

Effects of Outdoor Smoke Events on Indoor air Quality

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It is known that climate change has greatly enhanced the probability of extreme wildfires. While people spend most of the time at home or at the workplace, little is investigated how indoor air filtering systems are performing under intensive outdoor smoke conditions. For this aim, particle number size distribution and concentration in a size range 0.5 – 18 μm and equivalent black carbon (eBC) mass concentration were measured in outdoor and indoor office air simultaneously.

7-wavelength Aethalometer (Magee Scientific AE31) and Aerodynamic Particle Sizer (APS) (TSI 3321) were deployed in the Center for Physical Sciences and Technology (FTMC) campus located in the urban background environment in Lithuania from 30th September to 6th October 2020. Since all parameters were evaluated for indoor and outdoor air during the event (fire) and non-event (no fire) days, the air filtration system's performance during a long-range wildfire event were evaluated. Outdoor and indoor office air was investigated through various metrics: particle size distribution, $\text{PM}_{2.5}$, PM_{10} , and eBC mass concentrations. Filters selectivity for different eBC sources (biomass burning versus traffic) and chemical composition of carbonaceous aerosol particles (eBC versus brown carbon (BrC)) was tested as well. It was found that the coarse particle number concentration was found to be 14 times higher in comparison with clean periods in indoor air. The smoke event resulted in twice higher indoor and outdoor eBC mass concentrations. Because of lower removal rate for small particles, eBC had higher contribution to total $\text{PM}_{2.5}$ mass concentration in indoor air than in outdoor air.

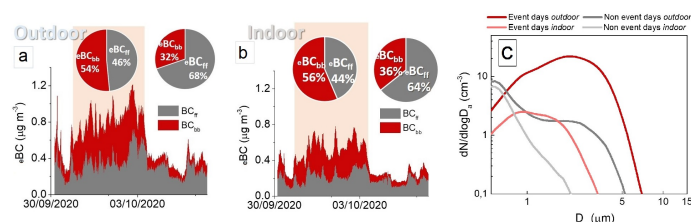


Fig 1. Time series of eBC_{ff} and eBC_{bb} mass concentrations in outdoor (a) and indoor (b) air. The pink areas mark the smoke event. Pie charts represent contributions of each parameter during non-event and event days. Particle number size distribution in outdoor and indoor air for the event and non-event days (c).

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