Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
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# Comment on acp-2021-81

Anonymous Referee #1

Referee comment on "Dispersion of particulate matter ($PM_{2.5}$) from wood combustion for residential heating: optimization of mitigation actions based on large-eddy simulations" by Tobias Wolf et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-81-RC2, 2021

General comments:

The study aims to use a LES model to identify the impacts of mitigating wood stove particulate emissions on air quality over Bergen. The study can have interesting scientific and policy-related implications. However, the current version lacks a proposer discussion and analyses of the mitigation impacts and the possible extrapolation of the results in other regions as it is limited to Bergen only. Additionally, although references to previous studies are provided with respect to model description, it is still necessary to include some features of the model regarding fx other emission sources, initial and boundary conditions, and meteorological drivers. Finally, it would be good to compare the simulated PM2.5 levels with observations to better discuss the contribution of wood stoves and their mitigation. I would also recommend revision in the language as there are some section that are difficult to follow. Given the above concerns, I still encourage publication in ACP.

Specific comments:

Abstract:

Lines 20-22: Do you mean that the observed levels were higher than simulated levels? This then cannot only be attributed to long-range transport as there are also biases in simulated local levels?

Section 3.1:

How about other sources of pollution such as traffic and other residential combustion sources? Are they (and how) treated?

What kind of meteorological information is used to drive the transport? These might be described in earlier publications but needs to be described briefly here for context.

Line 153: Correct "shell" to "shall" or replace with "will"

Line 156: Is there a reference for this "own user-code"?

Line 159: Change to "prescribed" or "prescribing"

Lines 163-164: So a bulk PM25 is emitted directly from the sources?

Lines 164-166: How are the sources treated, as area sources per grid cell? How do you then distinguish between the "old" and "new" stoves? Is it not possible to treat the chimneys as separate sources as you have this information on 1 m resolution from DEM? Is it not possible to calculate an assign a fraction of new vs old stoves per grid cell?

Line 216: "… installation OF only the new…."

Line 216: Why do you aggregate and average in 3x3 cells rather than using the absolute values in each grid cell?

Line 218: So the initial conditions are set to zero? This should be further clarified with regards to consequences. Is it not possible to use a typical "background concentration" from for example "clean days"? This also allows to more realistically evaluate the contributions of local chimneys with respect to observed levels. How about the boundary conditions? Is there transport of PM2.5 to the domain from outside?

Line 237: Replace "correspondence" with "agreement"

Lines 235-239: It would be interesting to have lower and upper bounds of this mean and represent them in the simulations with extra scenarios.

Section 4.1:

A brief model evaluation is needed here, although earlier publications are refereed.

Lines 271-273: This artificial pollutant methodology is not clear and need a bit more details on what it is based on. Is it a way to transport pollutants outside the model domain or within?

Section 4.2:

This section requires deeper analyses and discussion of the different mitigation scenarios. Currently, it reads like a summary of a previous study rather than stand-alone results from the present work.

Conclusions:

The section is missing an interpretation of findings with respect to existing literature on similar works in other parts of the world in in order to put the present study in a more regional and global context. Currently, the impression is that the general interest to the results seems to be rather limited.