

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 #1

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In this study, atmospheric PM_{2.5} samples were collected for one year at three urban sites and one regional background site in the BTH and analyzed for their chemical compositions. Emission sources of PM_{2.5} at the four sites were comprehensively investigated by using PMF and backward trajectory analysis. Some important findings were reported, which is helpful for readers to improve their understanding on the pollution situation in the region. Within this reviewer's knowledge, this work may be the first study using unified approach for sampling and subsequent analysis to perform synergetic source apportionment of PM_{2.5} in BTH region. In general, this paper was

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Discussion paper



well written, and the scientific contents fall in the scope and interest of the journal of ACP. Therefore, this referee recommends it to be accepted for final publication in Atmospheric Chemistry and Physics with minor revisions after addressing following questions.

General comments 1. The applied analysis method of PMF must be explained in more detail. How the authors prepared the error matrix and especially how they dealt with combining errors from different measurement techniques. In addition, the authors do not discuss how many solutions they explored (e.g. 1-10 solutions), and how similar or different the resulting factors are. 2. Eight factors were identified for Beijing and Tianjin, while nine were identified for Shijiazhuang and only five were identified for Xinglong. Although the first six factors were well identified, the remaining factors were poor discussed. What are the differences of these factors among the three megacities? Furthermore, the source apportionment results of the presented manuscript should be compared with the previous studies. 3. It would be more concise and easy to follow if the authors could condense the manuscript by removing the Section 3.2.2 to the Supplement, as the results of "Diurnal variation" is not essential to the expression of main points of this manuscript.

Specific comments: 1. Page 1, line 31-34. The conclusion of improving the quality of oil products from motor vehicles is weird. As haze pollution usually occurs when air masses originated from polluted industrial regions of the south prevailed, the control strategies should be focused on fossil fuel combustion, like coal combustion. 2. Page 2, line4: The first document named as "Zhang et al., 2015b" should be "Zhang et al., 2015a". 3. Page2, line 20: Please briefly discuss the relationship between chemical components and health effects, and add more results about the effect of chemical components on the environment and climate. 4. Page 3, line 23: "have reported that a new" should be "have reported a new" 5. Page 3, line 34: "....., these studies yield a narrow view of their", here, "their" is ambiguous. 6. Page 8, line 1: You should introduce the eight carbon fractions in Section 2.2.2 firstly. Otherwise, we don't

know what are OC1, OC2, OC3. 7. Page 8, line 30: The values of PM_{2.5} annual average concentration should be shown as "mean± standard deviation" 8. Page 9, Figure 2: Please add an instruction about BJ, TJ, SJZ and XL 9. Page 10 line 2 to 5, I think the frequent rain is also very important for the PM clear in summer. 10. Page 11, line 15: "Therefore, the NO₃⁻/SO₄²⁻ mass ratio was larger than 1.0 at Beijing, implying that the predominance of motor vehicle emissions over coal combustion in the contribution to PM pollution" this statement implies that motor vehicle emissions is the single source of NO_x, which is incorrect, as coal combustion from power plants is another important source. 11. Page 12, Section 3.2.2: The title should not be "diurnal variation", but "day-night variation". 12. Page 12, line 26: "(Sun, et al., 2016)" should be "(Sun et al., 2016)" 13. Page 15, line 15: "noticeably A remarkable. . . ." should be "noticeably. A remarkable. . . .". 14. Page 15, line 18-35: The authors discussed about the variation of OC/EC mass ratio with the pollution level, would you please display as a chart to make it more intuitive? 15. Page 15 line 31. "Therefore, the fact that the OC/EC ratio increases with the increasing development of haze pollution. . . ." This statement is wrong based on the context, it should be " ... the OC/EC ratio decreases with the increasing ..." 16. Page 15, Section 3.2.4: I suggest the authors show the meteorological parameters at different pollution level in the Supplement to further support the analysis of accumulation and enhanced secondary formation on pollution days. 17. Page 22, Figure 9: Please add an instruction about "C, MP, HP" 18. Page 25, Section 3.4. Please add more information about the backward trajectory analysis. 19. Page 25, line 6 "in three urban sites" should be "at ... sites" 20. Page 25, Figure 10: I believe the font in this figure is inconsistent. Please revise that. 21. Page 26, line 1-6: This part should be improved with a brief description of the chemical composition while mainly focusing on the seasonal characteristics of major components.

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