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Interactive comment on “Megacity impacts on regional ozone formation: observations and WRF-Chem modeling for the MIRAGE-Shanghai field campaign” by X. Tie et al.

Anonymous Referee #2

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The manuscript presented a study of ozone chemistry in Shanghai region by field measurement and WRF-Chem model simulation. This work gave a quite comprehensive overview from a number of aspects of ozone formation. The highlight of the MS was the model capacity in computing simultaneously the variation of VOCs, nitrogen compounds and ozone. I agree with the acceptance of the MS for publication on ACP with consideration of several issues listed below: (1)One big problem was the correlations of pollutants with CO. It presented the results but did not address much about the reason for the correlations. As the authors mentioned, CO was considered as a tracer from primary emissions, and in the MS the authors correlated it to PM2.5, NOx and VOCs. It was a surprise to see the correlation between CO and PM2.5. As we knew that a

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large portion of PM2.5 came from secondary production. The CO-NOx showed good correlation at lower levels while poor at higher NOx levels, I had difficulty to understand this because the local sources causing higher NOx could also lead to high CO. The correlation between CO and VOC were, very unfortunately, only done for VOCs groups (alkanes, alkenes, and aromatics) instead of species, it was very hard to know better for sources. I would suggest to perform such analysis for typical VOC species which were used for tracers for specific sources. (2)The authors stated in the MS that their model could well simulated O₃, VOCs, and NOx at the same time. However, section 3.2 for model evaluation was generally descriptive, As the species discussed in this section covered fresh emitted ones (NO, and HCs), inter-mediate compounds (HCHO, and other OVOCs), products O₃, and PM2.5 which came from both primary emissions and secondary processes. It would be very interesting if the authors could add some discussion about the key processes or mechanisms causing the discrepancies. And as the NOx/VOCs ratios from emissions to ambient air were the key for the work, the authors could also give the comparison of simulated ratio with measured ones. (3)Again, the manuscript needs to address the VOCs to species-specified discussion. As the ozone formation was modeled to be largely VOC control regime, and HCHO/NO_y was used for the diagnostic analysis for ozone formation. It would be interesting to know what VOC species were measured, how they were computed.

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