Geoscientific

Model Development

Discussions

Open Access

[GMDD]

Interactive

comment

Interactive comment on "An urban large-eddy-based dispersion model for marginal grid resolutions: CAIRDIO v1.0" *by* Michael Weger et al.

Anonymous Referee #2

Received and published: 20 December 2020

General comments

The paper describes a newly developed LES-based dispersion model suitable on the urban scale to simulate boundary layer flow and air pollutants. Herein, the authors use a known approach from two-phase modeling (diffusive obstacle boundaries) and apply it to an urban LES model for the first time. It is shown that this approach is computationally efficient even when grid spacings are in the order of the buildings itself. Overall, the content is presented well and in a scientifically sound manner.

Specific comments

I suggest that the paper be published in GMD after the authors have addressed the

following points:

1. Some sections of the manuscript are exhaustive and described in great detail. If the authors decide to keep everything within one paper, I suggest to shorten several parts of the paper to increase the overall readability.

2. The "Michelstadt" wind tunnel experiment is a very nice example for model evaluation. However, the other parts of Section 3 are rather numerical sensitivity and convergence tests. Therefore, this section should be divided into two separate sections.

3. Some technical parts of the model itself should be mentioned or explained. For example, why is it called CAIRDIO (if this is abbreviation, what does it stand for?). In which programming language is the code written? Which libraries are used? Also, since the authors argue that the main benefit is the increased computational efficiency due to the diffusive interface approach, some kind of scaling analysis for a varying number of CPUs (or nodes) to test the parallelization would surely be of interest.

4. For most of the figures, the font size (especially for the axis labels) needs to be increased.

5. The authors should spend at least one more iteration on checking language and grammar as well as formatting inline equations.

Technical corrections

P1 L1: Instead of "accurate numerical models" I would write "numerical models dedicated to accurately simulate".

P1 L6: "like e.g. the" -> "like, e.g., the"

P1 L12: What does "mid-sized" mean?

P2 L57: The term "terra-incognita" already existed before.

P2 L59: "stringend" -> "stringent"

P3 L62: "e.g.,"

P3 L67-68: What do you mean by "more holistic simulations"?

P4 Eq. 1: Introduce rho

P4 L117: Avoid putting a variable name at the beginning of a sentence.

P5 L136: "Computation grid" -> "Computational grid"

P10 L242-243: The superscripts "th" and "rd" should be in text-mode, not math-mode.

P10 L258: "while in" -> "while within"

P11 L268: Wrong citation style

P11 L285+288: "2nd" "3rd" etc. (see above). Please check all further appearances in the whole manuscript.

P13 Fig. 2 caption: Which exactly are the different resolutions for a) – f)?

P30 L648: NMSE and FB have already been introduced.

P30 L671: This is one example where inline equations are not properly formatted ("NMSE= 0.10"). Please check all occurrences.

P31 L679: delete "ever"

P31 L684+685: "Tab." -> "Table"

P31 L693: "over-estimates" -> "overestimates"

P32 L702+703: "x", "y" and "z" should be in math-mode. Please check for the whole manuscript.

P33 L704: "lower most" -> "lowermost", "upper most" -> "uppermost"

P34 L715: "an uniformly" -> "a uniformly"

P34 L715+716: Correctly format inline equations to avoid linebreaks within them

P34 L718: What unit is "u sˆ-1"?

P34 L735: Increased air pollution is also observed in stable boundary layers during nighttime (not only winterly high-pressure periods).

P36 L771-773: I would rewrite the sentence in the following way: "In this framework, a promising application could be a more comprehensive and holistic model evaluation with field data, as mobile measurements could be available for the city of Leipzig in addition to air monitoring."

_____

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-313, 2020.