

Interactive comment on “Large-eddy simulation of traffic-related air pollution at a very high-resolution in a mega-city: Evaluation against mobile sensors and insights for influencing factors” by Yanxu Zhang et al.

Anonymous Referee #1

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The authors have submitted a research article describing large eddy simulation of the atmospheric flow and CO concentration over the city of Nanjing. Numerical results are compared with experimental ones. The quality of the paper is good. A few minor improvements could be considered, as exposed below.

A - Specific comments :

1. Around line 104, the authors clarify the following : neutral stratification is assumed. It would be interesting to describe the meteorological conditions associ-

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ated with the experiments : was the stratification mostly stable / unstable / neutral ?

2. Around line 106, the authors clarify the following : dry and wet deposition are neglected. Did the authors removed the experimental samples associated with rain periods ?
3. The temporal window (year / month / day / hour) associated with the experiment seems to be missing
4. The boundary conditions are poorly described. Boundary conditions used at the inlet / outlet / ground and at the top of the domain for velocity, pressure and CO should be clearly described. Regarding the inlet, is the flow steady ? If not, are the authors using synthetic turbulence ? Is the simulation considered fully resolved at the ground level ? If not, are the authors using some wall-functions ?
5. Regarding domain extension, is the domain high enough so that the boundary condition used at the top of the domain has no significant impact on the flow of air and on the CO concentration ?
6. The authors have not investigated the mesh resolution. It would be interesting to perform a simulation on a finer mesh to improve local estimations of the air flow and CO concentration. On the other hand, the comparison with experiments is made on a coarse grid. Thus, a simulation performed on a coarser mesh might perform as well as the present one compared with experiment. Another improvement could be obtained by simulating more wind directions.
7. Figure 13 is a bit misleading. The averaged concentration and the exponential curve fit very well. Each sample of the averaged concentration should be given with error bars (obtained from the simulation). On one hand, it is correct to claim that after averaging, the decay of concentrations associated with the distance

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to the nearest major roads does not really depends on the wind speed, for the investigated cases. On the other, this does not rule out the possibility that, for a given wind direction and for a few streets, the decay will be much faster or much slower. The inclusion of error bars on the averaged concentration will allow the reader to visualize this variability.

B - Technical corrections :

1. Line 58, the authors claim that trees increase turbulence and reduce concentrations. Trees are also associated with reduced street ventilation, which leads to higher concentrations. Thus, their effect remains controversial. <https://doi.org/10.1016/j.envpol.2012.10.021>
2. Around line 140-155, the time dependence of the traffic flow and city-level emission should be clarified.
3. The URL links given at the end of Section 2 are not in english, and are thus of limited use for an international audience
4. In section 3.1 and at several other locations, the authors should replace "Air quality" by "Modeled CO concentration".
5. Regarding Figure 3, it seems that the concentration is not exactly zero at the top-right corner of the domain. This seems inconsistent with zero concentration at the inlet and no emission at this location.
6. In Figure 3 but also across the paper, the authors often present CO concentrations without giving the associated elevation. Please clarify when ground-level concentrations are used.
7. Figure 4 is of relatively poor quality and seems to contain negative modeled CO concentrations...

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8. Figure 5 seems to contain a cluster of samples with measured CO concentrations around 0.2 and modeled concentrations between 1.2 and 1.8. On one hand, the cluster might not be statistically significant. On the other, it could be interesting to investigate it.
9. Figure 11 contains a typo on Longitude
10. Figure 12 should be updated. The abscissa is the building height for frames (A), (B) and (D) only.

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