Response to referee #2

VOCs are key precursors of SOA and O3, and their emissions are of great uncertainty compared to some other species like SO2 or NOX, attributed to complicated sources and relative lack of field measurements. This paper presents a comprehensive analysis on China's national VOC emissions from 1990 to 2017, by source category and chemical component. It provides a very clear picture of the inter-annual trend, speciation variation, and the driving force of VOC emissions for the country. I only have some small concerns on the explanation of specific data and results and detailed comments follow. I suggest its publication subjected to minor revisions.

Response: We thank the positive comments given by referee #2, which are very helpful to improve the manuscript. Our response to each specific comment is presented below.

Detailed Comments and Responses:

1. Table S1 in the supplement summarized the emission factors and activity levels by source category. What are the meanings of the numbers in Column E (source profile)? In Column J, it seems that most of emission factors still came from foreign studies? Does that mean recent progress on local emission factors was very limited? I suggest the authors make some discussions here.

Response: Column E of Table S1 represent the source profiles used for each source category during speciation. The numbers are the "P_NUMBER" of profiles in the SPECIATE v4.5 database. We add a note in Table S1 to make it clearer.

As illustrated in the main text, we firstly evaluated the emission factors based on local measurements or determined by taking China's regulations into account, e.g., the values of Wei et al. (2009) for solvent use, Tsai et al. (2003) for residential coal combustion, and the technology-based emission factors derived from Zheng et al. (2014) for on-road vehicles. For sources that lack reliable local emission factors, we mainly refer to European studies (EEA, 2016) or AP-42 (EPA, 1995), combined with source information from local investigations where available (Zhang et al., 2000; Tsai et al., 2003; He, 2006; Li et al., 2011; Wang et al., 2013).

In recent years, more and more local emission factors are measured, covering biofuel combustion in stoves (Wang et al., 2009; Tsai et al., 2003; Zhang et al., 2000; Li et al., 2011), coal combustion in boiler and stoves (Tsai et al., 2003; Zhang et al., 2000), paint use (Wei et al., 2009), coke production (He, 2006), which have been used in compiling our inventory. For most industrial processes and solvent use sources, local measurements of emission factors are still limited and more investigations need to be conducted in the future. We add more discussions in the revised manuscript.

2. It is very interesting to know the control strategy and benefits of VOC emissions, as limited information was reported in previous inventories. I expected the VOC control started later than SO2 or NOX control. Relevant information is given in the last part of Section 2.1. Here I suggest the authors highlight the information in, for example, Table S1, thus the audience could

understand the control strategy more clearly. Current table include only unabated emission factors.

Response: Thanks for the comments. We highlight the control measures implemented for NMVOC emission control in Table S1.

3. It seems that open biomass burning is not included in the emission estimation. Could it be a potential bias of the estimate? Some review and discussion should be given.

Response: We add more discussion in the discussion section as follows:

"It should be noted that open biomass burning is excluded in the inventory, which may introduce bias for the total emission analyses covering all sources. Based on the most recent work (Yin et al., 2019), emissions of open biomass burning in China are 1.12~2.16 Tg NMHC, corresponding to 2.90~5.60 Tg NMVOC by applying an averaged OVOC fraction of 61.4% (8753 in SPECIATE 4.5, Andreae and Merlet, 2001) during 2003-2017. Compared to 17.6~28.5 Tg NMVOC from anthropogenic sources during the same period, we capture > 83% of the total emissions when including open biomass burning in the analyses, and the total NMVOC emission will be 32.8 Tg in 2017, with large emission decrease (-7%) for 2015-2016."

4. More description in Figure 5 should be provided in the caption. What are the meanings of the species indicated for each year? The species contributing most to the variation of emissions/OFP?

Response: The bars of species represent the contribution to the total emission / OFP changes for the specific time period. We revise the caption to make it clearer.

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