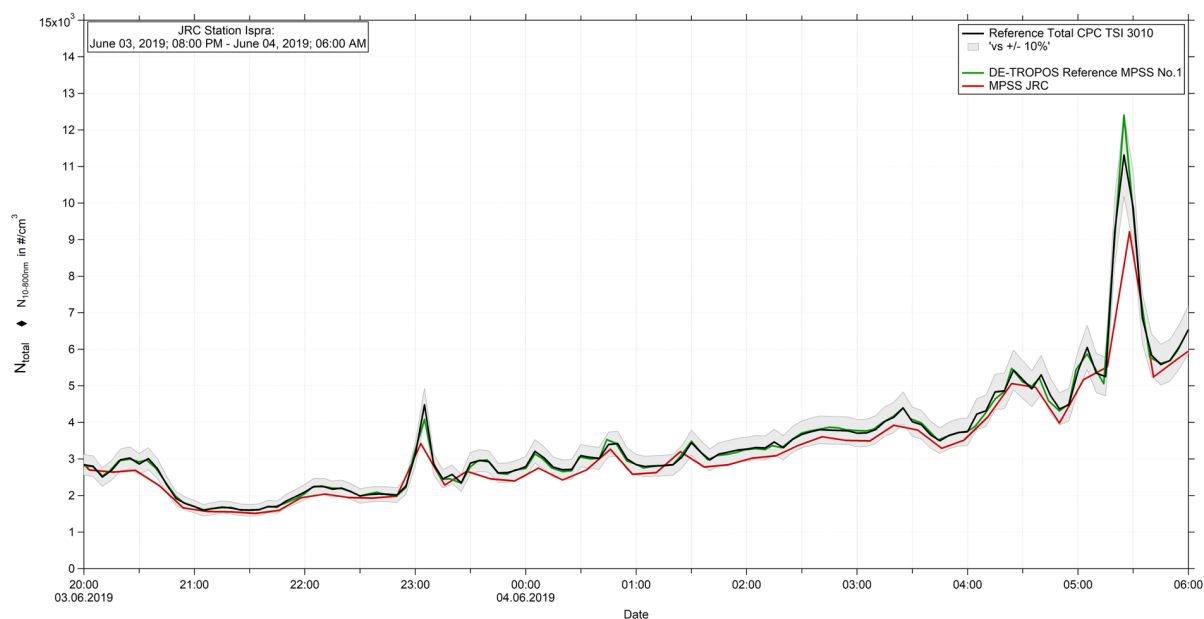
**Pre-Status June 03 – 04, 2019****Instrument Settings, Time Series, Particle Number Size Distribution and Correlation**

Table No. 1:

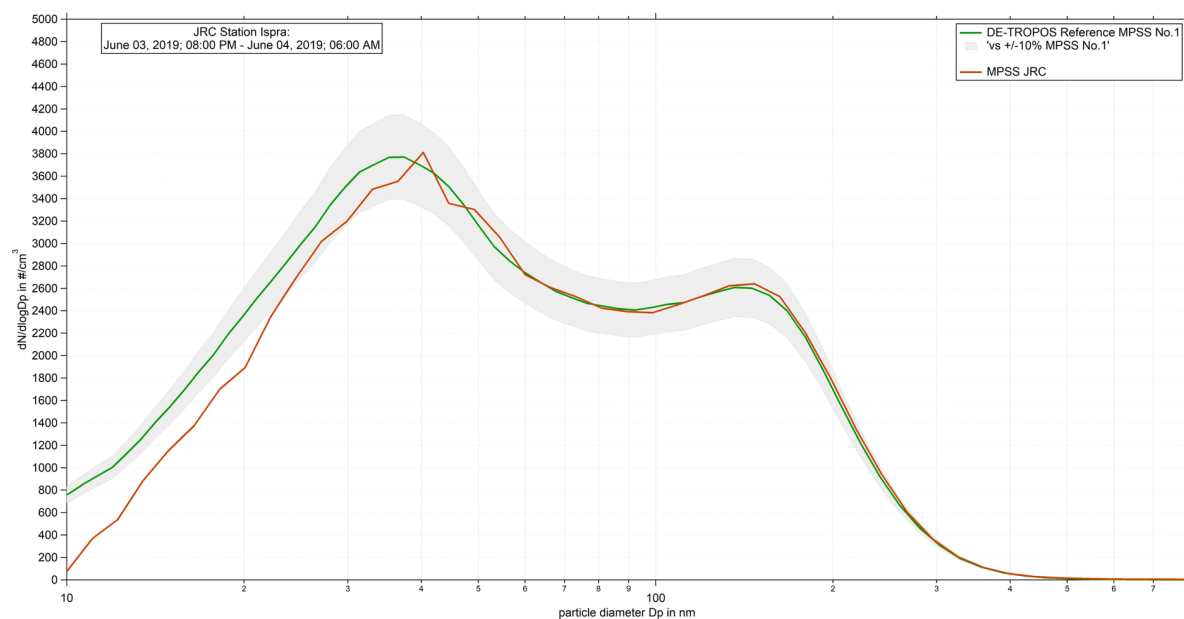
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<i>Station:</i> <b>Ispra</b>							
<i>Date of checking list:</i> <b>03.06.2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>SN</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>DMPS JRC</b>			<i>ST</i>	<b>39</b>	<i>OFF</i>	
<i>Firmware Classifier:</i>				<i>CT</i>	<b>22</b>	<i>5 V</i>	
<i>Firmware Software:</i>	<b>Source 32</b>			<i>OT</i>	<b>40</b>	<i>10 V</i>	
<i>DMA type:</i>	<b>Vienna</b>	<b>158</b>		<i>CabT</i>	<b>44.6</b>	<i>1000 V</i>	
<i>CPC model:</i>	<b>TSI CPC 3772</b>	<b>70847419</b>		<i>AP</i>	<b>99.5</b>	<i>250 V</i>	
<i>Firmware CPC:</i>	<b>2.9</b>			<i>OP</i>	<b>74.4</b>	<i>5 V</i>	
<i>radioactive source:</i>	<b>Kr.85</b>			<i>NP</i>	<b>2.5</b>	<i>400 V</i>	
<i>Flow CPC (l/min):</i>	<b>1.008</b>			<i>LC</i>	<b>53</b>	<i>600 V</i>	
<i>Flow Inlet (l/min):</i>						<i>800 V</i>	
<i>Flow Display (l/min):</i>						<i>700 V</i>	
<i>Zero (#/cm<sup>3</sup>):</i>						<i>650 V</i>	
<i>Maintenance</i>							
<i>Aerosol inlet:</i>							
<i>Aerosol Nafion dryer:</i>							
<i>Sheath Nafion dryer:</i>							
<i>Source:</i>							
<i>HV power supply:</i>							
<i>DMA:</i>							
<i>Aerosol/sheath RH/T- sensor:</i>							
<i>Pressure sensor:</i>							
<i>Filter:</i>							
<i>NI-card:</i>							
<i>CPC:</i>							
<i>Impactor:</i>							
<i>Setup settings over night:</i>	<b>Station conditions</b>						

