A Non Negative Matrix Factorization based method for source apportionment in atmospheric aerosols.

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The source identification process is an important step in air quality management. Receptor modelling offers a method to complete the process by measurements of the pollutant Concentrations at a sampling site. One type of receptor model is the multivariate model. Recently, this model is improved significantly. Positive matrix factorization (PMF) developed by Paatero (Paatero and Tapper, 1993) provides a flexible modelling approach that can effectively use the information content in the data. PMF has been used worldwide in the analysis of receptor modelling, and successfully applied (Pandolfi et al., 2008, Viana et al., 2008). Nevertheless, the PMF commercial version does not allow to add extra information on the source to bring the calculation around to the best result. In this context, we have developed a Weighted Non Negative Matrix Factorization (NMF) based method taking into account constraints on the source profiles. Input constraints consists in considering the a priori knowledge on the source profile resulting from chemical analysis of samples from industrial sources in the calculation procedure.

This method has been applied on atmospheric aerosols samples collected in Dunkerque, an heavily industrialized area in Northern France. A particular attention was paid to the identification and the estimation of the contribution of industrial emissions during the sampling period . Airborne particulates were collected over four month period in 2008 under various influence: urban, industrial, sea and continental. Several particulate emissions from the integrated steelworks based at Dunkerque were also analyzed to get their characteristics. These data were used to guide calculation of the source profiles. Results show that the major contributors to airborne particulates ambient concentrations were non-industrial sources (counting for 80% of the total particle charge): sea-salts, aged sea-salts, secondary and crustal aerosols ; the contributions of five local industrial sources are also evidenced.

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