

Smoke aerosol characteristics of Russian peat bog fires

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Biomass burning activities are wide-spread across the earth and are the main source of carbonaceous aerosol particles. The resulting smoke particles exert significant adverse effects on human health, air quality, and climate. Peat lands are particularly important source regions of biomass smoke.

As part of this study fine particulate matter (PM_{2.5}) samples were collected in a peat bog region north of Moscow, Russia, and concurrently at an urban location in Moscow. Aside from selected physical and optical aerosol properties, detailed chemical speciation of the PM samples was conducted, comprising the quantification of molecular source tracers for biomass burning (levoglucosan and mannosan) and other carbonaceous species, as well as functional group analysis by FTIR.

Measurement of chemical composition and physical properties of smoke emissions from smoldering burns in peat bogs is reported here for the first time. The organic carbon content in the near-source smoke particles was high, with a large contribution of light-absorbing compounds (i.e., brown carbon). Transport of peat smoke to downwind regions, specifically to the Moscow metropolitan area was observed during a haze episode, which resulted in enhanced fine particle mass concentrations, and was confirmed by high concentrations of biomass burning tracers, such as anhydrosugars. This study demonstrated that peat fires can produce large amounts of smoke which can be transported to urban areas and thus cause harm to human and environmental health.