<i>Institute:</i> <b>TROPOS</b>							
<i>Station:</i> <b>Reference Instrument No.1</b>							
<i>Date of checking list:</i> <b>June 3, 2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>Serial Number</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>TROPOS</b>	<b>No.1</b>		<i>ST</i>	<b>39.0</b>	<i>0 V</i>	<b>0</b>
<i>Firmware Classifier:</i>				<i>CT</i>	<b>22.0</b>	<i>5 mV</i>	<b>4.98</b>
<i>Firmware Software:</i>	<b>TROPOS 6.68</b>			<i>OT</i>	<b>40.0</b>	<i>800 mV</i>	<b>999.8</b>
<i>DMA type:</i>	<b>Hauke medium</b>		<b>142</b>	<i>CabT</i>	<b>27.3</b>	<i>200 mV</i>	<b>250.0</b>
<i>CPC model:</i>	<b>TSI 3772</b>	<b>3772141701</b>		<i>AP</i>	<b>98.5</b>	<i>0 V</i>	<b>0</b>
<i>Firmware CPC:</i>	<b>2.15</b>			<i>OP</i>	<b>72.1</b>		
<i>Radioactive source:</i>	<b>Kr.85</b>	<b>NER 8275</b>	<b>002/13</b>	<i>NP</i>	<b>2.8</b>		
<i>Flow Inlet (l/min):</i>	<b>1.031</b>			<i>LC</i>	<b>50</b>		
<i>Zero (#/cm<sup>3</sup>):</i>	<b>0</b>						

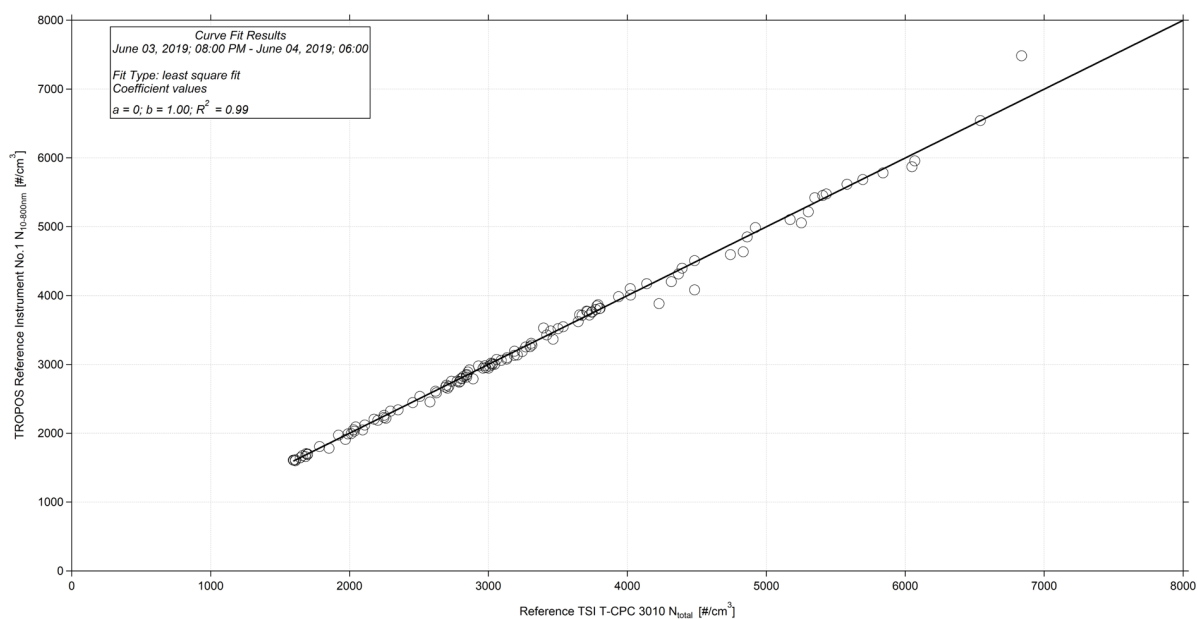
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<b>Station: Reference Total CPC</b>					
<b>Date of checking list: June 03, 2019</b>					
<i>Instrument/ Components</i>	<i>info</i>	<i>Serial Number</i>	<i>Cut off</i>	<i>CPC-Status</i>	
<b>CPC model:</b>	<b>TSI 3010</b>	<b>2410</b>	<b>D<sub>p50</sub> 10 nm</b>	<i>ST</i>	
<i>Firmware CPC:</i>	<b>2.15</b>			<i>CT</i>	
<i>Flow Inlet (l/min):</i>	<b>1.015</b>			<i>OT</i>	
<i>Zero (#/cm<sup>3</sup>):</i>	<b>0</b>			<i>CabT</i>	
				<i>AP</i>	
				<i>OP</i>	
				<i>NP</i>	
				<i>LC</i>	



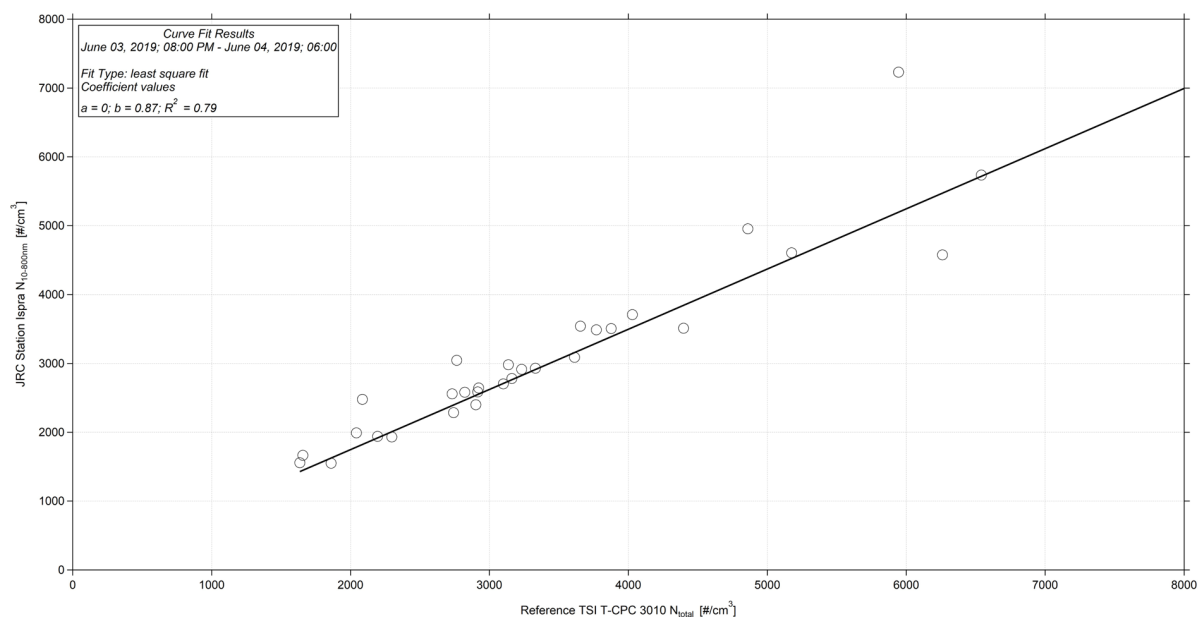
**Figure 05:** Time series (June 03, 2019 8 PM – June 04, 2019 6 AM) of the integrated particle number concentration ( $N_{10-800\text{nm}}$  or  $N_{10.6-500\text{nm}}$ ) of the MPSS and total number concentration ( $N_{\text{total}}$ ) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included. The candidate is running with the Kr.85 source.



