

INTERPRETATION OF THE LOADING EFFECT IN ABSORPTION FILTER PHOTOMETERS – DUAL SPOT AETHALOMETER MEASUREMENTS

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Filter-based measurements of aerosol optical absorption are widely used to determine Black Carbon (BC) concentrations in real time. Measurements at multiple wavelengths permit the separation of contributions of BC from different combustion sources. Filter-based methods can suffer from non-linearity due increasing sample deposit on the filter. The dual-spot Aethalometer model AE33 provides a real-time determination of this loading effect, by determining the compensation parameter k in real time for each of the wavelengths. We present an interpretation of k in terms of aerosol composition.

Optical properties of combustion aerosols were investigated under laboratory conditions. Optical properties of emitted aerosols varied greatly with the combustion regime. The type of combustion also influenced the parameter k , which is attributed to different particle coating thickness. Optical and chemical properties of aerosols were measured with high time resolution during summer and winter at different sites. The ratio of the sum of inorganic secondary and organic aerosol mass to BC (expected to be high for air parcels containing aged aerosols) correlates well with the parameter k measured by the AE33 at 880 nm. To investigate the influence of coating on parameter k , a drier and a thermodenuder were used to remove the coating.

These results indicate that the compensation parameter k can be used for discrimination between fresh and aged aerosols.

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