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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 #2

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Ziehn and Coauthors evaluate the ability of different atmospheric CO2 observation networks to constrain the CO2 fluxes of the Australian continent, by calculating the a-posteriori uncertainty achived by the different candidate networks in a regional atmospheric transport inversion. For the design of observational infrastructure, this is an important tool. The study provides interesting insight for Australia, but may also be helpful for groups considering other parts of the world. Method and findings are presented in a clear fashion. Possible limitations are discussed. I clearly recommend this paper for publication.

The only part I did not find convincing is the argumentation around Eq (14) (and the

correspondiong paragraph in Sect 4). While I fully agree to the conclusion that the boundary influence on the presented results is small, I do not see at all how that can be concluded from Eq (14). Rather, to my knowledge, the reason why the boundary influence on the a-posteriori uncertainties is small, is that the local fluxes are related to concentration gradients within the regional domain, such that the signals from the boundary largely cancels out. If the Authors decided to keep Eq (14) it would need substantially more explanation.

I'd further suggest to somewhat re-arrange sections 2 and 3, because both are on Methods. I suggest to either combine them into one section, or to rename section 3 into "Methodology: Network design for Australia". Further, I would move section 2.2 (plus the first paragraph of Sect 3.2) into an appendix as it is unexiting technical detail not specific to network design and not actually relevant to understanding the paper. Moreover, there are some repetitions that could be removed (e.g., part of page 7569 paragraphs 1 and 2).

Minor comments:

p7559 l 10: GLOBALVIEW is not a measurement program. Consider to replace "consists" by "summarizes data"

p7560 l 9: The word "cost function" (here and further down) is used for two separate items (Eqs (17)/(18) versus Eq (3)). It would be better to use different wording.

p7569 l 22: Is 4 weeks enough? How long does it take the air to travel across Australia?

p7571 l 9: Mention whether or not the ocean fluxes are adjusted in the inversion. I actually think the should, because otherwise the a-posteriori uncertainties of the land fluxes will be unrealistic.

Sect 3.3: You later only use Eq (18). I think a rationale needs to be given for this choice. How different would the results be when using Eq (17)?

p 7572 l 14-17: Put to appendix as well.

p7573 l 27 . . . p7574 l 4: Put to Methods.

p7580 l 2: "estimates" probably means "uncertainties".

Typos:

p 7565 l 1: "overbar"

p7580 l 24: "modelled"

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