

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2022-287-RC1>, 2022
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Comment on acp-2022-287

Anonymous Referee #1

Referee comment on "Parameterizing the aerodynamic effect of trees in street canyons for the street network model MUNICH using the CFD model Code_Saturne" by Alice Maison et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-287-RC1>, 2022

The paper proposed a parameterization to include the aerodynamic effect of tree crowns in the MUNICH street-network model. For that, simulations using Code_Saturne CFD code are performed varying the Leaf Area Index, the crown volume fraction, and the ratio between tree and street height for three types of street canyons. The effects of these parameters over the horizontal velocity (U_{street}) and vertical transfer coefficient (q_{vert}) in treeless and tree conditions are studied. Then, these effects are included in MUNICH horizontal and vertical transfer parameterization from Maison et al. (2022) which is based on Wang (2012, 2014). The q_{vert} and U_{street} calculated with the new MUNICH parameterization including trees agree with Code_Saturne simulations. The parameterized wind profile is closer to Code_Saturne for winds near the middle of the tree crown.

The paper is well structured and written. The assumptions are well explained, with a clear methodology, interesting results which are well supported by the plots, and conclusions in concordance with the journal scope. This work represents an improvement on MUNICH formulations with the potential of improving air quality simulation inside urban canyons. I think this paper is also a good example of the process of building new parameterization in street-network models.

Minor revisions are detailed below:

Specific comments:

- Line 106. A definition of ϕ , the angle formed by the wind direction above the roof and the direction of the street, is missing.
- Further details on Code_Saturne configuration are required. Specifically, What are the

criteria to determine the location of the trees (7m from the wall)? what are the criteria to determine the maximum height of the Domain? It is not clear if the reason for using a two-dimensional set-up is only to save computational time or is it a required adaptation to compare Code_Saturne simulation with MUNICH (in line 89).

- Fig 1. The location of the background and location of the inlet can be added in Fig. 1. Like in Fig 1. in Maison et al. (2022)
- Line 232-236. More details should be given on the reasons for the reduction of the effect on q_{vert} ($RD_{q_{vert}}$) in Intermediate and Narrow Canyons with high LAI values and small h/H ratio (Fig 3(b) and Fig 3(c)).
- Fig 4. What is the meaning of ER in Fig 4 subtitles? It can be added to the figure label.

Technical corrections:

- For consistency, Eq (15) and Eq (16) are missing the " x 100" as it is expressed in % in the plots and analysis and also in NMAE and NMB equations.
- Line 280: Eq. (2) should be Eq. (4)
- Line 286: The two introduced parameters to be determined based on Code_Saturne are f_{bxt} and C_u .
- Line 333: It should be "street-network model MUNICH".