Anonymous Referee #3

The authors evaluated the effectiveness of pollution control measures implemented during the G20 2016 Summit in Hangzhou, China. Field observation on NO_x, SO_2, CO, VOCs, PM_{10}, $PM_{2.5}$, PAN and O_3 were carried out. OBM and PMF model tools were used to analyze the data. It's valuable to publish in this journal. However, the English writing should be improved before publication.

Response: Thanks a lot for your positive comments and kind work on our manuscript. According to your suggestion, we made the corrections point by point in the revised manuscript.

Specific comments:

Line 269-270: CO showed a gradual increase (~20.7%), which is not consistent with SO_2, NO_2, and PM. It seems that CO sources are very different with NO_x and SO_2 sources in Hangzhou or pollution controls are not effective on CO reduction. Could the authors give more explanations? I also notice that 48i analyzer is used for the measurement. As we know, zero drift is inevitable for this kind of principle. So, pls provide the quality control measures during the observation.

Response: As we know, especially in urban region, atmospheric CO is normally derived from human activities (coal combustion, farming, residual usage, etc.) while vehicle exhaust and coal combustion are typically representative of the sources of NO_x and SO_2, respectively. As illustrated below in the Section 3.4 in the manuscript, industrial process with coal combustion and vehicle exhaust were strictly limited throughout the whole G20 period. Thereby, NO_x and SO_2 both exhibited significant decreases from BG20 to DG20. In addition, straw combustion was excluded according to the decrease in the number of fire spots in the same time period from BG20 to AG20. On the contrary, to ensure the clean energy used in 2016 G20, local government accelerated the supply of liquid natural gas and liquid petroleum gas (ZPSY, 2016, 2017). The consequent CO was more produced from the incomplete combustion of these fuels during G20 relative to BG20. As you speculated, the emission control measures might be poorly effective on CO reduction, specifically on fuel combustion. Also in our study, ethylene, as a representative tracer of fuel combustion, showed continuous increase from BG20 to DG20, further confirming the ineffectiveness of control measures in this source. Therefore, CO showed a gradual increase which is not consistent with the variation of NO_x and SO_2. This phenomenon was also found in another research conducted during G20 in 2016 (Zhao et al., 2017).

Yes, all trace gas analyzers were weekly span and daily zero checked during our measurement. Thus, according to your suggestion we added "It is worth noting that CO showed gradual increases (ca. 20.7%) from BG20 to DG20, which was mainly attributed to the weak control in fuel combustion. Specifically, residential usage and liquid natural gas and petroleum gas around YRD regions during this period might account for such unique pattern of CO. The other two types of fuel combustion including straw combustion and coal combustion were both excluded as discussed in Section 3.4." and "All trace gas analyzers were weekly span and daily zero checked." in the revised manuscript, respectively.

Reference:

Zhao, J. P., Luo, L., Zheng, Y. J., Liu, H. H.: Analysis on air quality characteristics and meteorological conditions in Hangzhou during the G20 summit, Acta Scientiae Circumstantiae, 37(10), 3885-3893, 2017. (In Chinese)

In Fig. 1, TVOCs is needed to add. It seems that PM_{10} and $PM_{2.5}$ results play no roles on the data analysis in the whole context.

Response: Yes, as you suggested we added TVOCs in this figure in the revised manuscript.

In this manuscript, we also discussed the variation of PM from BG20 to AG20 and evaluated the effectiveness of powerful control measures on reducing atmospheric pollutants such as PM, PAN, O_3, and the other chemicals (NO_x, SO_2, and CO). As classified in the Introduction, the effectiveness of a series of emission control measures on reducing atmospheric primary pollutants, in particular to the particulate matter, has been comprehensively evaluated during the events such as Summer Olympic Games (August 2008), the 21^{th} Asia-Pacific Economic Cooperation (APEC) conference, and China Victory Day Parade (Victory Parade 2015), but less on photochemical pollution. So we focused on their variation and underlying mechanism of photochemical pollution response to the effectiveness of emission control measures. However, it does not mean that PM is not necessary to be investigated in this study. We also paid much attention to PM in terms of their day-to-day variations and estimating the contribution of meteorological conditions by using the simulated $PM_{2.5}$ by WRF-Chem model.

Fig. S1 is better in the manuscript than in the supplement information.

Response: Accept

Fig.5, Similar fuel combustion contributions are found in DG20-II and AG20, which is very different with that in BG20. Why?

Response: Similar with the explanation response to the first comment above, we speculated that the increased contribution of fuel combustion from BG20 to DG20 II and to AG20 was attributed to the increased supply of liquid natural gas and liquid petroleum gas with the increasingly strict emission control measures on the other fossil fuels during the acceleration of emission control strategy. Similar phenomenon was also found by Li et al. (2015) in APEC China 2014, with the increased contribution of fuel combustion from 7.05 ppbv before APEC to 12.7 ppbv during APEC and to 31.7 ppbv after APEC to VOCs mixing ratios, although the other sources were effectively reduced.

Reference:

Li, J., Xie, S. D., Zeng, L. M., Li, L. Y., Li, Y. Q., and Wu, R. R.: Characterization of ambient volatile organic compounds and their sources in Beijing, before, during, and after Asia-Pacific Economic Cooperation China 2014, Atmos. Chem. Phys., 15, 7945-7959, 2015.

Much more contents are done in section 3.4 (VOCs source identification and OFP quantification). How do those results relate with the inconsistent variations in the primary and secondary pollutants?

Response: In this study, our main objects are not only to discuss the variation of atmospheric primary and secondary pollutants from BG20 to AG20, but especially to elucidate the underlying mechanism for photochemical pollution. We first found the daily maximum average-8 h (DMA8) O_3 exhibited a slight increase from BG20 to DG20 I and then decrease from DG20 I to DG20 II and to AG20, which was unlike with the other pollutants. However, we found the peak values of mean daily O_3 in DG20 II exhibited significant decrease compared to BG20 and DG20 I. So, another question is proposed, which factors dominated such variation? As we know, VOCs are the crucial precursors of PAN and O_3, and thus we should first identify which VOCs were the predominant precursors for PAN and O_3 and explore their variation from BG20 to AG20. As depicted in the Introduction, the additional emission control measure was vehicles control. It possibly played an important role in reducing the peak of atmospheric O_3 pollution in Hangzhou. Further, we should comprehensively appoint the corresponding sources of various VOCs and compare their variations and their respective ozone formation potentials (OFPs) before, during, and after G20. In summary, VOCs source identification and OFP quantification were necessary for exploring the variation of photochemical pollution from BG20 to AG20 in details.