Geosci. Model Dev. Discuss., 7, C1233–C1235, 2014
www.geosci-model-dev-discuss.net/7/C1233/2014/

Geoscientific Model Development
Discussions
Open Access

Interactive comment on "A robust method for inverse transport modelling of atmospheric emissions using blind outlier detection" *by* M. Martinez-Camara et al.

M. Martinez-Camara et al.

marta.martinez-camara@epfl.ch

Received and published: 24 July 2014

We would like to thank the reviewer for the very valuable comments, that have helped us improve the article. The way we addressed each comment is explained below.

Major comments:

The authors evaluate their approach against an emission pulse, a short but strong signal. They also clearly mention in the introduction that the inversion approach is also well suited for emissions that are continuous or variable over time. Some discussion is needed on how well the new blind outlier detection would perform if the source to be reconstructed is not an emissions pulse, but rather a continuous signal.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

We acknowledge that the article would benefit from a comment on the topic of different signal classes. In the interest of conciseness, we did not enter into this topic in the first version of the paper. However, prompted by the reviewers comment, in the revised manuscript we are including an extra paragraph at the end of subsection 1.3:

"Our presented algorithm is generic, in the sense that it is suitable for all classes of input signals. Of the four key elements that constitute our algorithm - the least squares term, the regularization, the outlier detection, and voting - only the regularization is affected by the type of input signal. We chose to use the regularizations given in (2) and (3) because they are the most generic, and are known to apply relatively well to a broad range of realistic signals (impulse, continuous, piece-wise constant, sparse, etc.). As always, improved performance can be achieved when the structure of the signal is known, by using an appropriate, more specific regularization suited to that structure. Our approach is in fact independent of the regularization that is used, and is applicable to any regularization found in the literature."

We admit that it would be beneficial to test our method also for other signal types. However, this is limited by the availability of suitable test cases. All long-range atmospheric tracer experiments have used emission pulses of the tracer substance release rather than continuous signals. Thus, any testing would be limited to synthetic rather than real atmospheric data. In this paper, we tested our method with real data, hence the limitation.

Minor comments:

3196 | 2: explain why 120 unknowns

Our period covers 5 days times 24 hours, thus 120 source elements. A suitable explanation was included in the revised article in Section 1.2.

p 3197 | 7-9: reference needed

We added the reference to Rousseeuw et al.

GMDD

7, C1233–C1235, 2014

p 3198 | 1-2: how reasonable is it to assume that the errors are indeed random, independent and identically distributed? Given e.g. that a wrongly predicted polar low will result in erroneous transport that affects multiple stations at the same time - the errors are not independent anymore. Discuss.

We acknowledge that some degree of correlation may exist among the errors (e.g., thinking of radionuclide applications, the radionuclide (e.g., ^7Be) background would be affected by transport from the upper troposphere, and such downward transport may affect all (or many) stations simultaneously for a particular weather pattern as suggested by the reviewer). However this correlation is generally unknown (especially for the concrete problem that we discuss). For this reason it is hard to include this correlation in the problem, and we assume the errors to be independent. Nevertheless, it is well known that the least-squares mechanism only works when the error e is Gaussian distributed. Our goal here is just to show that in the ETEX experiment, the distribution of e is indeed not Gaussian.

We added an explanation to the revised article in Section 2

p 3199 | 1-3: references are need to support this statement

We added a reference to Stewart et al.

p 3201 | 25: so does this mean TRANSAC is now very sensitive to beta instead of eta?

The algorithm is sensitive to beta, but for practically all beta values the performance is improved. A new plot to illustrate this has been added to the revised article in Subsection 4.1.2. However, how to choose beta automatically lies out of the scope of this paper and is part of our future work.

Interactive comment on Geosci. Model Dev. Discuss., 7, 3193, 2014.

GMDD

7, C1233–C1235, 2014