

## ***Interactive comment on “Quantifying the emission changes and associated air quality impacts during the COVID-19 pandemic in North China Plain: a response modeling study” by Jia Xing et al.***

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[Comment]: Xing et al. used the response surface model to estimate the emission changes based on the air pollutants concentration changes during COVID-19 in China. Accurate and timely estimate of emission changes are critical to investigate how the air pollutants response to rapid environment changes, such as halt of transportation, slowdown of industry and energy sector during COVID-19, which are missing in recently published journal articles studying the air quality response to COVID-19. The methodology proposed in this study provides a promising framework connect real-time emission changes with abrupt environment changes. I am also very satisfied when the

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authors provide hypothetical individual emission changes on the influence of ambient concentration changes (section 3.3), which is very helpful to design the multi-pollutants control strategies in China. The manuscript fits for the journal as well, and I suggest acceptance for this journal.

[Response]: We thank the reviewer for recognition of the implications of the results of the analysis presented, and positive comments.

[Comment]: L162: Fig 2 is not related to the reference pointed here; Also by looking at Fig. 2, there are more observations sites besides NCP. So I suggest the author rewrite the legend for Fig. 2.

[Response]: Sorry for the typo. The Figure 2 represents that in the reference. We have clarified this in the revised manuscript as follows.

(line 192) “Specifically, deep-learning technology was used to fit response surfaces for the three months in 2019 and 2020 using CMAQ simulations for baseline and zero-out emissions conditions (see Figure 2 in Xing et al. (2020)).”

We have also rewritten the caption of the Figure 2 as follows.

“Simulation domain and location of observation sites (colorred area: five provinces of North China Plain; red dots: surface monitor sites for NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub> and PM<sub>2.5</sub>; blue dots: monitor sites for PM<sub>2.5</sub> chemical compoments)”

[Comment]: Fig 3. Consider to put subscript letter for those air pollutants.

[Response]: As the reviewer suggested, we have put subscript letter for those pollutants in the revised manuscript.

[Comment]: Fig 4. Consider to put the simulations with the prior emission (without using the RSM to adjust) for comparisons purpose.

[Response]: As the reviewer suggested, we have put the simulations with the prior emission (without using the RSM to adjust) in the revised manuscript.

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