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An integrated system for the determination of the local, regional and long-transport contributions to Particulate Matter concentrations

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Several epidemiological studies have shown the negative effects of air pollution on human health, which range from respiratory and cardiovascular disease to neurotoxic effects, and cancer. Most recent investigations have been focused on health toxicological features of Particulate Matter (PM) and its interactions with other pollutants: it was found that fine particles (PM2.5) could be an effective media to transport these pollutants deeply into the lung and to cause many kind of reactions which include oxidative stress, local pulmonary and systemic inflammatory responses (Künzli and Perez, 2009).
Based on these implications on public health, many countries have developed plans to suggest effective control strategies which involve the identification of Particulate Matter sources, the quantitative estimation of the emission rates of the pollutants, the understanding of PM transport, mixing and transformation processes and the identification of main factors influencing PM concentrations.
In this field, receptor models can be useful tools to estimate sources contributions to PM collected in an area under investigations. Different approaches to receptor model analysis can be distinguished on basis of whether chemical characteristics of emission sources are required to be known before the source apportionment. The multivariate approach could be preferred when a lack of information concerning sources profiles occurred (Hopke, 2003).
In this work, the results obtained by applying an integrated approach in the monitoring of PM using several typologies of instrumentations will be shown. A prototype for the determination of the contributions of a single source ('fugitive emission') on the fine PM concentrations has been developed: it consists of a Swam dual-channel sampler, an OPC Monitor, a sonic anemometer and a PBL Mixing monitor. The investigated site chosen for the application of prototype will be the iron and steel pole of Taranto (Apulia Region, South of Italy).
Fugitive emission campaign will be performed by using three different positions around the Taranto industrial area; the main interest on Taranto is due to the presence of several activities of high impact as very wide industrial area close to the town and the numerous maritime and military activities in the harbour area (Amodio et al., 2008). The aim is to triangulate the area of the examined source on the basis of the prevalent directions of the wind. The investigation will be completed by chemical-physical characterization of PM2.5 and PM10 samples collected by the prototype in order to have additional information about the possible emissive sources. The statistical analysis, performed by Principal Component Analysis (PCA) and Positive Matrix Factorization (PMF), will be used for a detailed study of the impact of the local emissive source on the neighboring areas. Finally, the prototype will allow to identify and distinguish long range transport, regional and other local contributions on the fine PM concentrations.
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References

Künzli, N., Perez, L., 2009. Swiss Medical Weekly 139(17-18), 242-250.
Hopke, P.K., 2003. Journal of Chemometrics 17(5), 255-265.
Amodio, M., Caselli, M., Daresta, B.E., de Gennaro, G., Ielpo, P., Placentino, C.M., Tutino, 2008. Chemical Engineering Transactions 16, 193-199.