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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Feedback effects of boundary-layer meteorological factors on explosive growth of $PM_{2.5}$ during winter heavy pollution episodes in Beijing from 2013 to 2016" *by* Junting Zhong et al.

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For Referee #2:

Thanks for your thoughtful review of the manuscript. We read the reviewer's comments carefully, and have responded and taken all of the reviewers' comments into consideration and revised the manuscript accordingly. All the changes have been highlighted in the revised manuscript. My detailed responses, including a point-by-point response to the review's comments, are as follows:

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“General Comments: Based on the observational dataset of 12 wintertime heavy haze events in Beijing and its surroundings over 2013-2016, this manuscript explored the feedback effects of boundary-layer factors on explosive growth of PM2.5 during the different stages, including transport, cumulative and convergent explosive growth, presenting some interesting results about meteorological feedback on PM explosive growth during heavy haze pollution, which could improve our understanding on air quality change and fall within the scope of ACP. ”

Response: Thank you for the positive comments on our manuscript.

Specific comments:

1. “Airflow from the south of Beijing can transport not only water vapor and pollutants, and also warm air mass to Beijing. Considering the maximum transport layer at ca. 500 m, the southerly wind transport could also contribute warm air to the development of temperature inversion. Please discuss this potential contribution to anomalous inversion and PM2.5 accumulation during TS and CS.”

Response: The warm airflow transported by southerly winds would definitely facilitate temperature increase in Beijing, might serve to weak inversion during TSs, and also creates the requisite thermal conditions to some degree for the formation of anomalous inversion. However, in the TS stage, southerly winds which transports warm airflow are more striking during the TSs than the CSs, and we did not observe the anomalous inversion. On the contrary, in the CS stage, the anomalous inversion occurred under calm air, which indicates the contribution of southerly warm airflow is not direct and dominant in the development of anomalous inversion. The anomalous inversion in the CSs is more likely caused by surface radiative cooling under weak winds.

2. “Lines 167- 168: the statement: “with the Tai-hang Mountains and the Yan Mountains limiting the invasion of northerly cold air and leading northeast movement of southerly winds” is unreasonable for the boundary-layer analysis in heavy haze events in Beijing. I suggest change it with “with the Tai-hang Mountains and the Yan Mountains strength-

ening the southwest wind belt and leading the convergence of pollutant transport in Beijing"

Response: Thanks for it. Revised (L176-179, P8)

3. "Lines 152-153: Please check English grammar."

Response: Checked. (L163-165, P8)

4. "Line 185: Please modify " The ground exceeds long-wave radiation"

Response: Thanks for this. We have changed 'exceeds' to 'emits'. (L195, P9)

5. "Lines 314-315: please delete one repeated "different stages"

Response: Deleted. (L327, P14)

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