Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., author comment AC3
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Reply on RC3

Susan J. Leadbetter et al.

Author comment on "Assessing the value meteorological ensembles add to dispersion modelling using hypothetical releases" by Susan J. Leadbetter et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-638-AC3, 2021

We would like to thank the reviewer for their comprehensive review of the paper. They have highlighted some interesting issues which we have attempted to answer both within the paper and in the response below. The reviewer's comments are shown in italics and our response to their comments is shown in plain text. I've attached the same comments in a document for readability.

Specific comments

In the Introduction section, reference is given to earlier work on the use of ensemble techniques for atmospheric dispersion modelling. However, there is no reference to the research carried out by the Nordic countries on this issue in a number of projects, cf. e.g. Sørensen et al. (2020), see below:

Sørensen, J.H., Bartnicki, J., Blixt Buhr, A.M., Feddersen, H., Hoe, S.C., Israelson, C., Klein, H., Lauritzen, B., Lindgren, J., Schönfeldt, F., Sigg, R. Uncertainties in atmospheric dispersion modelling during nuclear accidents. J. Environ. Radioact. 222 (2020) 1-10. https://doi.org/10.1016/j.jenvrad.2020.106356

I've now added additional references to earlier work on ensemble techniques within the introduction section. These include comment on improving ensemble methodologies leading to lower computational requirements and citations for ensemble studies of Grimsvotn and Eyjafjallajokull.

For the selected scenarios, four months of meteorological data (mainly winter 2018-2019) are selected. However, no reasoning for this choice is given. A whole year would seem more appropriate. Please comment on this.

The reviewers make a very good point. However, to extend the study would require many months of work and the data volumes generated are prohibitive. We have, therefore added additional discussion of the limitations of the study both in the methodology (section 2) and the conclusions (section 4) as follows:

In section 2: "To explore a range of meteorological conditions both scenarios were repeated every 12 hours over a period of around 4 months (03/11/2018-28/02/2019 for the radiological scenario and 01/12/2018-31/03/2019 for the volcanic eruption scenario) with each simulation being run on single NWP forecast." has been replaced with "To explore a range of meteorological conditions both scenarios were repeated every 12 hours. Computational constraints restricted the period over which runs could be carried out to 4 months between late autumn 2018 and early spring 2019 so runs were carried out for the period 03/11/2018-28/02/2019 for the radiological scenario and 01/12/2018-31/03/2019 for the volcanic eruption scenario with each simulation being run on single NWP forecast."

In section 4: "Due to computational constraints this study was only able to examine skill scores over a 4-month period from the end of the northern hemisphere Autumn to the beginning of Spring. This was partially mitigated against for the radiological scenario by using a range of release locations. However, further work would need to be carried out to demonstrate that the results hold for the northern hemisphere summer."

Technical corrections

Line 47: Replace comminicate with communicate.

Done

Line 119-120: Incomprehensible sentence: (…) NWP ensembles including ensembles (…)

Removed "including ensembles!

Line 268: The range [−1, 0) should be corrected to]−1, 0[or]−1, 0).

In the current format we agree that it is unclear whether the lower end of the range is open-ended or closed. We have restated equation 3 to make it clearer that the lower end of the range is closed and that "[" is correct.

Line 274: Replace air concentration with integrated air concentration.

Done

Please also note the supplement to this comment:
https://acp.copernicus.org/preprints/acp-2021-638/acp-2021-638-AC3-supplement.pdf