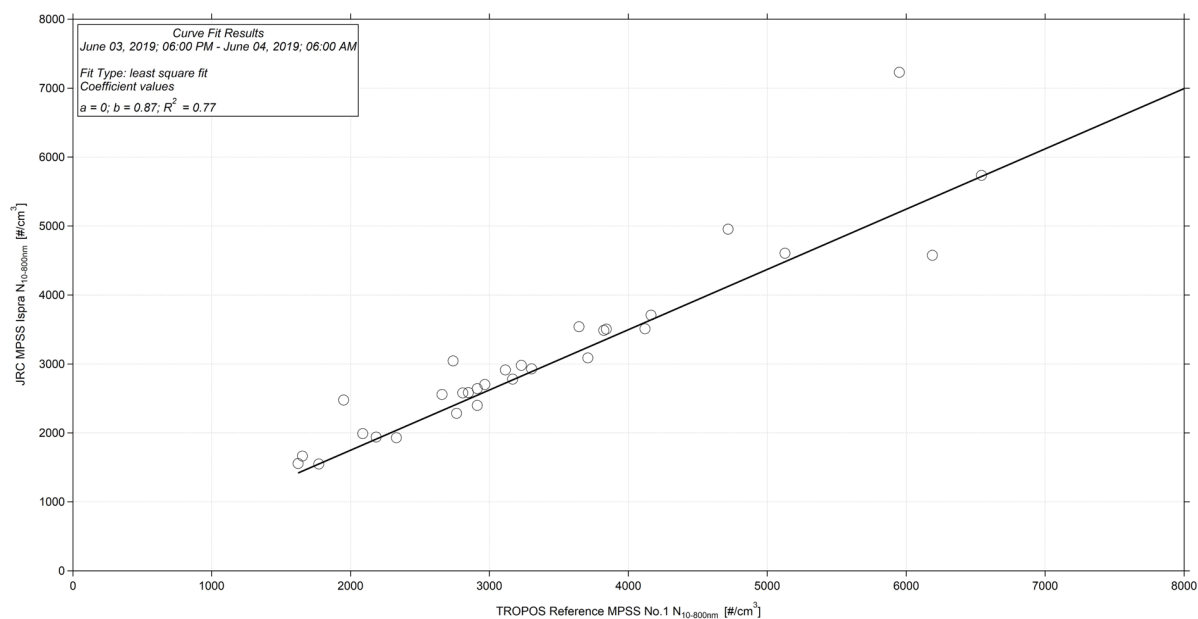
**Figure 06:** Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against JRC-Ispra MPSS from June 03, 2019 8 PM – June 04, 2019 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.



**Figure 07:** 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 08:** Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and JRC-Ispra MPSS. Multiple charge correction, internal diffusion losses and CPC efficiency are included.



**Figure 09:** Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and JRC-Ispra MPSS. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

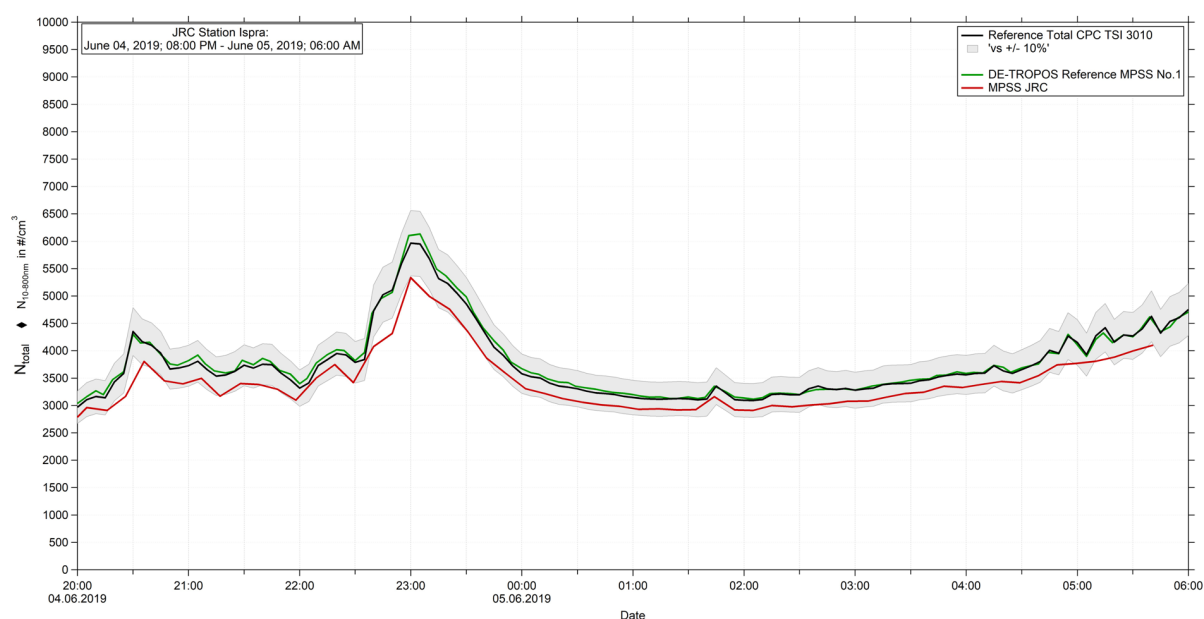
**Status June 04 – 05, 2019****Instrument Settings, Time Series, Particle Number Size Distribution and Correlation**

Table No. 2:

