Receptor Modeling of Nanofine Air-borne Particulate Matter

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Receptor models are mathematical or statistical procedures for identifying and quantifying the sources of air pollutants, including nanofine air-borne particulate matter, at a receptor location. Unlike photochemical and dispersion air quality models, receptor models do not use pollutant emissions, meteorological data and chemical transformation mechanisms to estimate the contribution of sources to receptor concentrations. Instead, receptor models use the physiochemical characteristics of particles measured at source and receptor to both identify the presence of and to quantify source contributions to receptor concentrations. The most widely used models are the chemical mass balance (CMB), principal components analysis (PCA)/absolute principal components scores (APCS), positive matrix factorization (PMF) or UNMIX model. All of them posses both many advantages and limitations. For example, in contrast to other receptor models, which extract source compositions from the data, CMB model requires detailed knowledge of source emission type. Furthermore, CMB is applied separately to each observation, rather than operating on the entire set of data. Applying PCA/APCS, PMF and UNMIX one can analyze a series of observations simultaneously in an attempt to determine the number of sources, their chemical composition and their contributions to each observation [1].

In this lecture some theoretical basis of the most popular models accompanied by several case-studies will be considered since the role of the modeler is extremely important not only as an information provider but as a designer of understandable visual material for those who are responsible for the clean environment and sustainability.

References

1. Miller S.L., Anderson M.J., Daly E.P. and Milford J.B., *Atmos. Environ.*, 36, 3629-3641, 2002.