SINGLE SCATTERING ALBEDO DEPENDENCE ON AEROSOL SIZE AND CHEMICAL COMPOSITION

Julija Pauraitė, Steigvilė Byčenkienė, Kristina Plauškaitė and Vidmantas Ulevicius

[1] Center for Physical Sciences and Technology, Vilnius, Lithuania
julija.pauraite@ftmc.lt

Atmospheric aerosols can significantly influence local and global climate. The impact of particles depends on their chemical composition and physical properties (such as optics). The the light absorption and light scattering are two main interaction processes in the atmosphere between aerosol particles and solar radiation. Large uncertainties in estimating the aerosol radiative forcing [1] urge a better understanding of optical processes in the atmosphere. Single scattering albedo (SSA) is the essential parameter of aerosol optical properties, which enables investigation of total aerosol radiative forcing effect. Therefore, SSA is a key input parameter in climate models.

We investigated aerosol optical properties during domestic heating season in Preila (rural-coastal background site). During measurement campaign in December 2017 – March 2018, we deployed an Aerosol Chemical Speciation Monitor (ACSM), a 7-wavelength Aethalometer and an integrating Nephelometer (TSI). Additional measurements included the meteorological parameters (temperature, relative humidity, solar radiation and wind speed). Absorption Angström exponent (AAE), scattering Angström exponent (SAE) and SSA were calculated. Furthermore, absorption due to coloured organics known as brown carbon (BrC) was evaluated.

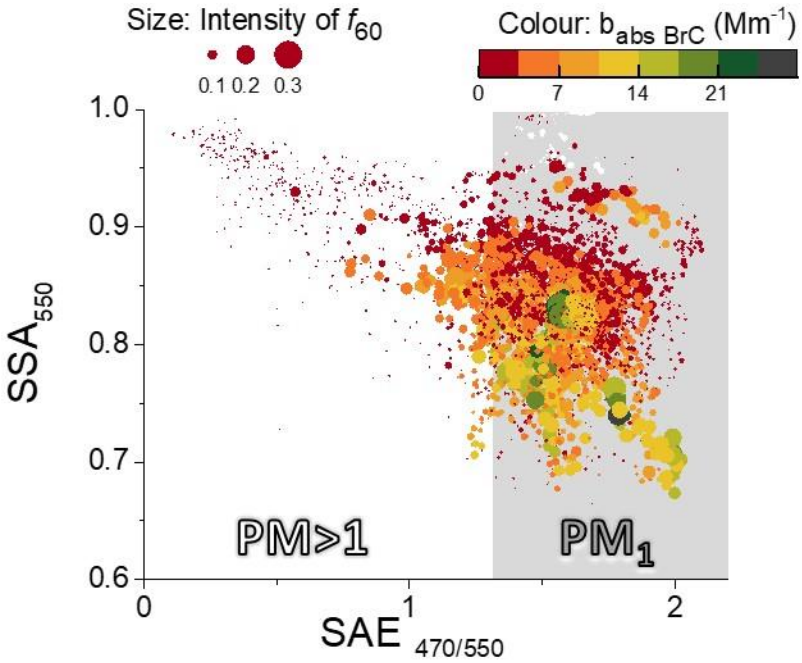

Fig. 1. SSA at 550 nm for all measurement period versus SAE at 470 and 550 nm. Size range stands for intensity of the signal f_{60}. Absorption coefficient of BrC depicted in colour scale. Division by sizes suggested by Cappa et al., 2016[2].

As can be seen in Fig. 1, SSA shows a strong dependence on both size and chemical composition. The lowest SSA values were reached when PM_1 fraction was dominating. Furthermore, decrease in SSA could be associated with higher f_{60} together with higher absorption coefficient of BrC. These results indicate fresh combustion products contribute to the atmospheric heating the most while with aging and bleaching processes the capability to heat decreases. These results will benefit in understanding the SSA sensitivity towards different atmospheric processes and to the broad extend will provide knowledge for modelling of atmospheric radiative balance.

This work was supported by by the COST Action CA16109 COLOSSAL (Chemical On-Line cOmpo- Sition and Source Apportionment of fine aerosoL).

[1] P. Forster et al., Changes in Atmospheric Constituents and in Radiative Forcing, Condensed Matter and Materials Physics, **77**, 129-234 (2008).
[2] C. D. Cappa et al., Understanding the optical properties of ambient sub- and supermicron particulate matter: results from the CARES 2010 field study in northern California, Atmospheric Chemistry and Physics, **16**, 6511–6535 (2016).