Response to Comments

Dear Reviewer:

We truly appreciate your comments on our manuscript entitled "Modelling of street-scale pollutant dispersion by coupled simulation of chemical reaction, aerosol dynamics, and CFD" (Manuscript Number: acp-2022-365). Your comments are valuable and have been very helpful in improving our paper. We have carefully studied the comments and made the appropriate corrections, which we hope will meet your approval. In this document, the reviewers' comments have been written in blue, while our answers have been typed in black. All changes have been highlighted in red in the revised manuscript. The responses to the reviewers' comments are presented below.

Response to the reviewers' comments

Reviewer #1:

The main concern for this paper is the methodology used in simulating the street level pollutants.

(1) The street domain is too small and ideal, not representing the real street configuration. Therefore, a detailed evaluation of the modeling results cannot be carried out.

In this study, the focus was put on the pollutants' physical phenomenon inside the street canyon, therefore the simulation domain was relatively small. The authors consider that the 2-D simplification of the street canyon is reasonable for a perpendicular wind, as shown by the small concentration difference in the 2D-3D comparisons performed by Maison et al. (2022). In addition, the 2-D simplification is frequently adopted for studying dispersion of reactive pollutants in a street canyon (Garmory et al., 2009; Wu et al., 2021). The related statements were added in Line 695.

(2) For such a small scale CFD simulations, the dynamical (3-D wind speed), thermal (Temperature) and mass (PM, BC, NO2,..) boundary conditions are the critical time-varying inputs to the CFD model, but the study failed to specify clearly.

The authors agree that the boundary conditions are the critical time-varying inputs to the CFD model. In this study, the hourly friction velocities, temperatures, and background concentrations at the inlet were from the regional model and were linearly interpolated into each timestep. The background concentrations were spatial-uniformly prescribed at the inflow and top boundaries. Therefore, the general trends were simulated but the fast fluctuations at the inlet were not reproduced. Nevertheless, this method is frequently adopted in the RANS-based simulations of street-level pollutant dispersion (Kim et al., 2019, Kumar et al., 2009). The related statements were added in Line 215 and 231.

(3) For the pollutants, the street level concentrations are composed by two contributions: local streel emissions and transports from outside the domain. If the outside

contributions were not specified and validated correctively, the modeling results from this study cannot be sufficiently evaluated.

As detailed in Sartelet et al. (2018), the simulated regional concentrations compare well to measurements of O_3, NO_2, PM_{10}, $PM_{2.5}$, black carbon and organic aerosols. Therefore, the authors considered the boundary conditions were suitable and real for the street simulations. The related statements can be found in Line 229.

Reference

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