TNA User Report

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Project title	WCCAP
Name of the accessed calibration center	TROPOS Leipzig
Number of users in the project	1
Project objectives (max 100 words)	The main purpose of the activity at the TROPOS laboratory was to carry out a check of the operation of the SMPS/CPC system in use at our research center, employed for four years in field campaign for air quality on board of our mobile van AEROLAB. A second, but no less important, objective was to perform an update calibration in order to comply with the standards of the main international measurements networks in which the instrumentation of the mobile van is present (e.g. ACTRIS).
Description of work (max 100 words):	The workshop was held at the TROPOS laboratories in Leipzig during March 2020. Functional checks were performed with the TROPOS operators on the instruments present and once their operation was restored, calibrations were performed to comply with the main standards of international networks.

Principal Investigator's and group's information	
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User status[3]	RES
New user	YES

User 1 Information[4]	
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Nationality	
Activity domain	
Home institution	
Institution legal status	
Email	
Gender	
User status	
New user	

User 2 Information	
First name	
Family name	
Nationality	
Activity domain	
Home institution	
Institution legal status	
Email	
Gender	
User status	
New user	

[1] Physics; Chemistry, Earth Sciences & Environment; Engineering & Technology; Mathematics; Information & Communication Technologies; Material Sciences; Energy; Social sciences; Humanities.
[2] UNI= University and Other Higher Education Organisation;
RES= Public Research Organisation (including international research organisations and private research organisations controlled by public authority);
SME= Small and Medium Enterprise;
PRV= Other Industrial and/or Profit Private Organisation;
OTH= Other type of organization.
[3] UND= Undergraduate; PGR= Post graduate; PDOC= Post-doctoral researcher; RES= Researcher EXP= Engineer; ACA= Academic; TEC= Technician.
[4] Reproduce the table for each user who accessed the infrastructure

Trans-National Access (TNA) Scientific Report

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Instructions

Please limit the report to max 5 pages, you can include tables and figures. Please make sure to address any comments made by the reviewers at the moment of the project evaluation (if applicable, in this case you were informed beforehand). Please do not alter the layout of the document and keep it in Word version. The report will be made available on the eurochamp.org website. Should any information be confidential or not be made public, please inform us accordingly (in this case it will only be accessible by the European Commission, the EUROCHAMP-2020 project partners, and the reviewers). Please include:

- Introduction and motivation
- Scientific objectives
- Reason for choosing the calibration facility
- Method and experimental set-up
- Data description
- Preliminary results and conclusions
- Outcome and future studies
- References

Name of the PI:Luca Di Liberto
Calibration center's name and location: TROPOS Leipzig,
Campaign name and period: March 2020
Text:

In early 2016, an upgraded version of the AEROLAB, the AERosol moObile LABoratory was implemented at ISAC-CNR (Institute of Atmospheric Science and Climate - Italian National Research Council) to allow for the field, in-depth characterization of ambient particulate matter. AEROLAB is mounted within a motorhome van so to be easily transferred to any destination, to be set-up in about 2-3 hours, providing a comfortable working space.

Range resolved, aerosol backscatter profiling between 100 m and 5 km is obtained by a zenith-pointing lidar ceilometer mounted at the rear of the AEROLAB van. A steerable micro lidar with depolarization (MILES) can also be transported to perform aerosol profiling at chosen directions. A Lufft Meteo/irradiance Station is positioned on the roof, at 5 m above the ground.

AEROLAB in situ aerosol measurements are carried out by i) a Tropos SMPS (scanning mobility particle sampler), measuring number size distribution between 10 and 800 nm, ii) a TSI APS (aerodynamic particle sizer) measuring number size distribution between 500 and 20,000 nm, iii) an Ecotech nephelometer, measuring the aerosol scattering coefficient @ 450, 520, and 700nm, iv) a Magee AETHALOMETER, measuring aerosol absorption coefficient @ 370, 470, 520, 590, 660, 880 and 950 nm, and v) a Grimm OPC (Optical particle counter) measuring aerosol optical size distribution between 250 and 20,000 nm, plus PM10, PM2.5, and PM1. The sampling line is located on the roof of the van, at approximately 4 m above the ground. The line is equipped with a one-meter Nafion dryer to reduce the sample relative humidity. The sampling inlet is fitted with an interchangeable PM10 head.

Fig. 1 AEROLAB

Fig. 2 SMPS on board the AEROLAB

Since 2019 AEROLAB is a National mobile facility of the International framework of ACTRIS and will now employed in several field campaign with the ACTRIS Qa/Qc standard.

The main purpose of the activity at the TROPOS laboratory was to carry out a check of the operation of the SMPS/CPC system in use at our research center.
A second, but no less important, objective was to perform an update calibration in order to comply with the standards of the main international measurements networks in which the instrumentation of the mobile van is now active (e.g. ACTRIS).

