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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone weekend effects in the Beijing–Tianjin–Hebei metropolitan area, China" *by* Y. H. Wang et al.

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Response to reviewer 2# comments: We are very grateful to the reviewer for the constructive suggestions and for the proposed corrections to improve our paper. Here, all the issues raised had been addressed. According, the manuscript had been modified. General comments: The metropolitan area of Beijing-Tianjin-Hebei (BTH) is one of the heaviest polluted areas in China. This study analyzed weekly variations of ozone using two-year in-situ surface and vertical measurements in BTH, and identified the possible causes. Therefore this paper may contribute to a better understanding of photochemical pollution and providing scientific basis for ozone control strategies. However, it has several weaknesses that need to be addressed: Detailed comments: 1. The main goal

of this study seems to assess characteristics of photochemical pollution, but the analysis presented does not quite get there. For instance, I suggest additional analysis of using daytime ozone concentration instead of daily average. Response: Thanks very much for your suggestion. According to your suggestion, we recalculated OWE using daytime ozone concentrations (08:00-18:00, Beijing time). The new result showed that there is still OWE over BTH area. However, the maximum ozone concentration occurred at Sunday, while the minimum ozone concentration occurred at Wednesday or Friday. This indicates that the difference of ozone concentration during weekend and weekday maybe from photochemical production. We also modified this part in revised manuscript.

Figure Weekly variations of surface ozone anomalies at these sites 2. Table 2 is not clear, âŰşw and percentage should be defined. For example, in LF site, should the sign of âŰşw for O3 and NO be negative or positive? Response: Thanks very much for your comments. We chose to define the weekend effect as the difference (âŰşW) in the average ozone concentration of Wednesday, Thursday and Friday minus the average concentration of Saturday, Sunday and Monday. Also, The OWE percetage was calculated using the following equation: Ozone weekend effect (OWE) = ([Weekend] – [weekday])/ [weekday]. We have defined the two in our manuscript. 3. Fig.1 does not show consistently higher surface ozone concentrations on weekends than weekdays, which the authors mentioned in the paper. Response: Thanks very much for your comments. In our study, we focus on the variation of surface ozone on weekend and weekday. We defined weekend as Saturday, Sunday and Monday, defined weekdays as Wednesday, Thursday and Friday. As figure 1 and table 2 (supplement information) shows higher surface ozone concentration on weekend is significant. 4. The ozone concentration at the high platform had minimal variability, but was more variable at the low platform? Please elaborate on this. Response: Thanks for your comments. The ozone showed higher concentrations and minimal variability at the high platform, while lower concentrations and maximum variability at the low platform, as showed in Figure 3. We think there are two reasons (1) According to numerical simulation by Tang

ACPD
13, C6931–C6935, 2013

(2010) and vertical measurements by Chen et al. (2013), transportation from upper atmosphere (nearly 1km) is an important source of surface ozone. Therefore, the ozone shows high level in the high platform. (2) NO is mainly from consumption of fossil fuels and the main source is from surface as figure 7shows. Therefore, the titration (NO+O3→NO2+O2) maybe more effective in the lower platform, so ozone concentration at the lower platform shows more variability. 5. In Fig.4, the ozone concentration at the site BD peaks one or two hours earlier on Monday than other days, and the same thing happens for the site SQL. More discussions about the cause are desired. Response: Thanks very much for your comments. The ozone concentration at the site BD and the SQL peak earlier than other days. This may be due to lower NOx emission at Sunday night and early Monday morning, which leads to high VOCs/NOx ratios and more ozone production efficiently on Monday. We also added more discussions about the cause in our revised manuscript. 6. Suggest combine Table 3-table 5 into one table. Response: Thinks for your suggestion. We combined Table 3 and Table 5 into one Table as (supplement information). 7. Suggest reduce the number of figures (or sub figures). For instance, in figure 9, use double y-axis to facilitate the comparison of results and also to reduce number of sub-figures. Response: Thinks very much for your suggestion. Reducing the number of figures or sub figures is necessary in our paper. According to your suggestion, we combined subfigures of figure1 into a figure as in the manuscript. However, the atmospheric pollutants levels differ from sites to sites, for example, The PM10 concentration is 94μgâĂćm-3-108μgâĂćm-3 at YF site, while PM10 concentration is 173μgâĂćm-3-195μgâĂćm-3 at BD site. So the comparison of results using double y-axis maybe hard and the weekly variations maybe also hard to identified. 8. Is there any evidence that CO can be appropriately used as a proxy for VOCs in the BTH area? Further, is it suitable to get VOCs/NOx ratio from CO variation? Because of this uncertainty, I wonder if the results related to this approximation can be highlighted in abstract and conclusion. Response: Thanks for your comments. Direct VOC measurements were not used in our analysis. These types of measurements are relatively sparse for the BTH area and have a low temporal resolution (i.e., one sample

