

## ***Interactive comment on “Parameterized reactivity of hydroxy radical, ozone, nitrate radical and atmospheric oxidation capacity during summer at a suburban site between Beijing and Tianjin” by Yuan Yang et al.***

### **Anonymous Referee #3**

Received and published: 6 January 2020

This paper shows OH, NO<sub>3</sub>, and O<sub>3</sub> reactivity from VOC and traces gas measurements conducted in Xianghe in 2018 from 6 July to 6 August. In addition, the authors estimate the trace gases oxidation rate using parametrized OH, NO<sub>3</sub>, and observed O<sub>3</sub> concentrations, which is defined as oxidation atmospheric oxidation capacity. This data set helps to add to the increasing knowledge of the oxidant reactivity. The atmospheric oxidation capacity highly depends on the parametrization. Though this method is not new, a detail uncertainty analysis related to the calculation is missing. This reviewer suggests using a box model to calculate the OH and NO<sub>3</sub> concentrations or prove the

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justification of the parameterization. Besides, it's difficult to follow the writing, especially the authors tried to compare their results with other campaigns. The manuscript needs a significant reduction to be concise and informative before reconsidering.

Specific comments: 1. Line 266-270, It's not clear which values are used from which literature. If there is difference between different literatures, e.g. OH+NO<sub>2</sub>, which one is used? 2. Line 270. Why not use the newest version of Master Chemical Mechanism v3.3.1 3. OH is parameterized to j<sub>o1d</sub>, j<sub>no2</sub>, and NO<sub>2</sub> using the results from a rural site in Germany, which could be different from the present study. A box/regional model to simulate OH concentration is helpful to validate the parameterization at Xi-an-ghe. On the other hand, previous field OH observations in China demonstrate that a strong correlation exists between OH and j<sub>O1D</sub> with a relatively constant slope  $4.5 \pm 0.5 \times 10^{11} \text{ cm}^{-3} \text{ s}^{-1}$  (Lu et al. 2012 10.5194/acp-13-1057-2013; Tan et al. (2017) 10.5194/acp-17-663-2017; Tan et al. (2018) 10.5194/acp-18-12391-2018). Maybe it's also a good idea to show the parametrized OH concentrations in supplement. 4. The parameterization of NO<sub>3</sub> is improved by considering the conversion to N<sub>2</sub>O<sub>5</sub> compared to the first version. A proper discussion related to this uncertainty is missing. In equation (4), AOD is defined as the sum of all trace gases oxidation rate by OH, NO<sub>3</sub>, and O<sub>3</sub>. Is NO included? Please declare it clearly. 5. Figure 10. It's good to have one more role showing the integral oxidation over a day. 6. Figure 11. Why alkenes show a significant variation in RNO<sub>3</sub> and RO<sub>3</sub> but not ROH? 7. Figure 12. Maybe it's better to use the same scale for all panels.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-788>, 2019.

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