Atmospheric Chemistry and Physics Discussions

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 NOx 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 NOx,.

Figure 4 shows significant underestimation for NO_2 in daytime, but overestimation for NO2 at nighttime. The overestimation of NO_2 at night maybe related to underestimated nighttime chemistry such as the removal of NO3 and N2O5 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 NOx-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 NOx 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.