$PM_{2.5}$ chemical composition and source apportionment in the Po Valley: the Med Particles and Supersito projects preliminary results

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Recent studies claim that PM10 is responsible for the most significant short-term effects on human health, while PM2.5 is likely responsible for the most severe health effects overall. Therefore, well-characterized PM2.5 data are requested by epidemiological studies to better understand the relationship between air pollution and adverse health effects.

Med Particles and Supersito projects aim at a better understanding of the PM air pollution characteristics in some European cities of the Mediterranean region and their interconnections with human health. A common goal of the two projects is to perform the PM2.5 mass closure and source apportionment in an area where scarse information on this size fraction is still available.

In this paper we discuss preliminary results about the PM2.5 chemical composition and its source apportionment obtained for Bologna urban area. The city of Bologna is located in the south-eastern part of the Po valley (Italy), a region which is considered a pollution hot spot as many exceedances of the 50/2008 EU Directive daily limit value for PM10 are registered.

The sampling period has been from October 2012 to March 2013. This is typically a period when the Po valley weather is characterized by several days of thermal inversion, fog, absence of wind and low temperature.

Parallel 24-h samplings have been carried out on quartz fibre and PTFE filters at the urban station in Bologna.

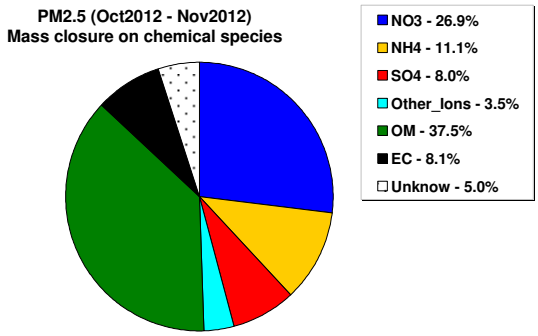
Ions (nitrate, sulphate, ammonium, sodium, potassium, magnesium, calcium, chloride, bromide and phosphate) have been analysed by ion chromatography on quartz fibre filters.

Elemental and Organic Carbon (EC/OC) have been analysed on quartz fibre filters with a transmittance thermal-optical instrument (Sunset Laboratory inc.) using the EUSAAR-2 thermal protocol.

Levoglucosan, mannosan and galactosan have been determined on PTFE filters using high performance anion-exchange chromatography coupled with pulsed amperometric detection following the procedure described in Piazzalunga et al. (2010).

Elemental analysis (Na, Mg, Al, Si, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Rb, Sr, Y, Zr, Mo, Ba, Pb) has been performed by ED-XRF spectrometry on PTFE filters.

The chemical characterization performed on about 200 samples allows to detect specific components or sources of particulate matter such as marine aerosol (Na, Cl, Mg), mineral dust (Al, Si, Ca, Ti, Sr), secondary inorganic components (e.g. sulphates and nitrates), biomass burning products (levoglucosan, K^+, Zn, Rb), heavy oil combustion (V, Ni), incinerator emissions (K, Zn, Pb), traffic (EC, OC, Cu, Fe, Mn), and industrial emissions (EC, OC, Mn, Ni, Zn, Pb).



The whole dataset is analysed by Positive Matrix Factorization to identify major PM2.5 sources impacting the area and to obtain source apportionment.

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