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Atmospheric Chemistry and Physics Discussions

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

Anonymous Referee #1

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This manuscript presents a case study on the origin and transformation of ambient volatile organic compounds (VOCs) during an episode of dust-to-haze in a city in northwestern China. It presents the variations of VOCs, oxygenated VOCs, PM2.5 and its chemical components (i.e., ions, carbonaceous fractions and elements) during this interesting transition of dust-to-haze. It also highlights the possible reactions of VOCs under the influence of source contribution, ambient conditions as well as the heterogeneous reactions promoted by particle elements. The manuscript is well prepared and fits the scope of the journal. It could be considered for publication after the following concerns are clarified.

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Discussion paper

(1) The authors suggested the formation of secondary organic aerosols by the reactions of VOCs during the haze period. It could be true due to the significant increases of organic carbon during the haze period. However, I would suggest more efforts should be made to clarify this point. Somehow I would also suggest that it might be necessary to be highlighted in the text as well as in the title.

(2) In the part of Section 3.2, I found it was quite difficult to read through this part. The influences of sources (seems not explicit), boundary layer, long-range transport and photochemical reactions were discussed but not in a clear manner, which made me very difficult to follow the conclusions.

(3) L224-226: The variations of the ratios of trans/cis-2-butene are discussed here. The finding/suggestion by the authors seems not really true if we have a close look at Fig. 4. For example, the increase in the rush hour seems not always the case during this observation. The increases could also be observed during the time periods of 19:00-22:00 and 11:00. In this case, it should be more careful to draw any conclusions e.g. to highlight the importance of photochemical reactions and promotion of dust particles.

(4) As mentioned above, the linkage of VOCs to PM2.5 and its chemical components in Section 3.4 should be discussed in a more clear and explicit manner. I think catalysis of particle metal could be very important during the formation of haze and it should be studied here. By the way, I found Cl- was elevated at night (see Fig. 6) and it might show the contribution of biomass burning in northern areas of China.

(5) L102-106: Quartz filter seems not an ideal filter media for XRF analysis due to the uneven surface. The authors should present more details of their XRF analysis.

(6) minor mistakes: L158: It should be “the potential sources. . .are characterized”. L241: “through”should be deleted.

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