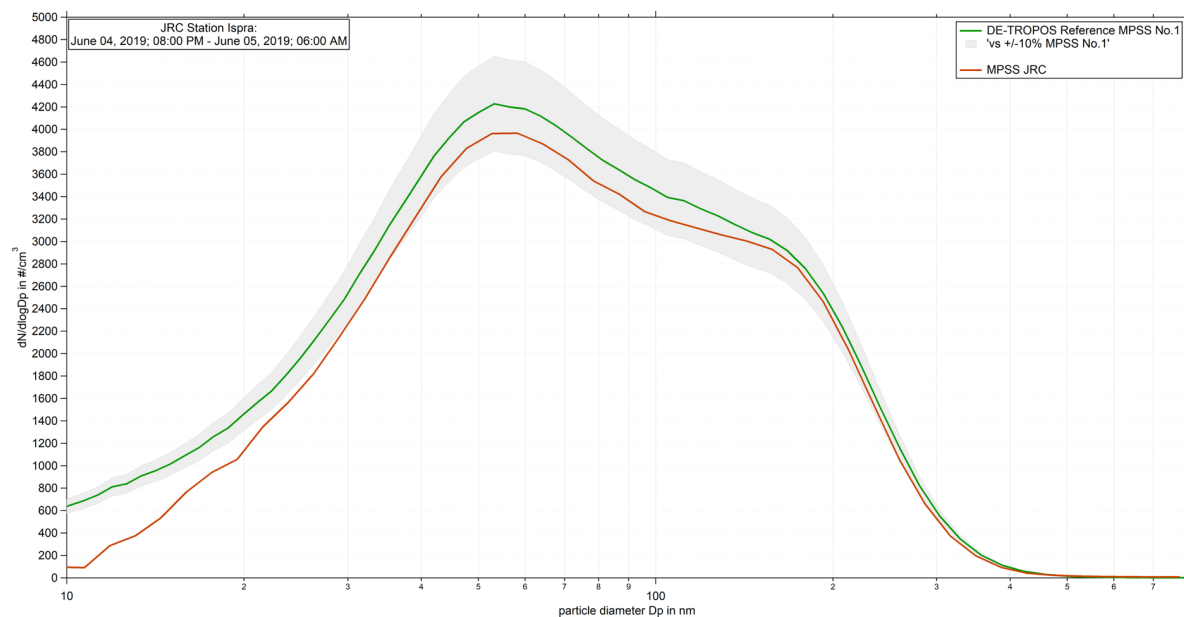
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<i>Station:</i> <b>Ispra</b>							
<i>Date of checking list:</i> <b>04.06.2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>SN</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>DMPS JRC</b>			<i>ST</i>		<i>OFF</i>	
<i>Firmware Classifier:</i>				<i>CT</i>		<i>5 V</i>	
<i>Firmware Software:</i>	<b>Source 32</b>			<i>OT</i>		<i>10 V</i>	
<i>DMA type:</i>	<b>Vienna</b>	<b>158</b>		<i>CabT</i>		<i>1000 V</i>	
<i>CPC model:</i>	<b>TSI CPC 3772</b>	<b>70847419</b>		<i>AP</i>		<i>250 V</i>	
<i>Firmware CPC:</i>	<b>2.9</b>			<i>OP</i>		<i>5 V</i>	
<i>radioactive source:</i>	<b>Kr.85</b>			<i>NP</i>		<i>400 V</i>	
<i>Flow CPC (l/min):</i>				<i>LC</i>		<i>600 V</i>	
<i>Flow Inlet (l/min):</i>	<b>1.006</b>					<i>800 V</i>	
<i>Flow Display (l/min):</i>						<i>700 V</i>	
<i>Zero (#/cm<sup>3</sup>):</i>						<i>650 V</i>	
<i>Maintenance</i>							
<i>Aerosol inlet:</i>							
<i>Aerosol Nafion dryer:</i>							
<i>Sheath Nafion dryer:</i>							
<i>Source:</i>							
<i>HV power supply:</i>							
<i>DMA:</i>							
<i>Aerosol/sheath RH/T- sensor:</i>							
<i>Pressure sensor:</i>							
<i>Filter:</i>							
<i>NI-card:</i>							
<i>CPC:</i>							
<i>Impactor:</i>							
<i>Setup settings over night:</i>		<b>Capillary cleaned</b>					

<i>Institute:</i> <b>TROPOS</b>							
<i>Station:</i> <b>Reference Instrument No.1</b>							
<i>Date of checking list:</i> <b>June 04, 2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>Serial Number</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>TROPOS</b>	<b>No.1</b>		<i>ST</i>		<i>0 V</i>	
<i>Firmware Classifier:</i>				<i>CT</i>		<i>5 mV</i>	
<i>Firmware Software:</i>	<b>TROPOS 6.68</b>			<i>OT</i>		<i>800 mV</i>	
<i>DMA type:</i>	<b>Hauke medium</b>		<b>142</b>	<i>CabT</i>		<i>200 mV</i>	
<i>CPC model:</i>	<b>TSI 3772</b>	<b>3772141701</b>		<i>AP</i>		<i>0 V</i>	
<i>Firmware CPC:</i>	<b>2.15</b>			<i>OP</i>			
<i>Radioactive source:</i>	<b>Kr.85</b>	<b>NER 8275</b>	<b>002/13</b>	<i>NP</i>			
<i>Flow Inlet (l/min):</i>	<b>1.022</b>			<i>LC</i>			
<i>Zero (#/cm<sup>3</sup>):</i>	<b>0</b>						

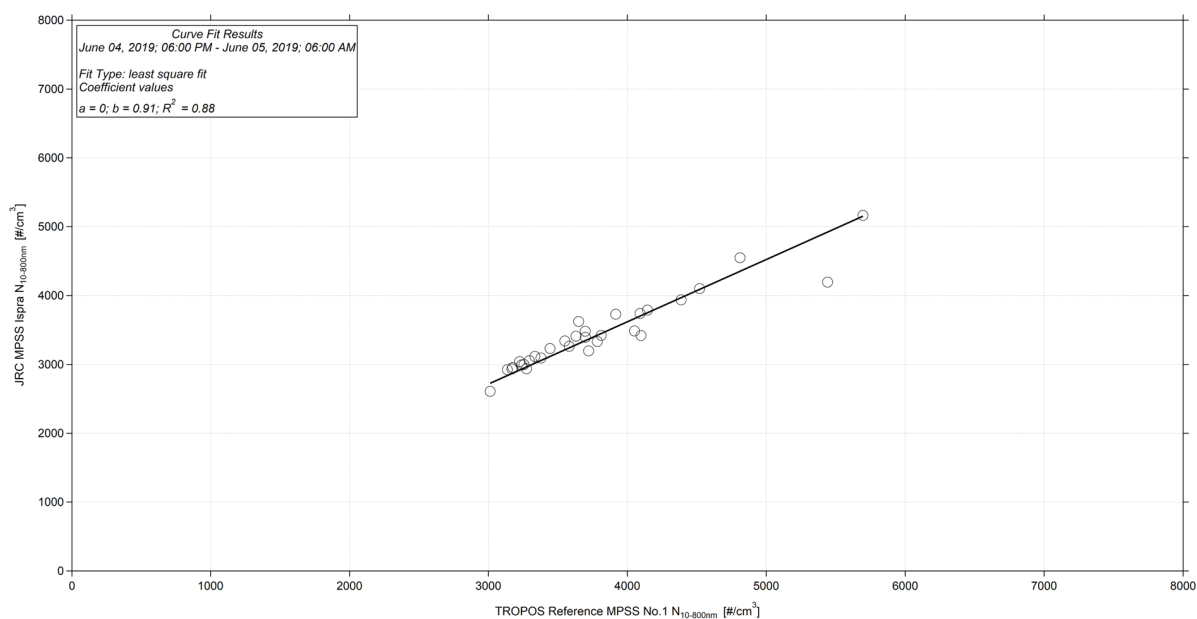
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<b>Station: Reference Total CPC</b>					
<b>Date of checking list: June 04, 2019</b>					
Instrument/ Components	info	Serial Number	Cut off	CPC-Status	
CPC model:	TSI 3010	2410	D <sub>p50</sub> 10 nm	ST	
Firmware CPC:	2.15			CT	
Flow Inlet (l/min):	1.011			OT	
Zero (#/cm <sup>3</sup> ):	0			CabT	
				AP	
				OP	
				NP	
				LC	



**Figure 10:** Time series (June 04, 2019 8 PM – June 05, 2019 6 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. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.



**Figure 11:** Comparison of median particle number size distribution of TROPOS Reference MPSS No.1 against JRC-Ispra MPSS from June 04, 2019 8 PM – June 05, 2019 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.



