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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Rebuilding sources of linear tracers after atmospheric concentration measurements" *by* J.-P. Issartel

Anonymous Referee #1

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The author addresses the classical problem of attribution a source strength and location on the basis of given observations. The underlying experiment is the ETEX 1 campaign, conducted in 1994. The basic question addressed here is of utmost importance, as it focuses on our poor ability to localise and quantify sources (and sometimes also sinks) of air pollution precursors, radiatively active trace gases and nuclear weapon ban control.

The author's method is based on a popular technique originating from approximation theory which is inverting a Gram matrix to calculate the expansion coefficients for linear combination of "retro plumes", computed from the adjoint dispersion simulation,

The author's treatment of the problem is skillful and a considerable contribution to inversion techniques, as he clearly describes strengths and weaknesses of the approach.

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To account for the ill posedness of the system an illumination function approach is invoked, with which the noisiness of the results could be smoothed.

However, the description of the method is poorly written and the basic idea is not sufficiently separated from the iterative method to optimise the function. As this part is central to the paper and for the sake of a greater impact of the paper, I recommend a thorough descriptive revision resulting in a new presentation of sections 4 and 5.

For the interpretation and validation of the ETEX results it is helpful to qualitatively compare the time series of both the observed time series records and the respective simulation of a very few selected stations. It should be made clear to what extent the practical limits of success are dictated by the performance of the meteorological simulation as given by phase shift and spread.

Some technical faults:

1. Symbol "L" is given to linear mapping between sigma and c as well as the vector space of square integrable functions. Select different symbols.

2. Sect. 3 paragraph 3: "s" should be sigma

3. Although widespread in literature and from wherever literature it is adopted: the Danish mathematician Joergen Pedersen Gram (1850-1916) is definitely written with a single "m" and has nothing to do with any weight unit.

4. Sect 7, paragraph 3, enumeration 2): although suggestive, please define or explain "alpha_i"

5. Sect. 8, para 1: Explain formula following words "... for each position"

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 3171, 2003.