

**Re: We thank the reviewers for your careful read and comments on our manuscript. We have carefully taken your comments into considerations in preparing our revision, and below marked in blue is our response to your comments point by point, or you can see the revised manuscript for more details. Thanks again for your comments.**

**Specific:**

**Reviewer 2:** In this manuscript, the authors designed a two-way coupled regional-urban-street network air quality model system, and applied and evaluated it in a megacity, Beijing, China. The topic is of great interesting to recognize the complex interactions of air pollutants between larger different scales in spatial dimension inducing by emissions, mass transform and chemistry among the scales. The manuscripts is generally well organized and the analysis is mostly sound. But some details need modify and some ambiguous presentation need clarify. I recommend a minor revision and my comments listed below.

Specific comments:

1. The title should include air quality, indicating you designed a two-way coupled air quality model system.

Re: Thank you for your comments. We appreciate the reviewer's positive evaluation of our work. Based on reviewer's comments, the title has been revised to: "IAQMS-street v2.0: a two-way coupled regional-urban-street-network air quality model system for Beijing, China". Please see the manuscript for more details.

2. In line 11 of the abstract, "gap" could be better replaced by "different" or other word implicating the large different between the concentration in regional and street scales.

Re: The sentence has been revised to: "the concentrations of pollutants, such as ozone (O<sub>3</sub>) and its precursors, have a large difference with the regional averages and their distributions cannot be captured accurately by traditional single-scale air-quality models". Please see the manuscript in line 11 for more details.

3. In line 27 and in the context, cannot say "O<sub>3</sub> emissions".

Re: The sentence has been revised to: "The relative contributions of local traffic emissions to NO<sub>2</sub>, NO, and O<sub>3</sub> concentrations were 53.41, 57.45, and 8.49%, respectively". Please see the manuscript from line 28 to line 29 for more details.

4. In line 121, dc-->dC;

Re: The "dc" has been revised to "dC", please see the manuscript in line 121 for more details.

5. In line 135, definition  $\gamma$  as mass transfer efficiency may better than mass flux.

Re: The sentence has been revised to: “ $\gamma$  is transfer efficiency between street and background concentration”. Please see the manuscript in line 135 for more details.

6. In line 150, “in Eq. (3),” could be in Eq. (4)?

Re: The “Eq. (3)” has been revised to “Eq. (4)” in line 150. Please see the manuscript in line 150 for more details.

7. In figure 3b, I found a truck, but the “truck up” and “truck down” were both zero. Were the statistics (in red) right?

Re: In the object detection system, the identified vehicles were counted when they drives across the yellow line (as show in Fig 3b). In Fig 3b, the truck was not cross the yellow line so the “truck up” is keep to zero. Based on reviewer’s comment, the Fig 3b is replaced to which truck has been counted (Fig R8). Please see the revised manuscript for more details.

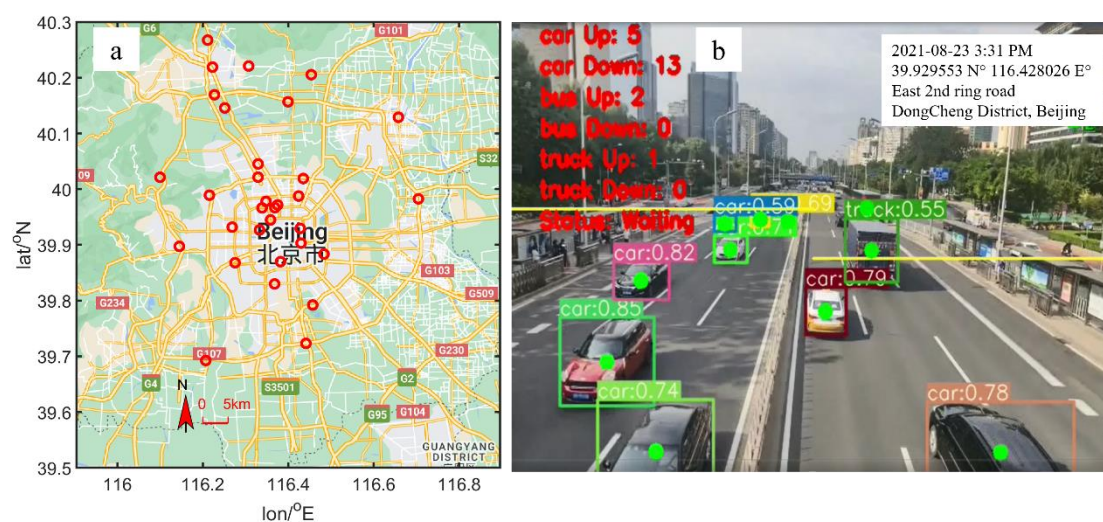


Fig R8. (a) Locations of observation sites on different roads for vehicle information (Imagery © 2022 Google, map data © 2022 Google). (b) Detection results of vehicles on road by the YOLO system.

8. In figure 7, we can find the simulated NO and NO<sub>2</sub> in regional (NAQPMS) higher than that in network simulations. So, what’s the means of the presentation in abstract “the concentration of NO<sub>x</sub> at street scale is higher than that at the regional scale,”?

Re: In this study, the NO<sub>x</sub> concentration simulated by regional model NAQPMS and coupled model IAQMS-street were compared with observation data at regional scale (Fig 7), the results showed that the NO<sub>x</sub> concentration simulated by NAQPMS was overestimate. As mentioned in the abstract, “the concentration of NO<sub>x</sub> at street scale is higher than that at the regional scale” is try to compared NO<sub>x</sub> concentration in street-scale and regional-scale in the coupled model (the concentration of pollutants in street and in background). Based on reviewer’s comment, the sentence has been revised to: “In the coupled model, the concentration of NO<sub>x</sub> at street scale is higher than that at the regional scale”. Please see the manuscript from line 22 to line 23 for more details.

Date of this revision:

28 Jun 2023