**Figure 12:** Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and JRC-Ispra MPSS. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

**Status June 05 – 06, 2019****Instrument Settings, Time Series, Particle Number Size Distribution and Correlation**

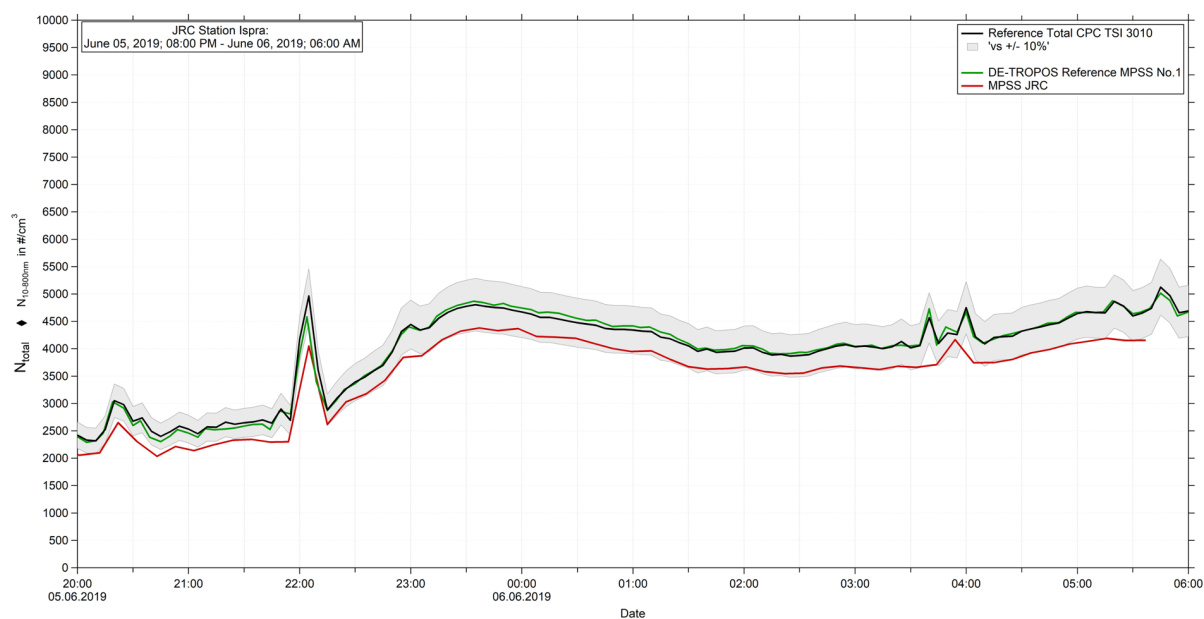
Table No. 2:

<i>Institute:</i> <b>JRC</b>							
<i>Station:</i> <b>Ispra</b>							
<i>Date of checking list:</i> <b>05.06.2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>SN</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>DMPS JRC</b>			<i>ST</i>		<i>OFF</i>	
<i>Firmware Classifier:</i>				<i>CT</i>		<i>5 V</i>	
<i>Firmware Software:</i>	<b>Source 32</b>			<i>OT</i>		<i>10 V</i>	
<i>DMA type:</i>	<b>Vienna</b>	<b>158</b>		<i>CabT</i>		<i>1000 V</i>	
<i>CPC model:</i>	<b>TSI CPC 3772</b>	<b>70847419</b>		<i>AP</i>		<i>250 V</i>	
<i>Firmware CPC:</i>	<b>2.9</b>			<i>OP</i>		<i>5 V</i>	
<i>radioactive source:</i>	<b>Kr.85</b>			<i>NP</i>		<i>400 V</i>	
<i>Flow CPC (l/min):</i>				<i>LC</i>		<i>600 V</i>	
<i>Flow Inlet (l/min):</i>	<b>1.006</b>					<i>800 V</i>	
<i>Flow Display (l/min):</i>						<i>700 V</i>	
<i>Zero (#/cm<sup>3</sup>):</i>						<i>650 V</i>	
<i>Maintenance</i>							
<i>Aerosol inlet:</i>							
<i>Aerosol Nafion dryer:</i>							
<i>Sheath Nafion dryer:</i>							
<i>Source:</i>							
<i>HV power supply:</i>							
<i>DMA:</i>	<b>New DMA-TROPOS-. JRC DMA sent for Maintenance</b>						
<i>Aerosol/sheath RH/T- sensor:</i>							
<i>Pressure sensor:</i>							
<i>Filter:</i>							
<i>NI-card:</i>							
<i>CPC:</i>							
<i>Impactor:</i>							
<i>Setup settings over night:</i>							

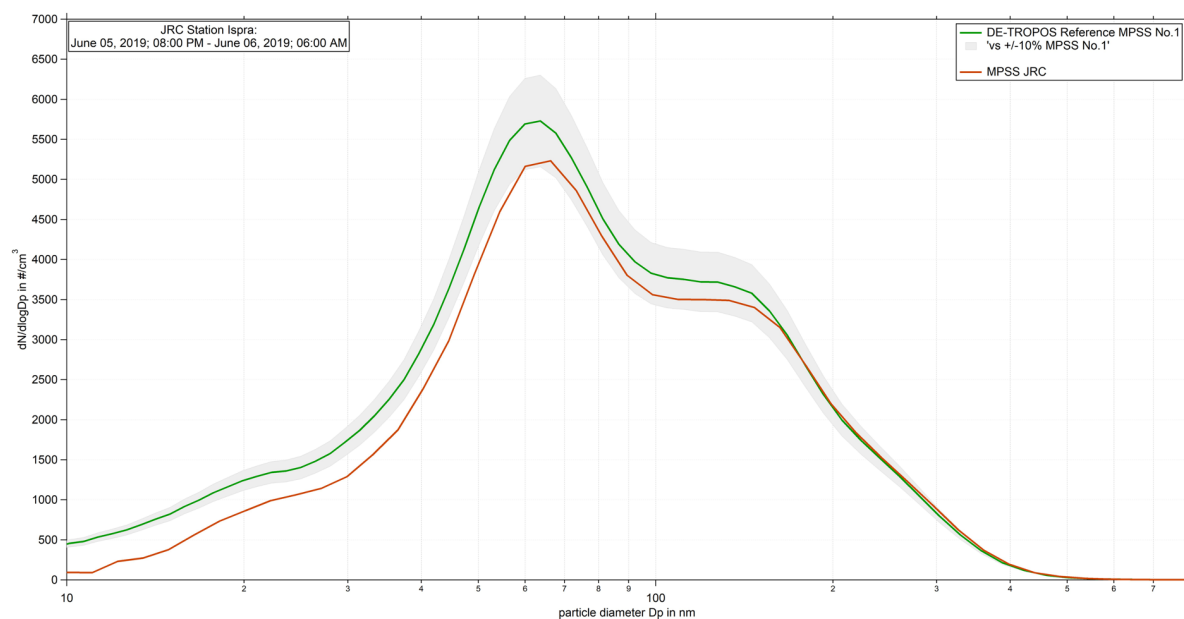
<i>Institute:</i> <b>TROPOS</b>							
<i>Station:</i> <b>Reference Instrument No.1</b>							
<i>Date of checking list:</i> <b>June 05, 2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>Serial Number</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>TROPOS</b>	<b>No.1</b>		<i>ST</i>		<i>0 V</i>	
<i>Firmware Classifier:</i>				<i>CT</i>		<i>5 mV</i>	
<i>Firmware Software:</i>	<b>TROPOS 6.68</b>			<i>OT</i>		<i>800 mV</i>	
<i>DMA type:</i>	<b>Hauke medium</b>		<b>142</b>	<i>CabT</i>		<i>200 mV</i>	
<i>CPC model:</i>	<b>TSI 3772</b>	<b>3772141701</b>		<i>AP</i>		<i>0 V</i>	
<i>Firmware CPC:</i>	<b>2.15</b>			<i>OP</i>			
<i>Radioactive source:</i>	<b>Kr.85</b>	<b>NER 8275</b>	<b>002/13</b>	<i>NP</i>			
<i>Flow Inlet (l/min):</i>	<b>1.02</b>			<i>LC</i>			
<i>Zero (#/cm<sup>3</sup>):</i>	<b>0</b>						