ACPD
13, C6931–C6935, 2013

a week). Here, we use CO as a proxy for VOCs because of their similar origins (Baker et al., 2008), similar to the method that was used by Stephens et al. (2008) for studying the OWE in Mexico City. VOCs are usually several times more reactive than CO; therefore, it is debatable whether variations in CO can be used as a proxy for variations in VOC reactivity. We highlighted this uncertainty in abstract and conclusion.

Reference Baker, A. K., Beyersdorf, A. J., Doezema, L. A., Katzenstein, A., Meinardi, S., Simpson, I. J., Blake, D. R., and Rowland, F. S.: Measurements of nonmethane hydrocarbons in 28 United States cities, Atmos. Environ., 42, 170-182, 2008. Chen, P., Quan, J., Zhang, Q.,Tie, X., Gao, Y., Huang, M.: Measurements of vertical and horizontal distributions of ozone over Beijing from 2007-2010, Atmos. Environ., doi:10.1016/j. atmosenv.2013.03.026,2013 Stephens, S., Madronich, S., Wu, F., Olson, J. B., Ramos, A., Retama, A., and Munoz, R.: Weekly pattern of Mexico City's surface concentration of CO, NOx, PM10 and O3 during 1986-2007, Atmos. Chem. Phys., 8, 5313-5325, 2008. Tang, G.: Modeling of ozone spatial-temporal distribution in the vicinity of Beijing during Olympics, Ph. D thesis, Chinese Academy of Sciences, 2010.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/13/C6931/2013/acpd-13-C6931-2013-supplement.zip

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ACPD
13, C6931–C6935, 2013

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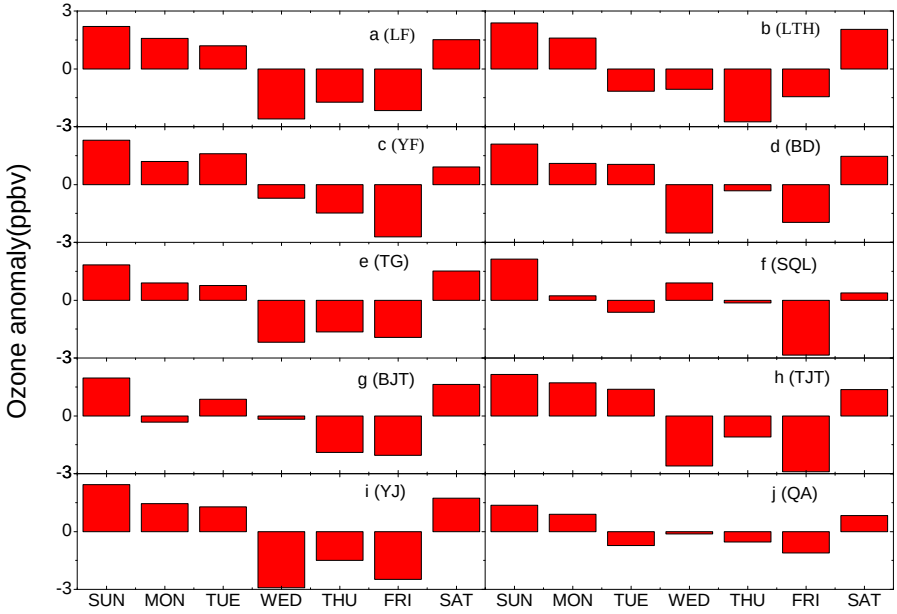

Fig. 1. Figure Weekly variations of surface ozone anomalies at these sites

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