

Carbonaceous particles speciation in PM10-PM2.5 collected in port cities

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Keywords: Carbonaceous particles, OC/EC, PMx
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It is known that carbonaceous species constitute a major, sometimes dominant, fraction of atmospheric particulate matter. Carbonaceous aerosol is commonly divided into an organic carbon (OC) and an elemental carbon (EC) fraction. Both of these have important roles and effects on climate and health because of their physical and chemical characteristics.

Despite the very large proportion of carbonaceous aerosols in PMx and the consequent relevance of this component for air quality, their origins are not fully understood and probably their contribution to PMx load vary largely across the different regions in Europe. The major sources of these species are biomass, bio-fuel burning emission (BBE), and fossil-fuel combustion (FFC). The origin of OC, especially of SOA (secondary organic aerosol), is a hot topic in atmospheric sciences and a recent WHO report (REVIHAAP report, WHO, 2013) indicates that further studies are needed to characterize the health effects of SOA. Another recent WHO report (WHO, 2012) also evidences clear health consequences from the increased concentrations of EC, although this is probably not due to EC per se but to the OC compounds that EC particles carry on.

The importance of these different sources, however, still cannot be estimated accurately and all different source apportionment methodologies have caution, because of the still limited knowledge of its molecular composition, atmospheric processes and characteristic emission profiles.

A commonly used method for the indirect evaluation of carbonaceous in atmospheric particles, which had the advantage of simplicity and low cost, was based on the values of OC/EC ratios.

In this study the single peak components of OC/EC thermograms have been analyzed.

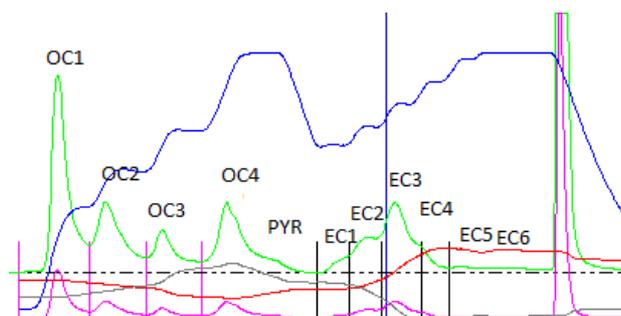


Figure 1. Thermogram of port city of central Italy

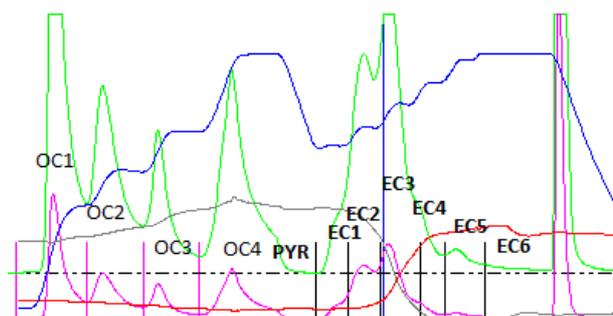


Figure 2. Thermogram of port city of south Italy.

OC/EC composition data have been acquired for PM10 and PM2.5 samples collected during 2014 by seasonal sampling campaigns performed at a port sites in South-Italy. In addition a second city (three sites) in Central-Italy has been evaluated in a parallel campaign on PM10 samples.

EC and OC in a 1.5 cm² filter punch have been measured on Sunset Laboratory Thermal-Optical Carbon Aerosol analyser using NIOSH protocol (NIOSH, 1998).

Discriminant Function Analysis and Principal Component Analysis were applied to dataset in order to identify main sources.

Moreover, the influence of wind direction has been evaluated.

NIOSH: Method 5040 M.E. Cassinelli, P.F. O'Connor (Eds.), NIOSH: Manual of Analytical Methods (NMAM) (fourth ed.) (1998) [Suppl. 2, Supplement to DHHS (NIOSH) Publication No. 94-113].

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