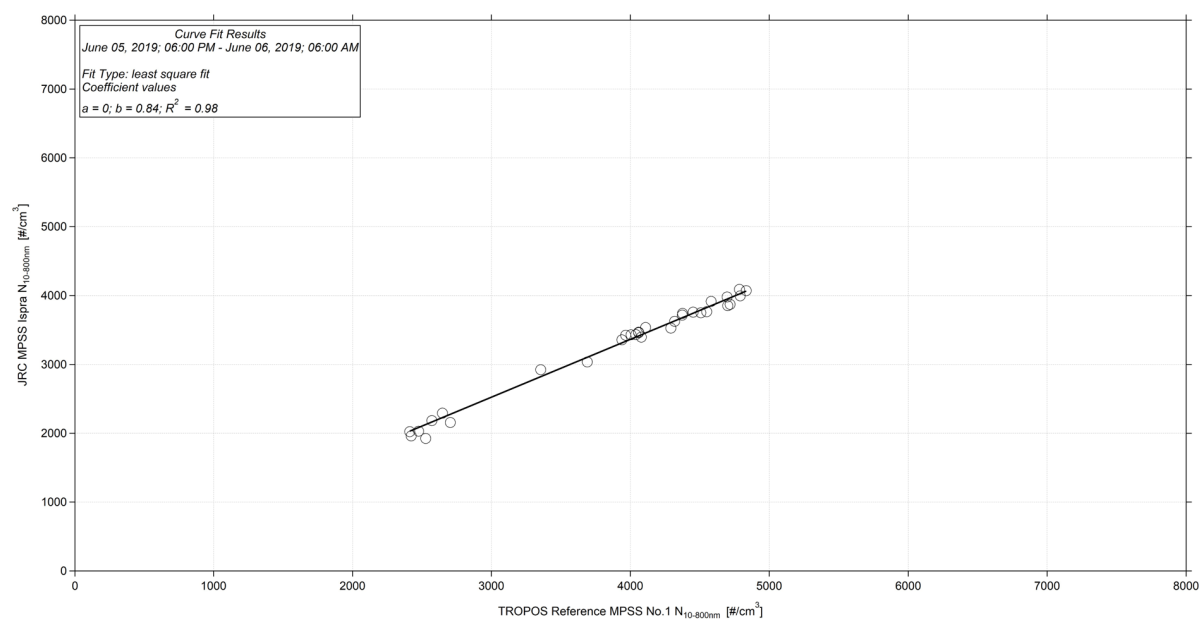
<b>Institute: TROPOS</b>					
<b>Station: Reference Total CPC</b>					
<b>Date of checking list: June 05, 2019</b>					
Instrument/ Components	info	Serial Number	Cut off	CPC-Status	
CPC model:	TSI 3010	2410	D <sub>p50</sub> 10 nm	ST	
Firmware CPC:	2.15			CT	
Flow Inlet (l/min):	1.01			OT	
Zero (#/cm <sup>3</sup> ):	0			CabT	
				AP	
				OP	
				NP	
				LC	



**Figure 13:** Time series (June 05, 2019 8 PM – June 06, 2019 6 AM) of the integrated particle number concentration ( $N_{10-800\text{nm}}$  or  $N_{10.6-500\text{nm}}$ ) of the MPSS and total number concentration ( $N_{\text{total}}$ ) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.



**Figure 14:** Comparison of median particle number size distribution of TROPOS Reference MPSS No.1 against JRC-Ispra MPSS from June 05, 2019 8 PM – June 06, 2019 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.



**Figure 15:** Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and JRC-Ispra MPSS. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

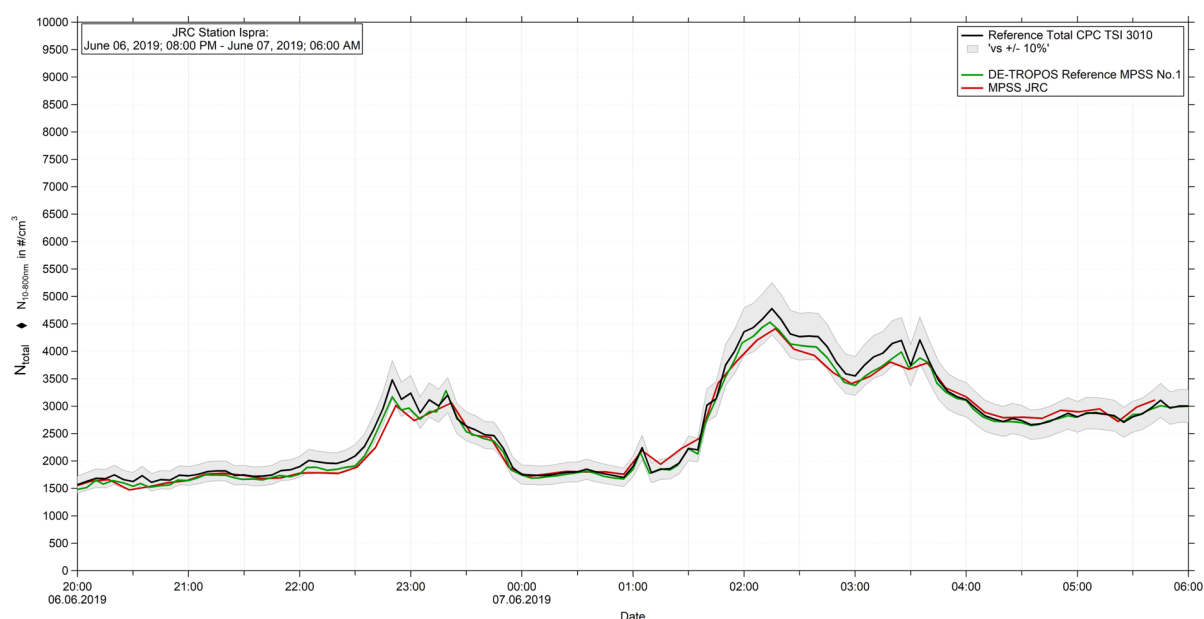
**Final-Status June 06 – 07, 2019****Instrument Settings, Time Series, Particle Number Size Distribution and Correlation**

Table No. 3:

