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Abstract EGU26-16395
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Automated quality control of atmospheric aerosol time series in near real-time

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Introduction

Ensuring reliable and comparable aerosol optical data across monitoring networks demands automated, standardized quality control (QC) procedures. We present an integrated, real-time QC system for AE33 Aethalometer equivalent black carbon (*eBC*) and Aurora 4000 nephelometer scattering coefficient (σ_{sca}) measurements (Houben et al. 2026, preprint).

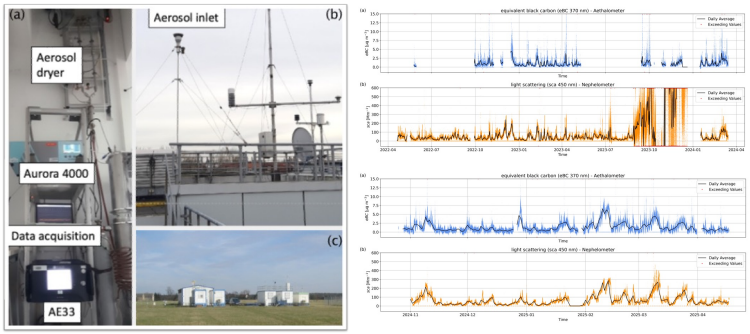

Fig. 1 Measurement sites and corresponding data sets.

Data

The workflow is configured using an anomaly catalogue from the urban TROPOS site and validated at the contrasting rural Melpitz station, confirming robust adaptability across diverse environments (Fig. 1).

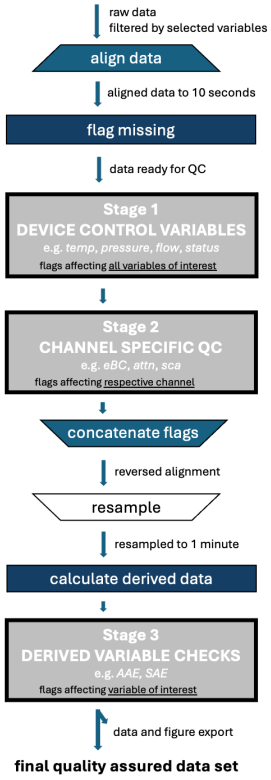

Fig. 2 Conceptual QC workflow

Methodology

Built on the open-source *SaQC* (Schmidt et al, 2023) framework and distributed through the *actris_qc* package, the system operationalizes community QA/QC guidelines through a structured, machine-readable rule hierarchy that performs device-control, channel-level, and derived-variable diagnostics (Fig. 2).

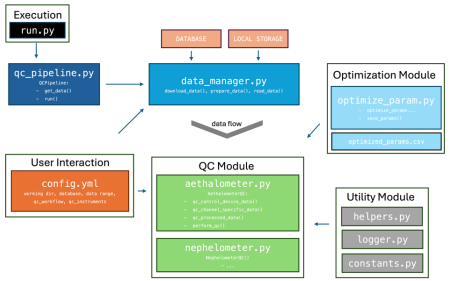

Fig. 3 Python package architecture

Its modular and declarative architecture (Fig. 3) facilitates seamless extension to further instruments and network infrastructures, enabling harmonized QC flagging, traceable provenance, and FAIR-compliant, AI-ready data streams for next-generation atmospheric monitoring systems.

Results

It consistently detects outliers, noise, plateaus and instrument failures while preserving plausible atmospheric variability, reaching real-time execution on standard computing platforms. Figure 4 shows an exemplary workflow for aethalometer data passing QC stages 1-3.

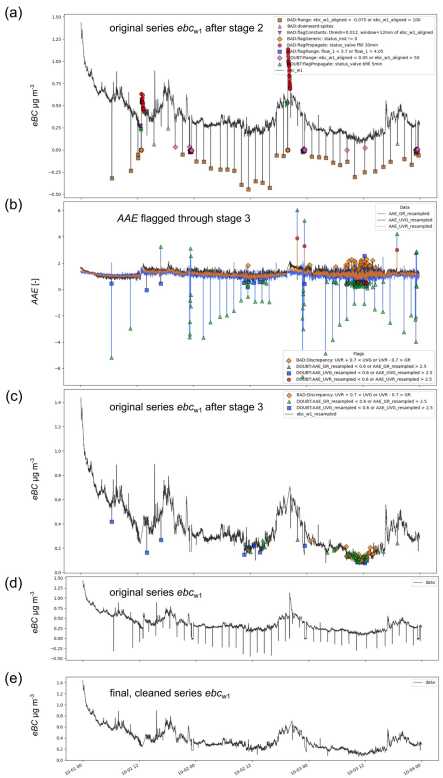

Fig. 4 Example QC workflow for aethalometer data

Preprint

Atmospheric Measurement Techniques, EGU
https://egusphere.copernicus.org/preprints/2026/egusphere-2026-235/

Web Page

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https://www.ufz.de/index.php?en=43660

References

Houben et al., 2026. "Real-time automated quality control of atmospheric aerosol time series," EGUsphere, pp. 1–39, 2026, Preprint, doi: 10.5194/egusphere-2026-235.

Schmidt et al., 2023. "System for automated Quality Control (SaQC) to enable traceable and reproducible data streams in environmental science," *Environmental Modelling & Software*, vol. 169, p. 105809, doi: 10.1016/j.envsoft.2023.105809