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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical characterization and synergetic source apportionment of $PM_{2.5}$ at multiple sites in the Beijing–Tianjin–Hebei region, China" *by* Xiaojuan Huang et al.

Anonymous Referee #2

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Interactive comment on "Chemical characterization and synergetic source apportionment of PM2.5 at multiple sites in the Beijing-Tian-Hebei region, China" by Huang et al.

This paper describe the chemical characterization and source apportionment of PM2.5 at four sites in the Beijing-Tianjin-Hebei (BTH) region, China. The topic of the paper is well suited for ACP, and the data itself are interesting. On the whole, the manuscript needs editing concerning the grammar and syntax by native English speaker. In addition, the manuscript suffers from many unclear statements. I have many points where

more information is needed or where I disagree.

Specific comments: Page 1, Line 20-34: The abstract could be improved greatly. The highlighted results in the abstract are not really exciting. I suggest the authors focus on the new findings on haze formation mechanism and the influence of regional transport.

Page 1, Line 32: Please define BTH at the first appearance. Abbreviations and acronyms are typically defined the first time they are used within the main text and then used throughout the remainder of the manuscript.

Page 1, Line 33-34: PMF was employed to apportion the source contribution to PM2.5. The sources of gaseous precursors are identified in this study?

Page 3, Lines 2-36: This part is not well written. The authors state that the studies on haze pollution in the BTH region have obtained fruitful and meaningful results. Please summarize the results on the chemical speciation, haze formation mechanism, emission sources, and influences of regional transport in North China. Meanwhile, the authors need to logically address why it is particularly important to do this study. The temporal and spatial characteristics can not be obtained based on single-site and short-term study. However, we still could get information from a lot of previous studies. What science questions need more research, particularly based on multiple-site and long-term study? Please clarify them.

Page 4, Lines 4-6: The authors state that they emphatically analyzed the chemical compositions and emission sources at different levels and the influence of air masses. Please highlight the new results or findings on them in the abstract.

Page 4, Line 14: "These site reflect the atmospheric pollutions condition in this region"? Reword this sentence. Please clarify the sampling strategy.

Page 4, Lines 27-28: Please clarify the distance between the filter sampling site and meteorological monitoring station in Tianjin, Shijiazhuang and Xinglong.

Page 7, Line 11: The calculation of mineral dust was performed on the basis of six

crustal element oxides. Why are Na, Mg, Zn not included in the Mineral dust? The calculations of Si, K and Fe are based on their ratios to Al in crustal dust. References should be added here.

Page 8, Lines 26-29: The authors state that the cycles of haze episodes are primarily driven by fluctuations in meteorological conditions such as wind speed, relative humidity, air temperature, atmospheric stability, the height of the planetary boundary layer and air mass origins. Please show the temporal trend of these meteorological parameters in 4-7 days here or in Supporting information. In my opinion, these parameters have more effect on the diurnal variation of air pollutants rather than the 4-7 days' cycle.

Page 9, Lines 26-35: The extreme pollution events on Oct 5-11 and Jan 2-6, Jan 11-16 are worth a in-depth discussion.

Page 10, Line 9: Shijiazhuang recorded high relative humidity and low wind speeds. It is usual or not from the historical record. Please clarify.

Page 11, Lines 10-21: Please provide the standard deviation of the ratio of NO3-/SO42- in four sampling sites. The data reported here is annual average value? Please clarify.

Page 12, Lines 16-17: The authors state that strengthened burning activities may occur at night because of the higher night/day ratios of EC and Cl- than that of PM2.5. Actually the photochemical reaction of secondary species and the boundary layer variation also could result in the higher night/day ratio of primary PM. Please provide more evidences to support this statement.

Page 12, Lines 29-31: Please provide the meteorological parameters at day and night in the four sites in the supporting information to support this statement.

Page 15: I still think the analysis on the whole pollution processes particularly the extreme pollution events could get more information on haze formation mechanism than that of the different pollution levels.

Page 15, Line 32: The OC/EC ratio increases with the increasing development of haze

pollution? It is different from the statement in Lines 19-20. Is there any study on the secondary organic carbon in the wintertime of Beijing and Shijiazhuang? Maybe the sources affect the OC/EC ratio in different pollution levels. Again, the discussion on the specific pollution process will avoid this bias associated with emission sources.

Page 16, Lines 22-25: I strongly suggest to discuss he differences between the spring haze and winter haze. The formation mechanism may be totally different.

Page 21, Lines 19-page 22, Line 19: The authors should consider incorporating this discussion into the other sections of the manuscript so that comparisons are made when results are discussed.

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