

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-255

Anonymous Referee #2

Referee comment on "uDALES 1.0: a large-eddy simulation model for urban environments" by Ivo Suter et al., Geosci. Model Dev. Discuss.,
<https://doi.org/10.5194/gmd-2021-255-RC2>, 2022

This paper presents uDALES, which is a highresolution, building-resolving large-eddy simulation code for urban microclimate and air quality, to model the local environmental conditions, urban morphology and interaction with the atmospheric boundary layer. In my opinion, the methodology of this paper is scientifically sound.

My general comments are:

The novelty of this open-source software should be further strengthened. Specifically, compared to OpenFoam and PALM, what is the advantage of this software? Does it also allow modules to be integrated by other users?

What extension have you added based on DALES? This should also be clearly stated in this paper.

The computational time and computational RAM or CPU requirement should also introduce in this paper, as well as the data communication process.

My specific comments are:

In equation (2), there is a notation θ_u ; and in equation (3), there is another notation θ_v . Are they the same notation? If so, please make it consistence, otherwise, please use different form to avoid misunderstanding.

For the schematic diagram in Figure 1, I suggest the authors could add some symbolic simulation obstacles in simulation section. I guess it could be the latter part in Figure 1b?

For section 2.3.2, could you please explain in more detail about the numerical settings for lateral boundary condition, especially the inflow-outflow condition? Does it mean that the upper part of the simulation domain is used to generate flow turbulence and set as periodic, then feed into the latter part? Also, what is a "run-up" region in figure 1c?

Page 21, What do you mean by stating the following sentence "All processors know about the facet properties and calculate the local wall fluxes according to the state of the local fluid cells. For the facet energy balance the processor average has to be determined."? Could you please give more details for clearer understanding? Does it mean the data will be summarized in one processor via MPI and then averaged or other operation and send to other processors?

Refer to the previous question, does this data communication need to be done every time iteration? If so, how much time does it cost, maybe a rough comparison between data communication and computation in each time step?

In table 1, the grid size for main simulation is 450X400X100, and the domain size is 900X800X200. I do not think that there are only 2 grid points in x, y and z direction. So, I think the grid size should be grid number or grid points. Please revise accordingly.

In figure 7, could you please indicate clearly about the position R?

The test case of wind tunnel experiment results of the DAPPLE project should be briefly introduced in Section 4.2. Or relevant materials should be provided in supplements.

What is the test case in Figure 11 (surface energy balance test case)? This should be carefully described in the paper.

In section 4.3, have you validated this case with on-site measurements? I think it will be more convincing if the authors can validate their codes with real time measurement.

In section 4, have you done grid sensitivity test on these case studies? As I understand, the filter in LES simulation in this paper is implicit and based on grid size. So, the grid size should be also important for the simulation quality. Perhaps, the authors can also add turbulent kinetic energy analysis in these test cases analysis.

How is the grid arrangement of this software? Does it only allow hexagon grid? Does the grid need to be uniform in x, y and z direction?

My technical comments are:

Page 2, In the following sentence, I think "transition" should be "transit". "The increased likelihood of extreme weather events due to climate change (IPCC, 2014) and the need to transition to a less".

Page 3, please check the citation format in the text "require turbulence parameterisations for the full range of active scales in the flow field Blocken (2015)." Please also do this for the whole paper and revise accordingly.

Page 3, please check the following sentence and revise "Popular codes for RANS are any of the commercial CFD packages (Fluent, ANSYS CFX, COMSOL etc), although there are also open source alternatives (e.g. OpenFoam)."

Page 3, I think "large turbulent scales" rather than "bulk of the turbulent scales" in the following sentence "Large-Eddy simulation (LES) tools explicitly resolve the bulk of the turbulent scales in the flow,"