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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Greenhouse gas network design using backward Lagrangian particle dispersion modelling – Part 1: Methodology and Australian test case" *by* T. Ziehn et al.

Anonymous Referee #1

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This is an excellent manuscript that describes a very useful new development. The approach is well introduced and the results are well presented.

Nevertheless, I would appreciate, if the manuscript could address more in depth the basic idea (combining scientific and economic aspects in the context of network design) and novelty of the approach (the novelty should be better highlighted), and discuss advantages (beyond computational efficiency) and disadvantages of the new approach in comparison to existing approaches. Else the manuscript – from my point of view - would be too close to a technical report.

I disagree with the first sentence of the abstract. The new approach suggests to select a priori from all possible locations of stations those, which are economically easy to realize. This is a subjective choice. This prior selection improves the computational efficiency of the network design, but by definition, the new method does not attempt to generate a – scientifically - optimal network any more. Also this method does not provide the opportunity to generate the optimal network including economic aspects, because the prior selection is subjective.

Given the financial costs of building and maintaining new stations, the computational costs of network design seem marginal. I would therefore suggest to consider combining the two approaches, first a general search based on a gridded surface, and on top of this the specified search accounting for the economical costs of maintaining existing or adding new towers. Only such an approach would combine the search for a scientifically optimal network and accounting for economic costs.

In case of the Australian example there is already information available, and the two-step approach may seem redundant. However, given Australia is only the example to introduce the new method, in general we cannot assume such rich prior experiences.

I don't appreciate the idea of using the measurement uncertainty as proxy for economical costs. This approach would make it impossible to account for both aspects independently and exact. As long as they are treated separately, their respective contributions to the prior and posterior cost-function could be analysed independently.

I do not suggest combining the two approaches (general and selected search) or explicitly adding the economical costs in the current manuscript, but I would like to suggest addressing these aspects in more depth in the introduction and discussion. This would contribute to highlight the current paper as a relevant step towards a general approach, which objectively combines scientific improvements and economical costs.

Minor comments:

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Please explain specific terms, e.g., “surface flux” – this term is frequently used but is not explained, or “BIOS2 model runs” is mentioned in the abstract and should be explained.

The analysis that shows only marginal influence of external contributions could be explained a bit

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 7557, 2014.