Aerosol light absorption is an important parameter for the assessment of the radiation budget of the atmosphere. Filter based absorption photometers, e.g. the Aethalometer and the Particle Soot Absorption Photometer (PSAP) have been available for several years. Multiple scattering of light in the filter medium and the presence of scattering particles result in a measured attenuation coefficient, which is different from the absorption coefficient of airborne particles. Correction schemes have to be determined experimentally using reference methods (e.g. photoacoustic photometers or extinction minus scattering). Often used correction schemes are described in Bond et al. (1999) and Virkkula et al. (2005) for PSAP and in Weingartner et al. (2003) for Aethalometer. In the frameworks of EUSAAR a workshop for testing existing and developing new correction schemes has been conducted in 2009 at the Leibniz Institute for Tropospheric Research in Leipzig.

**Experiments**

Aerosol characterization:
- Filter based absorption photometers: PSAPs, Aethalometers, MAAP
- Reference absorption: PASS-3, MuWaPaS
- Filter characterization: TDMPs, APS, nephelometer

**Results**

Filter based absorption photometers primarily measure the attenuation coefficient $\sigma_{\text{att}}$ defined by

$$\sigma_{\text{att}}(t) = \frac{1}{L} \int_{0}^{L} (\tau(t) - \Delta t(t)) dt$$

where $L$ is the length of the column of air, which is drawn through the filter in the time interval $\Delta t$ and $\tau$ is the transmittance of light. The attenuation coefficient depends on several parameters, e.g. the type of aerosol and the mass of deposited particles. Correction functions for relating the attenuation coefficient $\sigma_{\text{att}}$ measured with PSAP to the particle absorption coefficient are given by Bond et al. (1999) and Virkkula et al. (2005).

The dependence of the attenuation coefficient on filter transmittance $\tau$ and scattering coefficient $\sigma_{\text{scatt}}$ also was investigated during the EUSAAR workshop.

**Aerosol types and properties**

Ångström exponents were derived from PASS-3 at wavelengths 405 and 532 nm and single scattering albedos were determined with PASS-3 and a nephelometer at 532 nm.

<table>
<thead>
<tr>
<th>Aerosol type</th>
<th>$\alpha_{\text{ang}}$</th>
<th>Single scattering albedo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black (Printex 75, P75)</td>
<td>0.89</td>
<td>0.32</td>
</tr>
<tr>
<td>White (ammonium sulfate, AS)</td>
<td>0.08 to 2.5</td>
<td>0.997-0.999</td>
</tr>
<tr>
<td>Gray (external mixture of P75 and AS)</td>
<td>1.22 to 1.41</td>
<td>0.59 to 0.96</td>
</tr>
<tr>
<td>Colored (colored PSL spheres)</td>
<td>-1.31 to 1.98</td>
<td>0.71 to 0.81</td>
</tr>
<tr>
<td>Ambient</td>
<td>1.97 to 2.3</td>
<td>0.78 to 0.83</td>
</tr>
</tbody>
</table>

**Calibration experiments for filter based absorption photometers during the EUSAAR-2009 photometer workshop**

**References:**