

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-638

Anonymous Referee #3

Referee comment on "Can we assess the value meteorological ensembles add to dispersion modelling using hypothetical releases?" by Susan Janet Leadbetter et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-638-RC3>, 2021

General comments

The manuscript describes a study on the performance of an atmospheric dispersion model ensemble derived by applying an off-line atmospheric dispersion model to a numerical weather prediction (NWP) model ensemble. The dispersion ensemble is compared with results of the same dispersion model run by using corresponding deterministic NWP model data. The 'ground truth' is obtained by running the dispersion model using analyzed and few-hour forecast NWP model data. A few selected radiological accident scenarios and volcanic eruption scenarios are considered. Only meteorological uncertainties, as represented by the NWP model ensemble, are taken into account, and not uncertainties related with estimates of the release rates. The results, which are based on Brier skill score analyses, indicate that in general the ensemble dispersion results perform better than the deterministic calculations.

The paper is well written, relevant and interesting both from a practical and a scientific point of view.

Publication is recommended after minor revision following the advice given below.

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>

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.

Technical corrections

Line 47: Replace comminicate with communicate.

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

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

Line 274: Replace air concentration with integrated air concentration.