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Interactive comment on "Causes of a continuous summertime O_3 pollution event in Ji'nan, a central city in the North China Plain" *by* Xiaopu Lyu et al.

Anonymous Referee #2

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General Comments This paper presented a comprehensive diagnostic study of the Ozone-NOx-VOCs sensitivity in urban Ji'nan. The analysis is trying to synthesize the analysis tools from both observational constrained box model and regional model. This study is on the good way for the exploration of the ozone chemistry in urban China. Nevertheless, there are still trivial problems on the issues like site representation, measurement quality of key parameters like NO, ways to compare box model and regional model, the use and interpretation of PMF on VOCs source apportionment, etc which I provided detailed comments as follows. I suggest publication after addressing the following comments.

Specific Comments 1. Introduction: the review of the current O3 studies in the part of the introduction was not as comprehensive as it normally required. Recently, there

were several papers about the Ozone-NOx-VOCs sensitivity issues in Chinese megacities been published. It may be useful to include as a comparison.

2. Methodology: as shown by previous studies (e.g. Lu et al., JGR, 2010, 115, D07303; Cardelino and Chameides, AE, 2000, 34, 2325), the measurement quality of NO is of crucial importance for the diagnosis of the Ozone-NOx-VOCs sensitivity, sometimes this may lead to totally different results. The important point is that the detection limit of NO shall be on the level of 100 ppt so that sub-ppb NO can be accurately captured. The use of Mo-converter for the NO2 measurement is another weakness of the current paper. The interference is really variable case by case.

3. Methodology: as described the sampling site is very close ($\sim$50 m) to a main road which would be a problem for a regional (city scale) perspective.

4. Section 3.3, Figure 7: it is shown the ozone in Ji'an were actually come from the vertical and horizontal transport processes while removed through chemical reactions for most of time. Even during the O3 pollution episodes, the chemical production of O3 were much smaller than that from vertical transport. The diagnosed results again showed that this site is not ideal for the study of the Ozone-NOx-VOCs sensitivity and significantly reduced the value of current study.

5. Figure 8 and Figure 9, et al.: there is a general problem related to the PMF analysis of the observed VOCs samples. As the observed VOCs concentration were quite different from the emitted values, the PMF analysis is not applicable for the observed VOCs concentrations. To consider the VOCs consumption after emission through an estimation of the photochemical age is also not very helpful. The photochemical ages from different sources would be quite different for this site and also for different compounds. I suggest to remove this part and the following related discussions.

6. Figure 9: the ozone production rates from the box model and that from the regional model are not directly comparable. The box model results assumed a well-mixed condition of the PBL. And it is better compared with the PBL averaged value of the ozone

production rates from the regional model.

7. Figure 10: the solid lines #1 - #6 from different retrieved sources were not so meaningful as discussed above.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-970, 2018.