

Interactive comment on “Aerosol chemistry and particle growth events at an urban downwind site in the North China Plain” by Yingjie Zhang et al.

Anonymous Referee #2

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The manuscript presented by Zhang et al. proposes an interesting study on the chemical composition and new particle formation in North China Plain. The characterization of PM₁ sampled at the field site was performed using an aerosol mass spectrometer. Overall the work performed in this study is good and fall within the scope of the journal. However, the conclusions proposed from the PMF analysis are not always well sustained and more caution should be taken when extrapolating the results. Overall, more information needs to be added to validate PMF analysis and thus the conclusions of this study.

Lines 106:108: The molar ratio is not sufficient to predict aerosol acidity. Please use a thermodynamic model if you want to discuss aerosol acidity (e.g. Weber et al. 2016, Nature Geo.). Presence of organics also impacts CE. Overall the CE correction has to

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be better constrained/explained. Affct í affect (line 108)

Lines 113-115: How does the aerosol density compare with other field measurements? How did the authors evaluate that 75% of the mass is within the mass range of 15-685 nm? What is the size cut off of the aethalometer? The authors should better explain how they considered the size ranges and how they compared particle mass between instruments: ACSM mass between 50-1000nm Aethalometer? SMPS 15-685 nm

In addition, did the authors correct their data by determining the transmission/losses of the particles into the different instruments?

Paragraph 2.3.2. This section should be moved into the "Results and discussion" section as the authors started to discuss the results. In addition, several questions remain in their data analysis and the authors should provide more information (i.e. robust validation).

Why did the authors directly constrain the PMF? Have they tried to constrain the PMF with biogenic factors (i.e. isoprene and/or monoterpene)? It is unclear why the authors were not able to obtain similar factors as previous studies (e.g. Fig S8). How do the factors correlate with the reference MS? How do the factors correlate throughout the campaign (i.e event vs non-event)? How do the residuals evolve throughout the campaign and especially during events vs non-events? It is a bit surprising to identify only 3 factors, assuming the complexity of the aerosol formation in such area. Especially when the authors argue that SOA formation is due to different air masses. Therefore, the authors should present the time series of the contribution of the factors and Q/Q_{exp} parameter values across different model solutions as functions of the number of factors and constraint parameter ($\delta_{\text{MS}}^{\text{Q}}$ -value).

Lines 131:132: How is it an evidence that OOA is a surrogate of SOA? In addition, x vs y plot should be proposed for the entire period and not only for a selected period.

Lines 133:135: Show these results. It would help to understand/validate PMF analysis.

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Lines 152:153: Add the concentrations of O₃ & NO_x to Figure 3

Line 155: It is clear for the period early June but it is not obvious for the other periods. RH stays similar and particle scavenging is not showed by the SMPS compared to the beginning of June. Please comment.

Lines 156:157 The peaks are very sudden and appear suspicious. How long do they last? In addition, those spikes do not show up in the mass fraction plot while they should. What is the reason? In some case, organics should explain 80-90% of the mass (e.g. early May) but the contribution of organics stays ~ constant at 35-40%.

Lines 159:160 How do the diurnal cycles look like for those species? If it is only regional, why does the concentration of sulfate increase continuously? Shouldn't the authors expect to see a stronger diurnal variation if the wind changed?

Lines 160:161 It is hard to see as it is. The authors should plot the [NO₃] vs the temperature.

Lines 162:163 The authors indicate that "These results suggest that urban downwind sites in the NCP experience similar PM pollution events as those in urban cities." How do the authors reach this conclusion?

Lines 184:187 & 189:190 If the authors claim that they observed two different air masses. The PMF should be able to distinguish clean vs haze events and differences should be visible in the MS.

Lines 240:242 How do the authors define a NPE?

Line 249: In general, the authors should present the x vs y plots when they want to correlate/demonstrate a correlation between two parameters.

Lines 260:265 What is the influence of biogenic-derived SOA during clean periods? Is it possible that biogenic-derived SOA contribute more to SOA formation yielding larger NPF? A better comparison of the MS and PMF data is needed to better understand

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this aspect. In addition, what is the source of the big particles early morning during the polluted events? How do the meteorological conditions impact NPF?

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