The SMPS for the characterization of ultra-fine particulates was developed by TROPOS in 2015. In the last 5 years a constant support for its operation has been provided to us by the operators of TROPOS themselves who with great attention follow the correct operation of the instruments developed.

The SMPS is equipped with a CPC developed by TSI and installed in the system rack, as presented in Fig. 2.

In the second part of 2019 several problems were found in the observations performed by the SMPS and for larger particles no correspondence was observed with the observations performed by the APS.

The set up for the verification and calibration procedure has been carefully prepared in the TROPOS Leipzig, lab 118 by the TROPOS operators led by Dr. Weinhold.
After a first step of comparison with the TROPOS reference instrument a first analysis of problems has been elaborated:

1. Check of HV: The MPSS had an offset from 150V. The HV power cable was broken and had to be changed. The HV-power supply was checked by the electronical workshop and had to be recalibrated.
2. Check of electronic box: The electronic box was also checked by the electronical workshop. All connections were checked. There were no problems.
3. Aerosol inlet: The whole aerosol inlet was checked and cleaned. The capillary was taken out and checked as well.
4. Nafion dryer: Both Nafion dryers, in the sheath air and aerosol lines were old had had to be changed.
5. DMA: The DMA was in bad condition. It was necessary to clean and replace things because of liquid inside the DMA that caused burning.

All problems were solved during activities by TROPOS operators and it was possible to perform than an intarcalibration procedure.

The main results are presented in the following figure in order to show the latex calibration and the inetrcomparison with the reference TROPOS instrument.

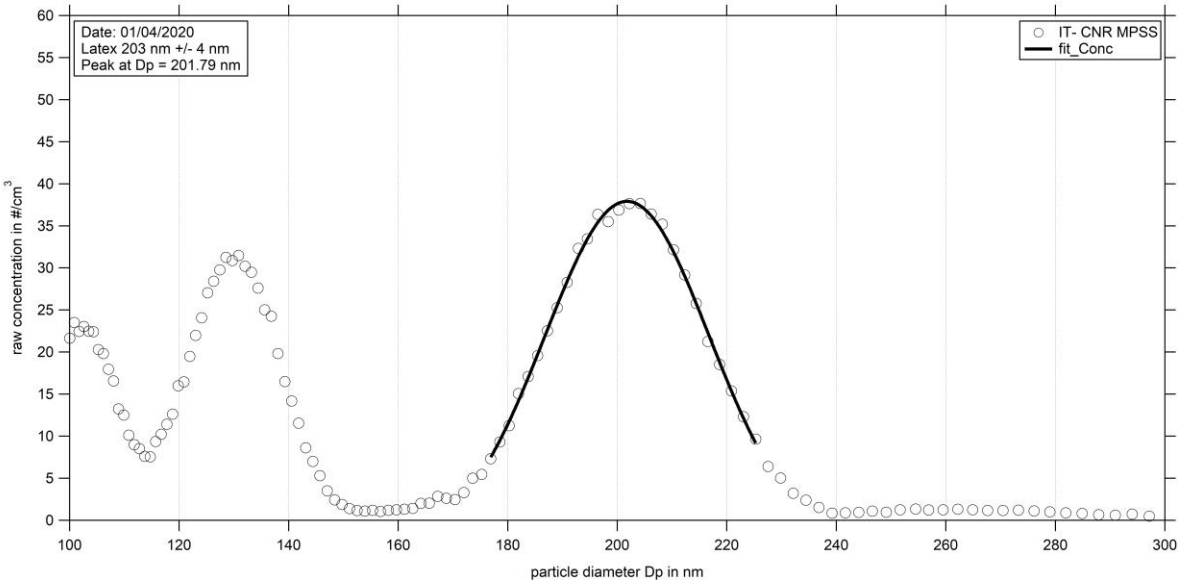

Fig. 3 Measurement of latex 203 nm – IT-CNR MPSS: Particle size distribution of latex 203 nm on April 01st, 2020. The peak shows at 201.79nm

