

Biogenic contribution to particulate matter in Northern Italy

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Aerosol particulate matter carbonaceous fraction contains organic tracers that are characteristic of the sources, the formation and the transformation during atmospheric processes.

Organic matter in aerosol particles is due to four major sources depending on environmental conditions: (1) natural biogenic detritus (e.g. plant waxes, microbes, pollens, etc.), (2) anthropogenic emissions (oil combustion, soot, etc.), (3) biomass burning (natural and anthropogenic) and, in minor quantity, (4) soil organic matter.

Biogenic organic matter consists mainly of lipids, humic and fulvic acids, sterols, triterpenoids, sugars, n-alkanes, n-alkanols and n-alkanoic acids (Simoneit, 1999).

In this study we compare some approaches in order to estimate biogenic sources contribution using different bio-aerosol tracers: n-alkanes, fatty acids and Water Soluble Organic Compounds (WSOC).

High volume PM10 aerosol samples were collected during winter and spring in Milan and other sites placed in the Lombardy region (Northern Italy) having different geographical characteristics.

GC-MS analysis is a useful tool for the identification, characterization and quantification of homologous series (like n-alkanes and fatty acids) and it provides very relevant information on organic compounds in complex mixtures.

n-Alkanes and fatty acids can originate from both man-made and natural sources and the distribution patterns of the homologous constituents can help one to assess the contributors (Rogge et al., 1993).

Some preliminary results have shown

that PM samples collected in Milan in a background site are characterized by higher concentration of odd carbon number alkanes. From the literature (Rogge et al., 1993) it is well known that biogenic sources are enriched in odd alkanes. An estimation of biogenic aerosol contribution can be obtained by the calculation of CPI_{odd} (carbon preference index).

For Milan, in the background site, during autumn, this value was about 1.7 confirming the contribution of the biogenic source (when only anthropogenic emissions are present $CPI_{odd}=1$). The background site has shown different alkanes concentrations with respect to a site affected by traffic placed in the centre of Milan.

As a comparison the contribution of biogenic aerosol has been studied also in some rural sites of the Po Valley.

Another parameter that can be correlated to the contribution of biogenic sources is WSOC concentration which is strongly dependent on the site (urban or rural) (Poschol 2005). WSOC concentration was estimated by TOT (Thermal Optical Transmittance) method.

Simoneit, B.R.T., (1999) *Environ. Sci. & Pollut. Res.* 6 (3) 159-169.

Rogge, W.F., Mazurek, M.A., Hildemann, L.M., Cass, G.R., Simoneit, B.R.T., (1993) *Atmospheric Environment*, 27A, 1309-1330.

Poschol, U., (2005) *Angewandte*, 44, 7520-7540