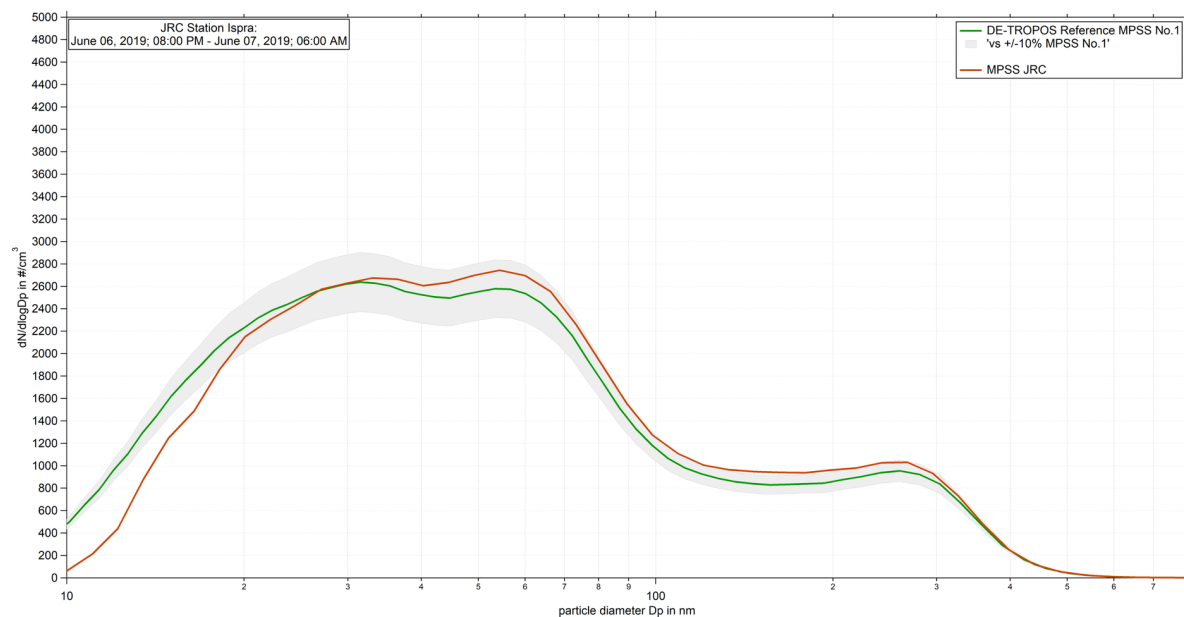
<i>Institute:</i> <b>JRC</b>							
<i>Station:</i> <b>Ispra</b>							
<i>Date of checking list:</i> <b>06.06.2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>SN</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>DMPS JRC</b>			<i>ST</i>		<i>OFF</i>	
<i>Firmware Classifier:</i>				<i>CT</i>		<i>5 V</i>	
<i>Firmware Software:</i>	<b>Source 32</b>			<i>OT</i>		<i>10 V</i>	
<i>DMA type:</i>	<b>Vienna</b>	<b>158</b>		<i>CabT</i>		<i>1000 V</i>	
<i>CPC model:</i>	<b>TSI CPC 3772</b>	<b>70847419</b>		<i>AP</i>		<i>250 V</i>	
<i>Firmware CPC:</i>	<b>2.9</b>			<i>OP</i>		<i>5 V</i>	
<i>radioactive source:</i>	<b>Kr.85</b>			<i>NP</i>		<i>400 V</i>	
<i>Flow CPC (l/min):</i>				<i>LC</i>		<i>600 V</i>	
<i>Flow Inlet (l/min):</i>	<b>1.006</b>					<i>800 V</i>	
<i>Flow Display (l/min):</i>						<i>700 V</i>	
<i>Zero (#/cm<sup>3</sup>):</i>						<i>650 V</i>	
<i>Maintenance</i>							
<i>Aerosol inlet:</i>							
<i>Aerosol Nafion dryer:</i>							
<i>Sheath Nafion dryer:</i>							
<i>Source:</i>	<b>Kr.85 from JRC</b>						
<i>HV power supply:</i>							
<i>DMA:</i>	<b>JRC original DMA installed back – Slit 0.5- Electrode polished</b>						
<i>Aerosol/sheath RH/T- sensor:</i>							
<i>Pressure sensor:</i>							
<i>Filter:</i>							
<i>NI-card:</i>							
<i>CPC:</i>							
<i>Impactor:</i>							
<i>Setup settings over night:</i>							

<i>Institute:</i> <b>TROPOS</b>							
<i>Station:</i> <b>Reference Instrument No.1</b>							
<i>Date of checking list:</i> <b>June 06, 2019</b>							
<i>Instrument/ Components</i>	<i>info</i>	<i>Serial Number</i>	<i>Date/Code</i>	<i>CPC-Status</i>		<i>HV-Status</i>	
<i>MPSS/Classifier:</i>	<b>TROPOS</b>	<b>No.1</b>		<i>ST</i>		<i>0 V</i>	
<i>Firmware Classifier:</i>				<i>CT</i>		<i>5 mV</i>	
<i>Firmware Software:</i>	<b>TROPOS 6.68</b>			<i>OT</i>		<i>800 mV</i>	
<i>DMA type:</i>	<b>Hauke medium</b>		<b>142</b>	<i>CabT</i>		<i>200 mV</i>	
<i>CPC model:</i>	<b>TSI 3772</b>	<b>3772141701</b>		<i>AP</i>		<i>0 V</i>	
<i>Firmware CPC:</i>	<b>2.15</b>			<i>OP</i>			
<i>Radioactive source:</i>	<b>Kr.85</b>	<b>NER 8275</b>	<b>002/13</b>	<i>NP</i>			
<i>Flow Inlet (l/min):</i>	<b>1.02</b>			<i>LC</i>			
<i>Zero (#/cm<sup>3</sup>):</i>	<b>0</b>						

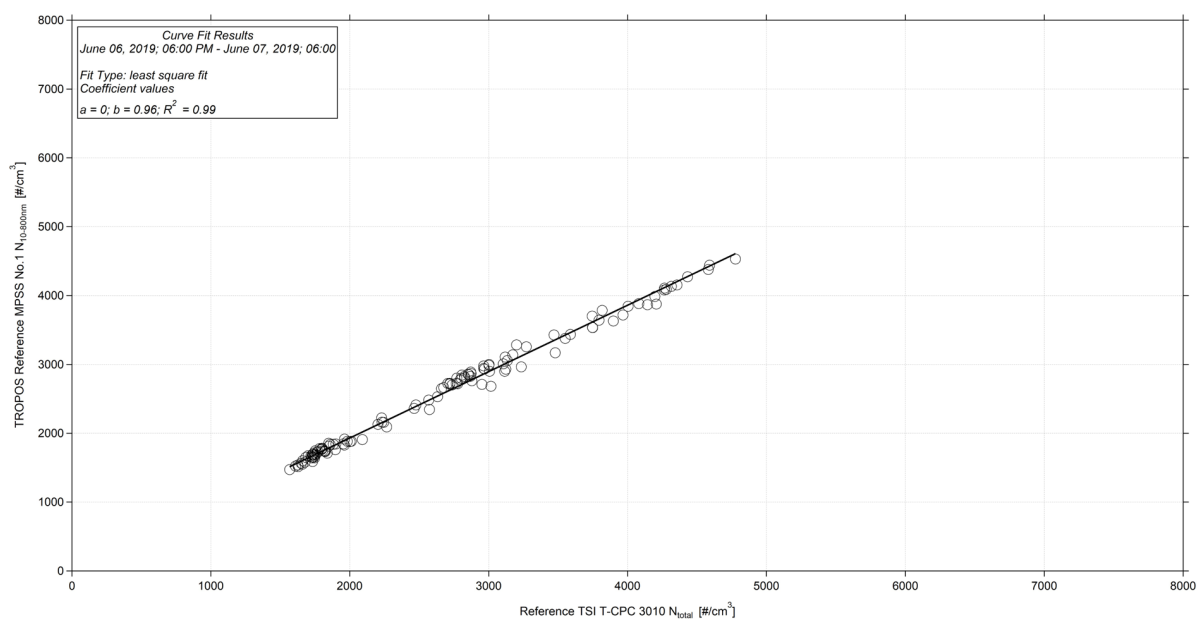
Institute: <b>TROPOS</b>							
Station: <b>Reference Total CPC</b>							
Date of checking list: <b>June 06, 2019</b>							
Instrument/ Components	info	Serial Number	Cut off	CPC-Status			
CPC model:	<b>TSI 3010</b>	<b>2410</b>	<b>D<sub>p50</sub> 10 nm</b>	ST			
Firmware CPC:	<b>2.15</b>			CT			
Flow Inlet (l/min):	<b>1.01</b>			OT			
Zero (#/cm <sup>3</sup> ):	<b>0</b>			CabT			
				AP			
				OP			
				NP			
				LC			



