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Interactive comment on "Characteristics of Ground Ozone Concentration over Beijing from 2004 to 2015: Trends, Transport, and Effects of Reductions" *by* Nianliang Nianliang et al.

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The logical structure of this study is to explain the change trend of ozone firstly, followed by the analysis of the effects of the reduction measures on the ozone concentration which is supposed to one of the classical logic structures. The modified text has been marked in red font in the revised article.

1. In Beijing, the nonattainment days of ozone is mainly concentrated in the months of May to September and the comparisons of trend analysis between nonattainment days and reaching standard days were very meaningful in some mega cities especially Beijing. (http://www.bjepb.gov.cn/bjepb/323474/324034/324735/index.html). Restricted by P(Ox=O3+NO2) calculation and observation,we fail to present comprehen-

sive explanations to compare the characteristics of O3 production between local Beijing and DL site. But according to the analysis (Zhang et al.,2014), VOCs and NOx both decreased between 2006 and 2011 and the decrease in VOCs reactivity ($-5\%yr-1$) was slightly larger than the decrease in NOx ($-4\%yr-1$), leading to a slight decrease in P(Ox). The sunshine hours and visibility are also the important factors influencing O3 production. Hence, variations of P(Ox) need to be further investigated for a better understanding of ozone trends. 2. The Mann–Kendall trend detection test(Kendall, 1975) has been commonly applied to assess the significance of monotonic trends in ozone pollution data time series and we found the year 2013 was an intercept break point. In 2008, Beijing held the Olympic Games and the ozone in Beijing decreased significantly.Thegood air quality promote the awareness of environmental protection to take various common emission reduction mearures in the next few years. In 2013,the state implemented a new environmental air quality standards, marking the work of environmental protection into a new stage. We divided the available the year of 2004-2015 of zone data into three parts: 2004-2007, 2008-2012, and 2013-2015.

3. The previous studies had proved that HCHO and NO2 from the OMI serve as appropriate indicators for in situ observations of total reactive nitrogen and VOCs (Liu et al.,2016;Duncan et al.,2010). OMI tropospheric HCHO/NO2 Ratio (Ratio)<1 represents PO3 reduces with diminishing in VOCs (VOC-limited conditions), and Ratio>2 represents NOx-limited conditions. When the ratio is between 1 and 2 indicates a transition regime (mixed VOCs-NOx-limited regime) where the instantaneous PO3 could be affected by both VOCs and NOx emissions. Three episodes are separately defined in this study: 1st episodes is defined as the period of Parade (from August 20th to September 3rd 2015); 2nd and 3rd episodes are defined as the "pre-Parade" from August 1st to 19th and the "post-Parade" from September 4th to 30th. Similarly, the three episodes of APEC are respectively defined as pre-APEC period (from October 15th to 30th), APEC period (from November 1st to 12th) and post-APEC period (from November 13th to 30th). With a series of strict emission control measures during Parade, the ratio retrieved from OMI had changed from 1.70 to 3.72. It means the PO3 conditions

had also changed from mixed VOCs-NOx-limited to a predominantly NOx-limited condition due to the sharp drop of NO2 during Parade periods. After the strict emission control measures, the NO2 returned to relatively high values as pre-Parade and the ratio was also diminished (Ratio = 0.90, < 1), which indicated the PO3 was turned into a VOCs-limited condition during post-Parade. To ensure the air quality during the military parade in 2015, NOx and VOCs emission control in Beijing and its surrounding areas lasted for almost a month, and VOCs emission control measures was much stricter than NOx; thereby, ensuring the reduction of VOCs emission (45%) is higher than that of NOx (30%)(MEP, 2015). Higher ratios by emission control measures during Parade were not only work effectively for NO2 pollution control patterns but also effective for O3 controlling. 4. Compared with pre-APEC, the ratio was changed from around 1.21 (VOCs-limited and mixed VOCs-NOx-limited) to around 1.60 (mixed VOCs-NOx-limited and NOx-limited) in Beijing during APEC. NO2 and HCHO had a certain reduction during APEC which should lead the O3 diminishing. Conversely, the ozone concentration was increasing compared to pre-APEC. Regional VOCs emission (about 30%) was equal to that of NOx (about 30%) (MEP, 2015) during APEC periods and it was easily affected by the relatively unfavorable diffusion conditions in Autumn in Beijing which lead to the concentrations of NOx and CO two times larger than those of the 2015 Grand Military Parade. So different emission reduction ratios between NOx and VOCs and different weather conditions led to different VOCs (ppbv)/NOx (ppbv)ratios during the 2015 Grand Military Parade periods and APEC meeting. These results indicated that emission controls in this case maybe not strict enough or worked well to lessen the levels of ozone. This phenomenon of concentrations of most of the air pollutants decreased, whereas concentrations of ozone increased during APEC meeting period which was consistent with the study of Wang (Wang et al,2015b; Liu et al.,2016).

Minor comments (The authors have revised the following errors.) 5. Line 185, revise " increased " to " increase ". 6. Line 200, " Table 2 " should be " Table 1 ". 7. Line 263, " stationwas " should be revised as " station was ". 8. Line 299, " 8.05.0% " should be changed to " 8.05% ". 9. Line 337, " a " should be deleted. 10. Pay more

attention to the format of the references. This manuscript has been further edited for language by Essaystar (http://essaystar.com/Service.html), acompany dedicated to helping international researchers publish their findings in the best English language journals possible.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/acp-2016-508/acp-2016-508-AC1-supplement.pdf

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