

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-957

Anonymous Referee #1

Referee comment on "Dramatic changes in atmospheric pollution source contributions for a coastal megacity in northern China from 2011 to 2020" by Baoshuang Liu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-957-RC2>, 2022

This manuscript investigated chemical environment for surface O₃ for six major industrial regions across China in summer 2016. Detailed chemistry-climate model simulations were employed to diagnose ozone sensitivity to precursors and contrast the effectiveness of different measures to reduce surface O₃ concentrations. This manuscript is helpful to understand ozone pollution mechanism in Chinese cities, and within the scope of ACP. I think it is publishable in ACP after my following concerns are addressed.

Line 215: The gross rate of production $P(O_3)$ actually represents the production rate of O_x ($O_3 + NO_2$) through the reaction $HO_2 (RO_2) + NO$. Therefore, the net ozone production rate should include the loss term $NO_2 + OH$ (Wang et al., 2019. doi.org/10.5194/acp-19-9413-2019). In addition to $OH + NO_2$ and $RO_2 + NO_2$, the loss of NO_x should also include $RO_2 + NO$ and $OH + HONO$. When calculating OPE. Please give specific quantification even though these reactions play a minor role in the loss of NO_x .

Figure 4 shows significant underestimation for NO_2 in daytime, but overestimation for NO_2 at nighttime. The overestimation of NO_2 at night maybe related to underestimated nighttime chemistry such as the removal of NO_3 and N_2O_5 through heterogenous uptake (Li et al., 2018; Li et al., 2019). A short discuss should be performed. Additionally, how do these underestimation and overestimation for NO_2 influence your diagnosis of ozone sensitivity? For example, the underestimation of NO_2 in Chongqing will lead to more NO_x -limited, which likely misleads the actual situation.

Figure 8. shows ozone increased from 70 ppb to over 80 ppb during 2013-2019. However, observed ozone concentrations in Beijing didn't increased significantly during the period or decreased after 2015 in spite that ozone increased over North China Plain (Lu et al., 2018. DOI: 10.1021/acs.estlett.8b00366; Tang et al., 2020. doi.org/10.1016/j.atmosres.2020.105333). This needs further explanations.

Line 270: How do you obtain VOC and NO_x emissions in 2018 and 2019 given that Cheng et al (2019) just estimated emissions during 2013-2017. Please give specific description.

Line 145: There are only 450 measurement stations in 2013, growing to 1,500 stations in 2017 and 1670 stations in 2019.

Line 300: "summer-mean ozone" should be "daily mean ozone".

References:

Li, J., Chen, X., Wang, Z., Du, H., Yang, W., Sun, Y., Hu, B., Li, J., Wang, W., and Wang, T.: Radiative and heterogeneous chemical effects of aerosols on ozone and inorganic aerosols over East Asia, *Science of the Total Environment*, 622, 1327-1342, 2018.

Li, K., Jacob, D. J., Liao, H., Zhu, J., Shah, V., Shen, L., Bates, K. H., Zhang, Q., and Zhai, S.: A two-pollutant strategy for improving ozone and particulate air quality in China, *Nature Geoscience*, 12, 906-910, 10.1038/s41561-019-0464-x, 2019.