

A mass closure and source apportionment study on PM1 in Milan (Italy)

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It is well known that the particle size plays a major role in determining the particle penetration in the respiratory system and therefore in threatening human health.

Despite this fact, data on PM1 composition and sources are still relatively rare. This work aimed at a detailed physical and chemical characterisation of PM1 to obtain the mass closure and to perform a source apportionment study using receptor modelling. Episodes with very high PM1 pollution levels were analysed in detail to identify processes/sources affecting this fine PM fraction.

Moreover, a critical comparison to the results obtained during the previous PM1 campaigns carried out by our group at the same location about 10 years ago (Vecchi et al. 2004; Vecchi et al., 2008) will be also shown.

PM1 was sampled at an urban background station in Milan, Italy, during winter 2011-2012. Milan is the greatest urban area in the Po Valley, a well-known hot-spot pollution area in Europe, especially during wintertime. Parallel PM1 sampling was carried out during daytime and nighttime (07-16, 19-04) on PTFE and quartz fibre filters using two low-volume samplers for a total of about 300 samples. Mass concentration was determined by the gravimetric technique and all the PM1 samples were chemically characterised for elements, inorganic ions, levoglucosan, EC/OC and water soluble organic compounds. BC determination was also carried out on both PTFE and quartz fibre filters by a polar photometer (Vecchi et al., 2010; Vecchi et al., 2012). Moreover, BC concentrations in PM1 were monitored with a 5 minute resolution by a MAAP. Ancillary information on atmospheric dispersion conditions was available by ²²²Rn measurements and the main meteorological parameters (temperature, pressure, RH, solar radiation, wind speed and direction) were also monitored at the sampling site.

PM1 data were analysed by receptor modelling using Multilinear Engine ME-2 and 5 factors were identified. The most relevant contributions to PM1 were from ammonium nitrate and biomass burning (about 30% each) followed by ammonium sulphate (about 20%), traffic (about 15%) and industry (about 5%).

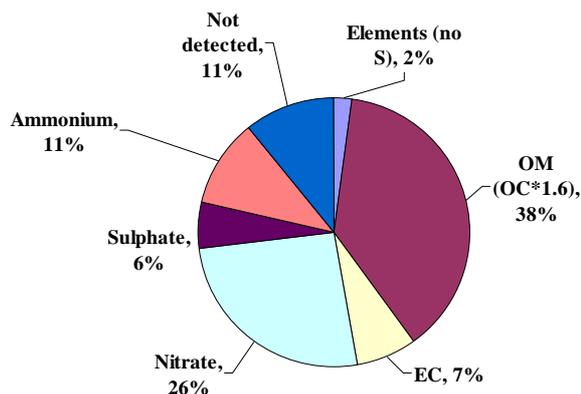


Figure 1. PM1 mass closure.

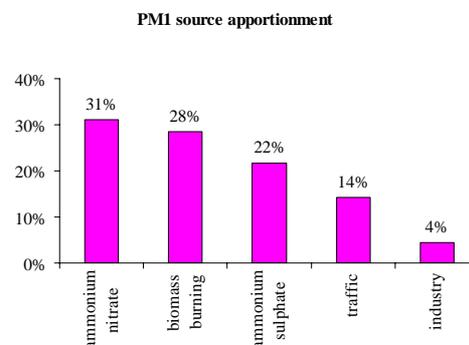


Figure 2. PM1 source apportionment.

References.

- Vecchi, R., et al. (2004). *Atmos. Environ.* **38**, 4437–4446.
- Vecchi, R., et al. (2008). *Atmos. Environ.* **42**, 2240–2253.
- Vecchi, R., et al. (2010). *Abstract 11E2, International Aerosol Conference 2010*, Helsinki, August 29 - September 3, 2010.
- Vecchi, R., et al. (2012). *Abstract, European Aerosol Conference 2012*, Granada, 2 – 7 September, 2012.