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Road dust emission factors and source apportionment in Turin (Italy)

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In recent years interest on road dust resuspension increased due to the absence of control measures. The main reason is the lack of information on the burden of different source contributions to the build-up of road dust reservoir. Indeed, such information could drive targeted measures to reduce emissions, from the technological and management points of view. Moreover information on emission factors and their variability in space and time is lacking, hampering the possibility of modelling and simulating population exposure to road dust particles. In this study an improved sampling methodology was applied to collect road dust from different sampling sites in the city of Turin (Italy).

The fraction of road dust below 10 µm was sampled in 20 sampling sites across the city, in main and secondary roads, to assess differences in mass loadings and in emission factors between residential, industrial, construction and urban background sites.

Samples were analysed for major and trace elements by inductively coupled plasma mass and atomic emission spectrometry (ICP-MS and ICP-AES), for OC and EC by a thermal-optical transmission technique, for sulfate, nitrate and chloride by ion chromatography and by specific electrode for ammonium.

Due to the difficulties found by previous studies for separating source contributions to road dust, a constrained Positive Matrix Factorization was applied using a priori information about likely sources of road dust such as brake wear, road wear, tire wear, soil and vehicle exhaust.

To this aim 10 representative samples of roadside soils were sampled (the top 5 cm layer) and the PM10 fraction was resuspended in the laboratory using a resuspension chamber and analysed in the same way as for road dust samples.

Other two important sources for road dust are brake and road wear, to address these contributions 11 cars and 9 trucks were sampled collecting the dust deposited on wheel rims and 5 samples of the asphalt surface (top 5 cm layer) were taken in different sites within the city of Turin (high and low traffic zones and a parking site). All the samples were analysed in the same way as for road dust and, additionally, with X-ray diffraction.

Emission factors (EFs) were calculated following the approach of Amato *et al* (2011) which allows to estimate EFs from deposited road dust loadings (mg/m^2).

References

Amato F., Pandolfi M., Moreno T., Furger M., Pey J., Alastuey A., Bukowiecki N., (...), Querol X. Sources and variability of inhalable road dust particles in three European cities (2011) Atmospheric Environment, 45 (37), pp. 6777-6787.