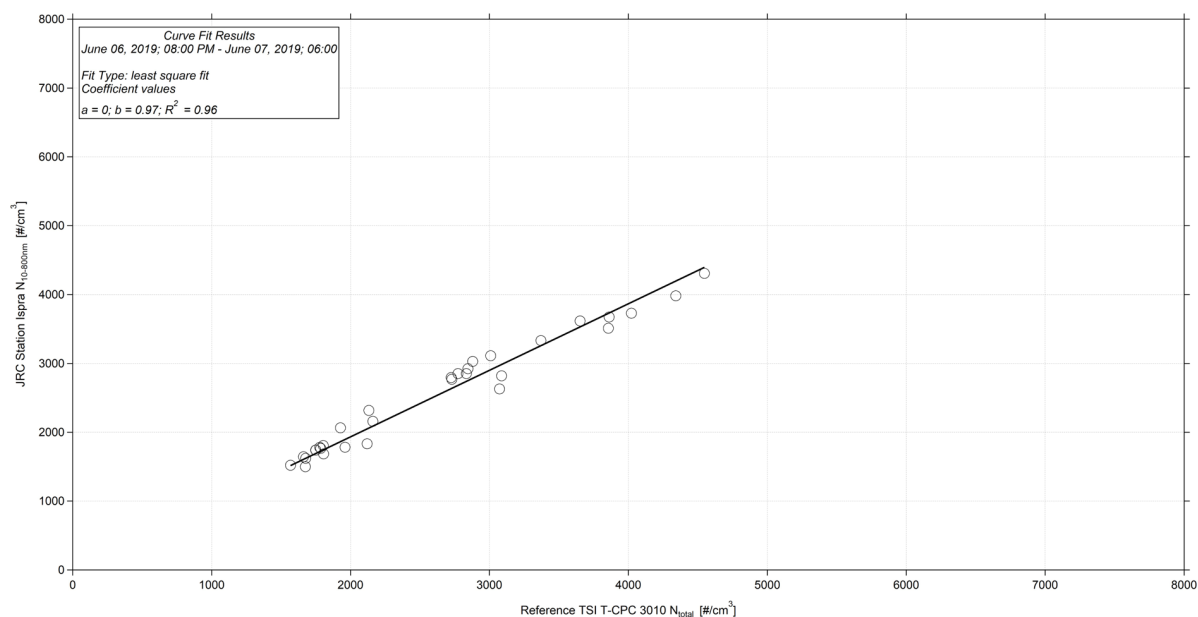
**Figure 16:** Time series (June 06, 2019 8 PM – June 07, 2019 6 AM) of the integrated particle number concentration ( $N_{10-800\text{nm}}$ ) of the MPSS and total number concentration ( $N_{\text{total}}$ ) of the Reference TSI-CPC Model 3010. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.



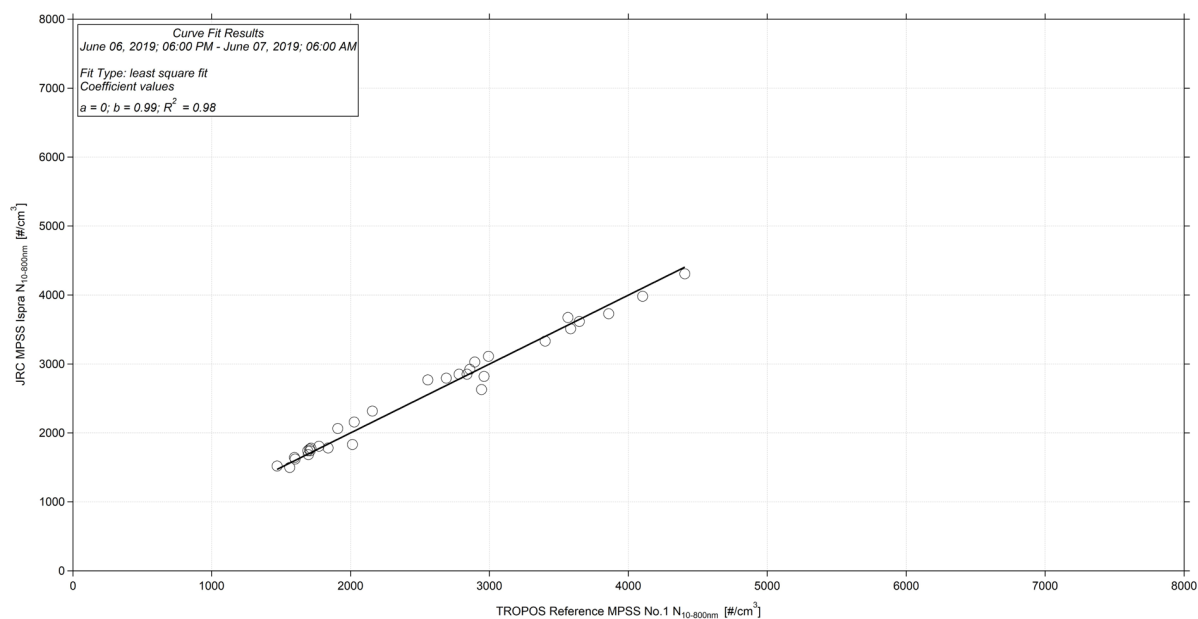
**Figure 17:** Comparison of mean particle number size distribution of TROPOS Reference MPSS No.1 against JRC-Ispra MPSS from June 06, 2019 8 PM – June 07, 2019 6 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included in different steps.



**Figure 18:** 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 19:** Linear regression between the number concentrations of the TROPOS Reference TSI T-CPC Model 3010 and JRC-Ispra MPSS. Multiple charge correction, internal diffusion losses and CPC efficiency are included.



**Figure 20:** Linear regression between the number concentrations of the TROPOS Reference MPSS No.1 and JRC-Ispra MPSS. Multiple charge correction, internal diffusion losses and CPC efficiency are included.