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Characterization of long-range transported Canadian biomass burning over Central Europe - A case study

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Aerosols are a major component of the Earth's atmosphere and have substantial impact on the Earth's radiation budget and on the hydrological cycle. Biomass burning smoke is one important component with respect of global climate warming as it is an important source of black carbon, which is a key player in atmospheric heating. As biomass burning smoke layers are often transported over long distances they cannot be considered as local events only but have a global effect. During transport the smoke particles are affected by aging and mixing processes. Thus their microphysical and optical properties change and, as a consequence their effect on the Earth's radiation budget. However, the influence of aging and mixing processes on the particle microphysical and optical properties is still only poorly understood. To improve our knowledge, studies of transport conditions together with measurements of the horizontal and vertical distribution the smoke layers as well as of their microphysical and optical properties are crucial.

We present a case study of long-range transported Canadian biomass burning smoke to Central Europe in summer 2013. The smoke layer is characterized by multi-wavelength lidar measurements over Maisach and by continuous Ceilometer measurements over Munich, Germany. Multi-wavelength lidar measurements are an important tool for the characterization of aerosols, as they provide vertically resolved information of their optical properties which serve as input parameters for the determination of microphysical properties of the aerosol layers. Additionally, airborne in-situ measurements of size distribution and black carbon mass concentration onboard the DLR research aircraft Falcon are presented. The source regions and transport conditions are studied using a combination of satellite measurements and model simulations.