

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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We are highly grateful to the reviewer, and your comment is highly helpful to further improvement of our manuscript and further study.

Comment 1. Why did the authors choose the period of dust-to-haze episode to observe? How did it relate with the reaction of aerosols? Please describe the relationship between the scientific issue and the research design.

Response: Dust is one of the most important sources of airborne metallic oxides in the natural environment, and the previous studies found explosive growth of ultrafine

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particles following dust episode, which implied positive effect of dust on the formation of fine particles. In addition, controlled experiments in chamber found surface transitional-metal-catalyzed chain reaction would highly impact formation of organic and inorganic aerosols on the surface of mineral dust (this was introduced in the part of introduction). Hence, dust was viewed to highly impact the transformation of organic and inorganic gas in the atmosphere. While few field work on the transformation of ambient VOCs in the dust event were found in the previous studies to support the assumption that dust would impact the transformation of VOCs in the ambient VOCs. The present study was designed to investigate the transformation of VOCs in dust event, and this work might helpful on further understanding of the impacts of dust on the transformation of VOCs and its further impact on the formation of fine particles.

Comment 2. In the Results and Discussions, the basic results, such as the levels of pollutants and the ratios of compounds, were not shown the manuscript. It is strange for readers that the sections starts with the sentences like “the concentrations in Xi’an are similar with Beijing” or “the T/B ratios in this study indicated that. . .”

Response: This comment is fully accepted. In our manuscript, Table S2 were given in the supporting information, and the level and composition of ambient VOCs was summarized in this table. We will further improve our manuscript in this part, and the detail description of VOCs level and composition will replenished in the next version of manuscript.

Comment 3. I don’t think it is reasonable to use HYSPLIT model in L157-186. It had discussed that the pollution come from local emission in the above sections.

Response: Thanks very much for this comment. In the present study, origin of the ambient VOCs was analyzed in two aspects. In the first aspect, emission source types of VOCs were estimated with PMF model. In another aspect, effect of transport or local emission on the ambient VOCs were evaluated based on the variation of VOCs ratios and air mass transport. In this part, back trajectory of air mass in different period of

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sampling were used. Hence, the author believe hYSPLIT model should be useful in this part. And we decide to firstly remove the description of back trajectory of air mass to supporting information, if this decision will not be accept, we will delete this part.

Comment 4. The abstract and Introduction highlighted the effect of metallic oxides on the photochemical reactions of VOCs. But in the manuscript, this situation wasn't discussed in details, and even no relationship figures of VOCs and metals were shown.

Response: The objective of this work is to supply a reference of evidence the effect of dust on the transformation ambient VOCs and their further impact on the formation of secondary aerosol. While we believe in this study, our field work could just supply a solid transformation of ambient VOCs in the dust episode, which should be just a lateral evidence of particulate metallic oxides' catalysis effect on the oxidation of VOCs, because too many factors impact the variation of level and composition of ambient VOCs. In addition, because the sampling time of VOCs and particles were not synchronous. The VOCs were sampled hourly, while the particles were only collected with two samples in 24 hours. As a result, we can not get a correlation analysis result of particulate metals verse VOCs. And in the following study, we will carry out fully chamber work on the transformation of VOCs on the dust surface that might supply direct evidence of dust catalysis effect on the transformation of VOCs.

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