

Technical Update: Comparison of calibration methods for in-situ aerosol absorption instruments

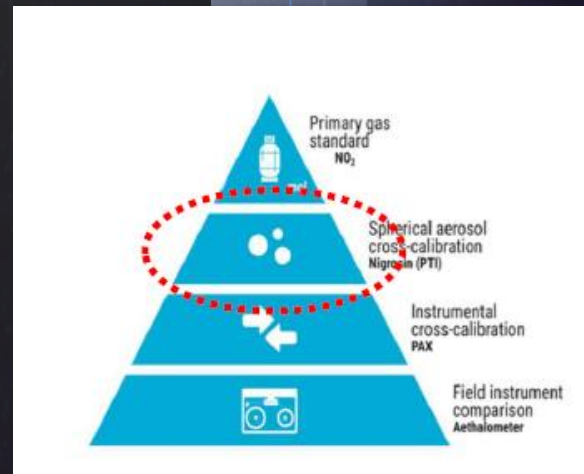
The aim of this work was to compare different calibration schemes with respect to their measurement uncertainty and ease of implementation, whether in the field or laboratory. Aerosol absorption was measured using a photothermal interferometer PTAAM-2λ (Haze Instruments), a photoacoustic extinctionsmeter PAX (Droplet Measurement Technologies) and an extinction-minus-scattering (EMS) method consisting of a cavity attenuated phase shift extinction instrument (CAPS PMEX, Aerodyne Research) and a nephelometer (Aurora 4000, Acoem) nephelometer.

The measured and calculated absorption of monodisperse nigrosin aerosols were compared, and the response of in-situ absorption instruments (PTAAM, PAX, and EMS) was compared using both monodisperse nigrosin and carbon black (CAB-O-JET200) aerosols.



Conclusions

- Different schemes for monodisperse particle selection were compared
- In situ absorption instruments can be calibrated with low uncertainty (<5% @ k=1) using absorbing gas NO₂ or monodisperse nigrosin particles
- Absorption of nigrosin particles measured by EMS compares well with PTAAM



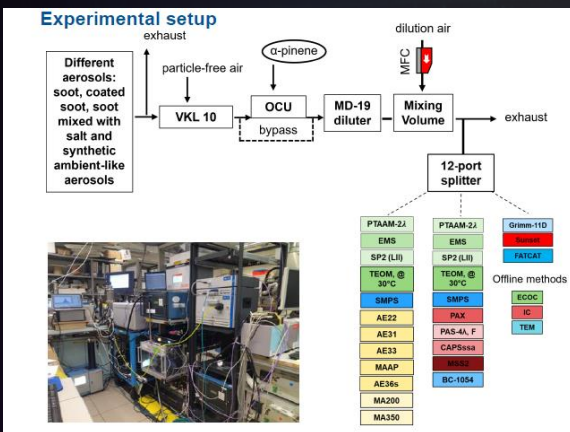
The results were presented at the [EAC1024](#). Visit our [website](#) for more details

Technical Update: Intercomparison for the standardization of BC mass measurements

METAS, with the support of STANBC partners and stakeholders, organized a calibration workshop at the METAS lab facility focusing on the comparison of filter-based absorption photometers using different aerosol mixtures. Fresh soot (SSA < 0.1) was simulated by generating combustion particles with a miniCAST generator and aged soot by coating the miniCAST particles with secondary organic and inorganic matter (ammonium sulphate). Ambient-like aerosols consisting of mixtures with known amounts of fresh soot, coated soot, secondary inorganic salts and mineral dust (SSA > 0.9) particles were generated with the PALMA facility.

The absorption coefficients (babs) measured with the two reference methods PTI / PTAAM and EMS were compared to each other and to the babs measured with a photoacoustic instrument (PAX) and to the attenuation coefficient (batn) of a filter-based instrument (AE36s).

- PTAAM, EMS and PAX show similar babs in the red/infrared wavelength range of 630 nm to 880 nm for bare soot, while the batn values from AE36s are higher by a factor of about 4
- Greater deviations in the babs and the batn for aerosols with higher SSAs
- babs and batn in the blue wavelength range of 450 nm to 470 nm increase with increasing coating thickness
- Size effect for the babs measured for ammonium sulphate particles particularly visible for the 450 nm channel of the EMS; slightly decreasing values for the PAX.



Data analysis is still ongoing. Stay updated through our website and social media channels!

These preliminary experimental results were presented at the [EAC1024](#). The poster presentation is available on our [website](#).

Communication, Dissemination and Networking highlights

European Aerosol Conference 2024

Members of the project consortium were in attendance for the [European Aerosol Conference](#), August 25th – 30st, 2024 in Tampere, Finland.

- ❑ Luka Drinovec from HAZE-Instruments provided an oral presentation *Comparison of calibration methods for in-situ aerosol absorption instruments*.
- ❑ Tobias Hammer presented the poster *Calibration of filter-based absorption photometers against two reference standards*. The poster is available on the STANBC website.

BC Footprint Seminar

Luka Drinovec from HAZE-Instruments participated in the BC Footprint Seminar, presenting the study: Measurement of Black Carbon Absorption Using Photo-Thermal Interferometry. The seminar took place in Tampere on October 7, 2024, and was sponsored/organized by the BC Footprint, BBrCaC, GIANT, NEX-EL, TUBE projects, and Dekati Oy.

Publications in scientific journals

A new paper from the STANBC project has been recently published in the Journal of Aerosol Science. *Aerosol physical characterization: A review on the current state of aerosol documentary standards and calibration strategies* by Konstantina Vasilatou et al. 2025. <https://doi.org/10.1016/j.jaerosci.2024.106483>.

Aerosol metrology pertains to the science of the measurement of aerosols. This has multiple facets, ranging from establishing standards, to verifying aerosol instrumentation. This review aims to inform the scientific community about recent advances in aerosol measurement and documentary standards and calibration strategies and to help experts from different fields (e.g., emission control versus air quality) better understand the differences in the various measurement protocols and the effects these may have on the measurement results.



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