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A comparison of indoor and outdoor size distribution and chemical composition of fine particles between front- and back-door locations

Air Pollution from traffic is a major public health concern and the improvement of the characterization of population exposure to traffic pollutants occurring both indoor and outdoor is a key element both from epidemiological and health prevention point of view. In this work we present the results of a study undertaken in the urban area of Bologna (Italy).

Both indoor and outdoor monitoring was simultaneously carried out at the front- and back-door locations. The measurement site was a building at the side of a street canyon with very high traffic density. Indoor environments were uninhabited and very similar in terms of volumes and building materials. Air exchange rates were maintained at the fixed value of 0.5 h⁻¹, a typical level for residential environments. In fact one of the main goal of the study was to assess the different population exposure to particles in relation to traffic without considering the specific indoor characteristics and personal behaviours.

Both sites were monitored during two 15-day periods (13/6–26/6 and 28/11–13/12). We collected data of PM_{2.5} mass and chemical composition (ions, organic and elemental carbon, metals). Two FMPSs (TSI) provided size distribution of particles in the 5.6–560 nm interval and Ultra-Fine Particle (UFP) concentration with 1-min time resolution. Two switching units, one for each site, alternatively activated indoor and outdoor inflow with a switch time of 10 min.

While we found very similar PM_{2.5} mass concentrations in the two monitoring sites, chemical composition and UFP concentrations showed large differences. UFP outdoor concentrations at the front-door site were much higher than at back-door site. Indoor UFP gradients were similar to outdoor gradients. Relevant differences between the two indoor and outdoor sites were also evident for the shapes of size distributions.

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Primary author: Dr MARCHESI, Stefano (ARPA Emilia-Romagna)

Co-authors: Dr TRENTINI, Arianna (Arpa E-R); Dr MACCONE, Claudio (Arpa Emilia-Romagna); Dr BACCO, Dimitri (Università di Ferrara); SCOTTO, Fabiana (ARPA Emilia-Romagna); Dr RICCIARDELLI, Isabella (Arpa Emilia-Romagna); Dr LAURIOLA, Paolo (ARPA Emilia-Romagna); Dr FERRARI, Silvia (ARPA Emilia-Romagna); Dr ZAULI SAJANI, Stefano (ARPA Emilia-Romagna); Dr POLUZZI, Vanes (ARPA Emilia-Romagna)

Presenter: Dr MARCHESI, Stefano (ARPA Emilia-Romagna)