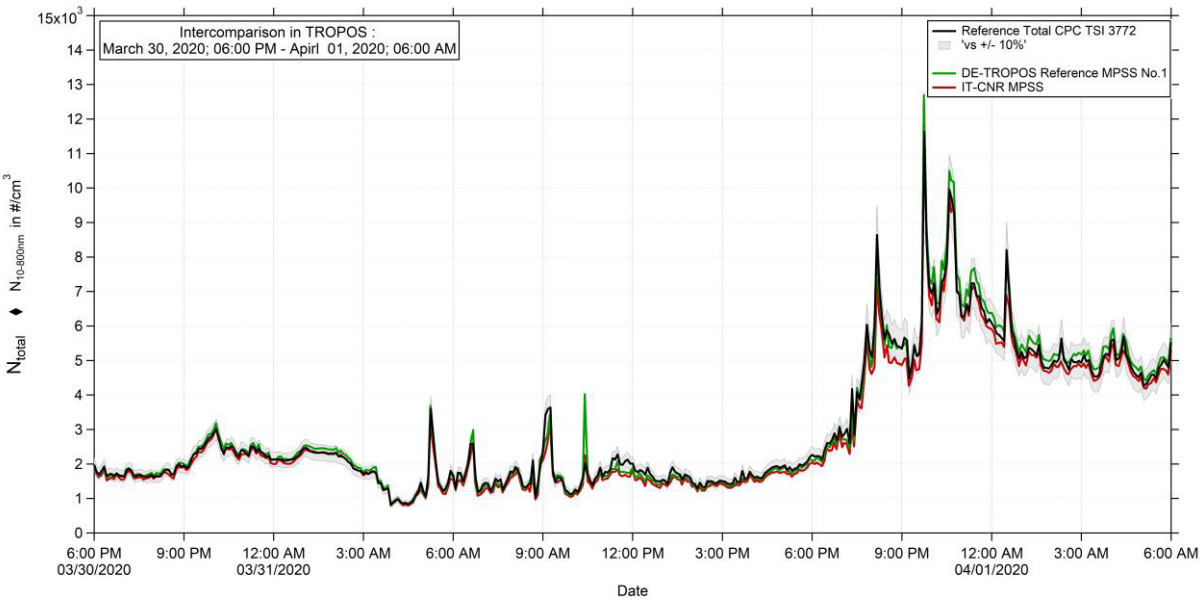

Fig. 4 Time series (Mar. 30, 2020 6 PM – April. 01, 2020 6 AM) of the integrated particle number concentration (N10-800nm) of the MPSS and total number concentration (Ntotal) of the Reference TSI-CPC Model 3772. Multiple charge correction, internal diffusion losses, CPC flow corrections. The candidate is running with the TSI Kr.85 source.

At the end of the workshop the report presents an excellent correlation between the observations made with the ISAC CNR instrumentation with respect to the reference system of TROPOS showing in the linear regression a R2=0.99, as presented in figure 5.

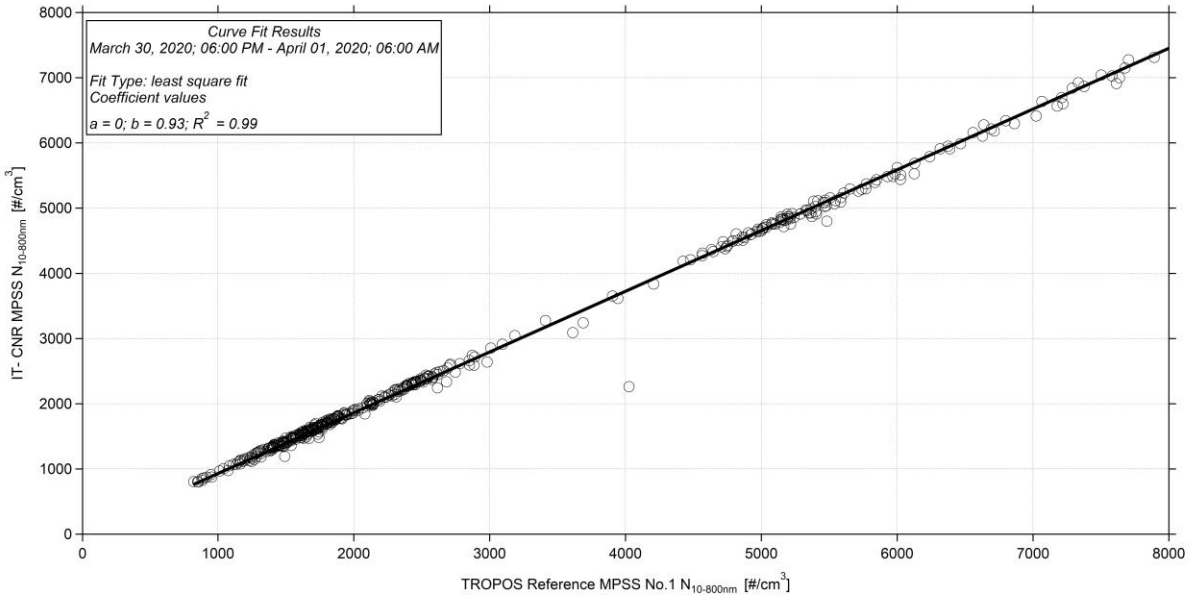

Fig. 5 Linear regression between the number concentration of the TROPOS Reference MPSS No. 1 and IT-CNR MPSS.

The workshop confirmed the great validity of the work done by the TROPOS community and we will certainly participate in the new initiatives that will be proposed for the calibration of the in-situ aerosol instrumentation present at AEROLAB in order to have a costant calibration of our instruments involved in ACTRIS activities.

References:

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