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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Contributions of meteorology and emission to the 2015 winter severe haze pollution episodes in Northern China" *by* Ting Ting Liu et al.

Anonymous Referee #1

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General comments: This study analyzed the contribution of meteorological factors and emissions to 2015 winter haze episodes in Northern China through basic comparisons and model simulations. Although this study has an interesting hypothesis, it suffers from multiple major flaws in its logical flow, data analysis and result presentation and discussion. In its current form, this manuscript does not meet the quality standard of ACP, therefore should be rejected.

Major comments: 1. The introduction section lacks a clear logic. The literature review is superficial and failed to contextualize this study. Aside from listing many studies, the authors failed to emphasize the significance and innovation of this study. Simply comparing the air pollution levels in 2015 with 2014 is not sufficient to establish 2015

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as an unusual year. This weak justification undermines the scientific objectives of this study. The description of the inter-annual trend of PM2.5 on page 2, line 10-16 has nothing to do with the seasonal trend described in this paragraph. On page 3, line 3-13, the description of source apportionment techniques is mixed with the description of meteorological factors, making the entire paragraph confusing and difficult to follow.

2. The manuscript lacks a real methods section to explain overall strategy of the data analysis and justify the choices of data and analytical tools, leaving the reader with only confusion and suspicion. For example, the authors mentioned that the air pollutant monitoring data were from CNEMC and previous studies using the same data source reported that missing and implausible measurements were observed. Did the authors conduct any data cleaning to account for that? The manuscript provides no such information.

3. The results and discussion part of the paper is chaotic. A major section (Section 3) is dedicated to the comparisons of meteorological parameters in Nov. and Dec. between 2014 and 2015. Such comparisons are based on the hypothesis that 2014 is a standard normal year. However, as mentioned above, there is not sufficient evidence to support this hypothesis. Since the ground monitoring of PM2.5 in China started from 2013, the author should at least include data about 2013 to support the comparison. Much of the analysis and results in Section 3 came out of nowhere. Why should we care about WSCL and SWF? Are they the most appropriate parameters to characterize atmospheric stability? Have they been used in previous studies? Previous work has been very poorly cited and discussed, making the entire section seem out of context.

4. The authors also used model simulations to analyze the impacts of meteorological factors. However, the model used in this study, CUACE, is primarily developed for dust forecasting. Nothing is said about why this is the right model for this analysis. The cited study, Gong and Zhang (2008), evaluated the model performance based on PM10 concentrations. This model's ability of estimating PM2.5 concentrations was not evaluated in this study or in the cited study. Thus, the model simulations were

questionable and cannot be used to support the author's conclusion. The author should evaluate the performance of this model before applying its simulations in any analyses.

Minor comments: 1. On page 2, line 10-16. The authors described the temporal trend of PM2.5 but only cited a China government website that is in Chinese. This website lists lots of government documents and I have no idea which one is particularly relevant to this manuscript. Several national and local analyses of spatiotemporal distributions of PM2.5 in China have been published in peer-reviewed journals and should be cited here. 2. On page 5, line 12-13. SO2 shows the inter-annual variations that differ from other pollutants. Why? 3. Figure 2 is messy and hard to read. Please highlight the concentrations and remove the unnecessary background. 4. Figures 4, 6-8: the study areas should be specified, otherwise, it would be difficult for readers, who are not familiar with China, to figure out Beijing or other areas. Also, it would be helpful to add the WSCL line into figures 4 and 6. 5. On page 9, line 7. "2105" should be "2015". 6. Figure 7 and Figure 8. The legend titles need to be changed to English.

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