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A statistical approach for the identification of sources associated with concentration peak events

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In air quality management a crucial aspect to be considered is related to the number of times that the concentration of some pollutant overcomes a given threshold value.
The impact on human health is in fact related to the number of overcomings, whose annual maximum number, together with the threshold values, is estimated through health impact and exposure studies and fixed by European directives, most of which transposed into national laws.
The reference number of overcomings and the threshold value are related to the consequent
Consequently, evaluating the contribution of emission sources associated with concentration peak events becomes an important feature to be considered. In this framework, it is also interesting to develop a numerical tool being able to estimate the relative contribution of near and far pollutant sources. This is an important aspect that an environmetal agency should be able to carry out and that should be considered in the problem of traffic management associated with the high levels of pollutant concentration.
In this work we illustrate a statistical methodology, involving also a backward Lagrangian dispersion model [1, 2], to characterize the position of sources that give the main contribution to concentration peaks. This is made by computing a spatial probability distribution of the sources, which, for each given spatial point in the considered domain, represents the probability of having a source in that point. The usefulness of the method is related to the finding of evident maxima points in the source probability distribution. These maxima are considered to be reliable if they are at least one order of magnitude greater than the surrounding regions. In the neighbourhood of a receptor, measuring the pollutant concentration, a high level of the source probability distribution is usually found, and the comparison of this level with that of the regions far from the receptor can be also used to estimate the relative contribution of far and near sources.
In order to check the capability of the statistical model to estimate the main source regions, artifical receptor data are derived from numerical simulations performed with an Eulerian dispersion model [3]. The Eulerian model runs are performed over a computational domain approximately corresponding to the European continent and with known simplified source distributions, which are expected to be reproduced by the statistical model. The Eulerian simulations are performed over a computational domain approximately corresponding to the European continent. The method is then applied to experimental pollutant concentration data.

References:

[1] A. Stohl, Atmospheric Environment **32**(6), 947 (1998).

[2] A. Stohl et al., Atmospheric Environment **36**, 4635 (2002).

[3] M. Mircea et al., Atmospheric Environment **42**, 1169 (2008).