

Primary organic aerosols in the atmosphere of Belgrade

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Particulate matter (or atmospheric aerosols) affects the quality of air, human health, and the environment, as it can interact with solar radiation and act as cloud condensation nuclei (CCN), influencing the optical properties of the atmosphere and climate.

Primary atmospheric aerosol particles can be emitted directly by both natural and anthropogenic emission sources. An important primary source of atmospheric aerosols, organic material and greenhouse gases at regional and local levels is biomass burning. Wood combustion for residential heating in city is responsible for 45% of the organic matter in the atmosphere and in rural areas for 65% of OC and EC. Another source which can affect air quality in our cities are "primary biological aerosol particles", or PBAP, defined as solid airborne particles derived from biological organisms including microorganisms and fragments of biological material such as plant debris and animal dander.

The aim of our work was to study primary emission sources in an urban environment using molecular biomarkers as indicators of specific sources.

Airborne samples were collected during the September-December 2008 period in the urban area of Belgrade, Serbia (44°49'14''N, 20°24'44''E). Sampling was performed over a 24h-period every 6 days.

The airborne aerosol was collected on a pre-combusted (4 h at 400 °C in a muffle furnace) quartz fiber filter (QFF) (SKC Inc., Eighty Four, To-13 model) using a TE 5000 High Volume Air Sampler (Tisch Environmental Inc., OH).

We determined the atmospheric concentration of the following analytes as indicators of biomass combustion: anhydrosugars (levoglucosan, mannosan and galactosan), methoxyphenols (vanillic acid, isovanillic acid, homovanillic acid, syringic acid, coniferil aldehyde, ferulic acid, syringaldehyde, p-coumaric acid, vanillin). Six monosaccharides (arabinose, mannose, xylose, galactose, glucose and fructose), one disaccharide (sucrose) and nine alcohol sugars (xylitol, ribitol, sorbitol and galactitol, glycerol, erytritol, maltitol) were also determined. These sugars are correlated to plants and combustion. Arabitol and mannitol are associated to fungi spores. L- and D-amino acids included: L-Ala, L-Asp, L-Asn, L-Arg, L-Glu, L-Phe, L-Pro, L-Tyr, L-Thr, L-Hys, L-Lys, L-Leu/Ile, L-Orn, L-Ser, L-Gln, L-Val, Gly D-Ala, D-Asp, D-Phe, D-Ser, and D-Thr. L- amino acids are indicators of primary

production while D-amino acids are indicators of bacterial material.

We obtained the atmospheric concentrations and temporal trends of these organic compounds. In addition, statistical analysis helped us differentiate between different kinds of biomass combustion sources: open fires and residential heating.