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Optical properties of fire-originated aerosols

Optical methods play an important role in the monitoring and characterization of aerosol particles. Among them, non intrusive methods have the advantage of not disturbing the aerosol sample by collection, avoiding changes like selective losses, coagulation, and evaporation of volatile compounds. Most of these optical methods rely on light scattering and are therefore very sensitive to particle shape and composition. Thus, in order to use them it is important to have good knowledge of the optical properties of the relevant aerosols.

Here, we present a study of the optical properties of aerosol particles originating in different kinds of combustion processes, including open and smouldering combustion of different materials. The measurements were done using the Diesel Particle Scatterometer (DPS) which measures the angular distribution of the Müller scattering matrix elements. The size distribution and the complex refraction index of the particles were then determined by fitting the data with Mie scattering calculations. Additionally, we complemented the optical information with the aerosol size distribution. The results show that the combustion process of the fire originated aerosols can be well determined from the scattering properties whereas this is not possible based solely on the size distribution.

back to index