Data reporting for aerosol particle light absorption coefficient

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- Data from MAAP, AE33, AE31, and AE22 must be processed and undergo quality checks.
- This guide gives a brief overview of the steps required:
    1. Data conversion and correcting
    2. Data quality control
    3. Data aggregation
    4. Preparing file in EBAS Nasa-Ames format

1. Data processing

The MAAP, AE33, AE31 and AE22 instruments report an equivalent black carbon concentration (eBC), which must be converted to a light absorption coefficient.

MAAP

- Check the instrument settings. This step corresponds to the preparation of level 0 data in the *ACTRIS guidelines for manual QC of MAAP* (https://www.actris-ecac.eu/particle-light-absorption.html)
- Convert the eBC concentration to the light absorption coefficient using the follow equation (c.f level 1 in ACTRIS guideline):

$$b_{abs}[1/Mm] = eBC\ [\mu g/m^3] \bullet 6.6\ m^2/g * 1.05 \bullet \textit{STP-Factor}$$

- If the instrument has been set to report concentrations at standard conditions (T_0=273.15 K, P_0=1013.25 hPA) set *STP-Factor* = 1, otherwise use *STP-Factor* = $T/T_0 * P_0/P$, where T and P are the the aerosol temperature and pressure at the instrument inlet.

1. Data processing cont.

AE31 and AE22

- Inspect instrument settings (e.g. setup file AE31_setup.txt).
- Convert the eBC concentration to the light absorption coefficient using

$$b_{abs,\lambda}\,[1/Mm] = eBC\,[\mu g/m^3] \bullet \sigma_\lambda / 3.5 \bullet \textit{STP-Factor}\,,$$

wherein 3.5 is the ACTRIS harmonization factor and σ_λ is the wavelength dependent absorption cross sections used for AE31:

wavelength λ	370 nm	470 nm	520 nm	590 nm	660 nm	880 nm	950 nm
Attenuation crosssection σ_λ in m^2/g	39.5	31.1	28.1	24.8	22.2	18.8	15.4

- This conversion applies to AE33 and AE22 photometers, whereas the AE22 only has the two wavelengths 370 and 880 nm.

1. Data processing cont.

AE33

- Inspect instrument settings (cf. https://www.actris-ecac.eu/particle-light-absorption.html)
- Since there are three types of filter tape make sure you are using the proper harmonization factor *H** and that the filter factor *FF* was set correctly in the instrument.
- Convert eBC concentration to light absorption coefficient using the follow equation:

$$b_{abs}^{AE33} = \frac{eBC \times SG}{H^*} \bullet \textit{STP-factor}$$

- Therein *SG* is the wavelength dependent mass absorption cross section and *H** is the ACTRIS harmonization factor.

AE33 cont.

Table: Specific attenuation cross section

wavelength λ	**370 nm**	**470 nm**	**520 nm**	**590 nm**	**660 nm**	**880 nm**	**950 nm**
Specific crosssection SG_λ in m^2/g	39.5	31.1	28.1	24.8	22.2	18.8	15.4

Table: Harmonization and filter-factors for the three filter types.

Filter	**H***	**FF**
M8020 / AE33-FT	2.21	1.57
M8050 (1)	1.76	1.39
M8060	1.76	1.39

(1) The M8050 filter was only used for a short time. Since data are sparse, a distinct harmonization could not be performed. Therefore, the factors as for M8060 should be used.

For new measurements, only use the filter M8060!

2. Quality control

- Do a manual quality control and flag data as shown in the ACTRIS guidelines for manual QC.

3. Data aggregation

- Aggregate data into hourly data and calculate percentiles.

4. Prepare EBAS Nase-Ames file

- Prepare EBAS Nasa-Ames level 2 files using the template and instructions found at

https://ebas-submit.nilu.no/templates/Filter-Absorption-Photometer/lev2