

Interactive comment on “An analysis of the impacts of VOCs and NO_x on the ozone formation in Guangzhou” by Y. Zou et al.

Anonymous Referee #2

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ACPD-14-18849-2014 Title: An analysis of the impacts of VOCs and NO_x on the ozone formation in Guangzhou Authors: Y. Zou, X. J. Deng, B. G. Wang, F. Li, H. B. Tan, T. Deng, B. R. Mai, and X. T. Liu

General: fine particles (PM_{2.5}) and O₃ are two air quality headaches in China. As PM_{2.5} has become a hot topic in China partly because that it can be sensed by the public through visibility degradation, ozone is haunting China and would be a trouble even long-lasting than PM_{2.5} in China. As far as I know, in the Pearl River Delta region, which is the study area of this manuscript, levels of ozone monitored near-ground are exceeding national air quality guideline level as frequently as that of PM_{2.5}, yet for ozone the public, as well as scientists, concern much less as they do for PM_{2.5}. The authors of this manuscript obtained one-year online data of ozone, NO_x and VOCs
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at a station in the Pearl River Delta region and attempted to see their diurnal/seasonal variations and to explore the impacts of precursors NO_x and VOCs on ozone. Although the authors seemed not so skillful in in-depth interpretation of some complex aspects of ozone formation, the dataset about the ozone-NO_x-VOCs triad, particularly long-term online data of VOCs that are very scarce in the study area, is quite valuable to give some implications. The manuscript needs improvement before considered publication at least in the following aspects:

Major: 1. In the “Results and Discussion” part, sections 3.1 and 3.3 are much more objective and reasonable when compared to sections 3.2 and 3.4. Section 3.2 is relatively weak in linking NO₂/NO with ozone formation. In fact there is no steady-state cycle as claimed by the authors: ozone is changing with drastic diurnal/seasonal vibrations. As mentioned by the authors, in the real atmosphere ozone formation is too complicated to be merely dependent on the ratio of NO₂/NO. The causal relationship between them is far more complicated as termed as a steady circle described by equations 2-4. I would rather this section removed from the manuscript. For section 3.4, we must bear in mind that control strategies are targeted on emission sources. The emissions of NO_x and VOCs in a region are relatively stable day after day, yet mixing ratios of NO_x and VOCs, as well as their ratios, may change greatly due to transport and chemical processes. Therefore cautions should be taken when trying to say something about emission control strategies based only on observed data without modeling approaches starting with emission inventories. Additionally, using VOC/NO_x ratio of 8:1 to is a simplified approach long ago and thus applying it to the PRD is under question. Nonetheless, with the ozone-NO_x-VOCs triad dataset, the authors already calculated hourly ozone increase in section 3.1; they can investigate the sensitivity of NO_x and VOCs on local ozone production. Also it is quite good to single out high-ozone episodes.

2. Section 3.3: it is scientifically sound to calculate propylene-equivalent concentration or MIR to say something about OFP of VOCs; at the present state of knowledge,

few would agree that carbon number concentrations in ppbC or mixing ratios in ppbv can served as a measure of OFPs. It is a kind of common sense. So the authors should just show their results calculated propylene-equivalent concentrations or MIRs, and avoid unnecessary discussion (a long passage) on whether ppbC or ppbv is reasonable.

3. Conclusions: this part should be consistent with and strongly supported by the results and discussions in the section 3. You can figure out major findings specific to this study and avoid saying general rules.

Minors: 1. English: Although I am not native English speaker, I can find errors in grammar but I would go to details one by one. I do suggest that English writing of this manuscript should be improved, better with the help of a native English speaker.

2. QA/QC: Better add some words about QA/QC.

3. Chemical reaction equations: some equations (like 2-4, 7-9), if they are common in text books and not further referred to in the discussion, can be omitted.

4. The title: the manuscript has many interesting aspects, but impacts of VOCs and NO_x on the ozone formation are probably not the strongest. If possible, consider a title best cover the contents after revision.

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