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Interactive comment on "Origin and Transformation of Ambient VOCs during a Dust-to-Haze Episode in Northwest China" *by* Yonggang Xue et al.

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comment: The manuscript entitled "Origin and Transformation of Ambient VOCs during a Dust- to-Haze Episode in Northwest China" discussed the characteristics of ambient VOCs in a northwestern city in China, and the transformation of VOCs during a dust-to-haze episode was explored in this study. Generally, the paper is well organized and pre- sented, and shows the possibility of VOC transformation through heterogeneous re- actions during the episode. The paper can be considered for publication after the following minor revisions are made. Some specific comments are listed below.

1. Line 73: Change "sampling" to "samples"

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Discussion paper

Response: this sentence was changed to “Severe dust-to-haze episode was observed in Xi’an and the surrounding areas from 8 November to 12 November in 2016, and samples was continuously collected during this period to investigate the chemical compositions of both VOCs and fine PM.” Line 81 in new version.

2. Line 82: Change “with” to “by”

Response: this sentence was changed to “PM2.5 filter samples were sampled with mini-volume samplers (Model Mini-Vol, Air Metrics Co., Oregon, USA) by a flow rate of 5 L min-1”, line 93 in new version.

3. Line 139 The last sentence is not clear. The contribution of gasoline vehicular emissions on ambient VOCs should be pointed out.

Response: this sentence was reorganized, and this sentence was rewritten as (line 160-163 in new version) “ The ratios of T/B, trans-/cis-2-butene, propane/n-butane and n-pentane/iso-pentane indicated that gasoline emission was dominated sources of ambient VOCs, and the source apportionment by PMF model result, and the detail description of source apportionment will be carried out in the following section.”

4. Line 150: It should be “aerodynamic diameter”

Response: the description of diameter was corrected as“aerodynamic diameter”. Line 176 in new version.

5. Line 228: Is the difference of photochemical reactions rate with OH radical between trans-2-butene and cis-2-butene large enough to compare?

Response: Trans-2-butene has higher photochemical reactions rate with OH radical in the atmosphere (kOH 6.40×10-11 s-1) than cis-2-buteneïijĹkOH 5.64×10-11 s-1ïijĽ, and the photochemical reactions rate with with OH radical of trans-2-butene is about 14% higher than that of cis-2-butene, and this difference would show in the photochemical reactions of these two congeners.

6. Line 278-281: The first two sentences are not necessary in conclusion part, moreover, key conclusions should be presented by supporting data.

Response: This comment was accepted, and the first two sentences were delated in the new version. And the supporting data was replenished in the new version in part of conclusion. And the part of conclusion was reorganized as "Comprehensive field work was carried out to investigate the origin and transform of VOCs within the dust-fine particles pollution periods in winter with the city of Xi'an. And the assumption of promotions of dust on the heterogeneous reactions of VOCs was further verified. Local vehicle exhaust (40%) and heating activities (41%) were found to be the most important sources of the ambient VOCs in Xi'an within winter, while long range transport air mass has limited impacts. Within the period of dust transport, loading of ambient VOCs decreased sharply from the late half period (average of 38 ppbv in dust period to average of 19 ppbv in transitional period), and the lowest concentration was observed in the transitional period (8 ppbv), in accordance with aging of primary VOCs. In addition, loading and proportion of secondary VOCs in gaseous phase and secondary ions and organic carbon in particulate phase increased with the aging of primary VOCs. Source strength, physical dispersion, and regional transport were eliminated from the major factor for the variation of the ambient VOCs. On another aspect, sharp increase of active metals concentrations (Ti and Fe) and fast decrease of trans-/cis-2-butene ratio was observed from the late half of dust transport period (1.21 to 0.65). In consequence, we conclude that windblown dust might accelerate the gas-solid heterogeneous reactions of atmospheric VOCs, and further induced the formation of SOA precursors." As shown in line 332-346 in new version. And the revised contents are marked in blue color in new version of manuscript.

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