

Interactive comment on “On tuning of atmospheric inverse methods: Comparison on ETEX and Chernobyl datasets using FLEXPART v8.1 and v10.3” by Ondřej Tichý et al.

Anonymous Referee #1

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This paper presents sensitivity studies of source term estimations applied to ETEX experiment and Chernobyl accident. Interesting results are shown and they shed light on the importance of the regularization parameters. While some well known aspects of the inverse problems are discussed in the paper, it is not clear what is suggested for the future applications. For the ETEX experiment, the source term estimation results are pretty disappointing. More discussions are probably needed for the causes.

General:

The derivation of the equations (4-6) is important to reach the final simplified form (7). However, only the simplified form is used and discussed later in the manuscript. It may

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be more appropriate to put them in an appendix.

Most of the estimated source terms are not as good. It is likely due to the model errors in the SRS matrix M . It will be useful to present the M matrix or its simplified form for both applications.

Two versions of the FLEXPART are used for the two different applications. How different are the two versions? If version 10.3 is considered an updated version, will replacing v8.1 with v10.3 for ETEX experiment provide better results?

Specific and editorial:

Page 2, lines 18-20: Interpreting no prior source term as having zero prior source term is not accurate.

Page 4, Equation 5: Some terms are probably missing. Is it " $\bar{x}-x_a$ " or " $\bar{x}+x_a$ "?

Page 4, Equation 6: Please check whether it is correct.

Page 4, Equation 7: J is supposed to be the sum of the two terms, rather than the difference.

Page 7, Equations 14-19: The notations, such as the normal/Gaussian, truncated normal, and Gamma distributions, should be explained.

Page 9, line 26: Please fix "?".

Page 11, line 2: Remove "a" before "two representative values".

Page 12, line 30: Remove the repeated "we".

Page 18, line 30: Please briefly explain how the absolute measurement errors are handled.