

Climatology of aerosol organic fraction (EC/OC) at a mid-altitude rural background site in Central Italy

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Carbonaceous particles are one of the major components of atmospheric aerosol and contribute substantially to the physical and chemical properties of the finer airborne particles. Even if this issue is central in the attention of many research groups there is still a large uncertainty on their sources (biogenic versus anthropogenic, primary versus secondary), their complex chemical nature and optical properties. Therefore, long-term monitoring campaigns are important both in polluted environment as well as at pristine sites.

Monte Martano (Italy, Umbria, 1100 m) is a rural background site in central Italy setup at 1100 m. asl in the 2009 (Moroni et al. 2015). The site, particularly suited for monitoring long-range transport of pollutants, participates to the observation net of the SDS (Sand and Dust Storm) warning alarm system of the WMO. As a part of a broader study in progress aimed at the characterization of this site we present here a thorough analysis of elemental and organic carbon content of the aerosols on a database of PM₁₀ and PM_{2.5} filters collected in the years 2009-2014.

The samples were collected with a low-volume sampler (Swam, Fai Instruments, Rome), and the analyses were performed with a thermo optical analyzer (Sunset) using the NIOSH thermal protocol.

The measurements show in general low values of TC (Fig.1), falling in a narrow range of variation, and suggesting a declining trend from 2009 to 2014.

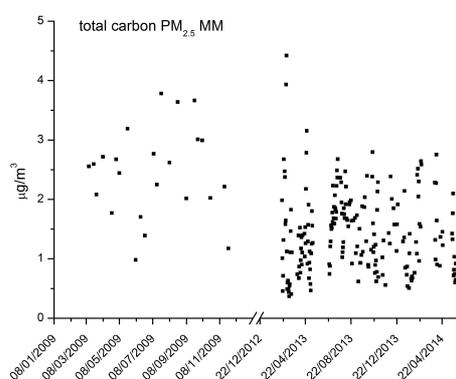


Figure 1. Total carbon measured on PM_{2.5} filters at MM. Only data of 2009 and 2013-2014 are shown.

Between 2009 and 2014 the average concentration of elemental carbon ranged between 120

to 200 ng/m³ both in PM₁₀ and PM_{2.5}. Organic carbon concentrations were found in the range 1.5-2.6 µg/m³ and 1.3-2.3 µg/m³ for PM₁₀ and PM_{2.5} respectively.

Besides the background values, a series of long-range transport intrusions (for example dust from the Sahara desert but also air masses from Eastern Europe), individuated by modeling prevision and back trajectory analysis, have been characterized and show characteristic OC/EC ratios. For example in the case of Saharan dust events the thermo optical analysis suggested the origin based on the presence of the double peak of carbonates and the yellow coloration of the filter after combustion. The averages of the measured values in the conditions of Saharan Africa are much lower compared to the values in the absence of intrusion or for air masses of different provenance.

The results obtained for the site of Monte Martano will be compared with those of the regional monitoring network as provided by the control units of the ARPA Umbria, with data of the Italian territory as obtained by a recent joint campaign (Sandrini et al. 2014) and with measurements at background sites in Europe (see i.e. Pio et al. 2013, Simpson et al, 2007, Plaza et al, 2006, Kirpa rami et al. 2011).

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