In the manuscript "Insights into characteristics, sources and evolution of submicron aerosols during harvest seasons in Yangtze River Delta (YRD) region, China" the authors describe measurements with an Aerodyne aerosol chemical speciation monitor during two harvest seasons in China. The focus of the paper is on emissions from agricultural fires during the harvest season and there are some interesting results regarding biomass burning. One notable finding was the extraction of two BBOA factors and the possible reasons for this a discussed. Also the authors present an equation for estimating fresh biomass burning, which would be of interest to the wider aerosol community.

Overall, I would recommend publication after minor revision with consideration to the comments below.

General Comments

1. Overall, the language and grammar could be improved, as I found a number of instances were I could not quite understand the sentence. I have highlighted a number of these below however the authors are advised to thoroughly check the whole manuscript.

2. My main comment is regarding the manuscript is that the authors appear to not consider local or other sources of biomass burning apart from agricultural residue burning. While the authors state that there is negligible local biomass burning, based on their findings I am not sure that the authors can discount local source influences. I realize that the measurements were taken during summer and autumn and so the contribution from domestic heating would be minimal, however this does not exclude local emissions.
The authors identify with PMF a fresh and an oxidized BBOA source factor, and while I am convinced that are two distinct BBOA sources, I am not sure about attributing the source of both of these factors to the agricultural residue fires.
How far away are the harvest fires from the sampling site, as they appear to be a considerable distance from Nanjing in Figure S1?
As the authors mention in the manuscript, primary BBOA emissions will rapidly oxidize in the atmosphere and if the fires are a fair distance, would not the BBOA have been mostly oxidized by the time they reach the receptor site? Or to put it another way, how can you 'see' fresh biomass burning aerosols from these agricultural residue fires?
Furthermore, as mentioned by the authors in the manuscript, differing fuel, burn conditions and efficiency will affect the chemical composition of primary BBOA. In previous work with aerosol mass spectrometry, the differing fuels and burning conditions was put forward as the reason for finding two biomass burning source factors (e.g. Young et al. 2014). Therefore rather than fresh and aged BBOA from the same source (agricultural fires), could not the BBOA factor be more from local emissions of a different source (with differing fuel, etc.) and the OOA-BB more related to the agricultural fires?

3. I think that the title should be changed slightly to reflect that the focus of the work is on biomass burning emissions of agricultural waste during the harvest season.

Specific comments
1. Page 3, line 61. The authors state that farmers burning agricultural residues may result in BB emissions, surely this WILL result in biomass burning emissions?

2. Page 4, line 82-83. Suggest rewording this sentence as it is difficult to follow.

3. Page 9, line 218-220. Perhaps the meteorological values (e.g. WS, WD, etc) could go in Table 1, for clarity.

4. Page 10 line 230. "An over estimation was previously suggested by Huang et al. (2011)".
What was the extent of this over estimation found by Huang et al.? The authors may wish to comment on how much this could have affected the observed correlation between measured and reconstructed PM1 based on Huang et al. findings.

5. Page 10, line 242. "Overall, those species also show a similar contribution between summer and autumn harvest". To which species are you referring to here? It is not clear in the text, please clarify.

6. Page 11, line 260-1. "This speculation is consistent with the highest loadings of K^+, BBOA, OOA-BB, chloride and BC during the summer harvest".
When were these highest loadings observed? During case 1? Please clarify.

7. Page 11, line 263. From figure 1, case 2 and 3 appear to be at times when the wind came from different directions, from the NW and E, respectively. Earlier in the paragraph it is stated that the agricultural fires are located to the NW of Nanjing, so case 3 also in the direction of agricultural fires? The authors should perhaps clarify this in the text,

8. Page 12, line 280. "This means the non-volatile character of sulfate and its more regional pollution in the YRD region during the summer and autumn harvest." Please re-word.

9. Page 15, line 366. The peak of the diurnal profile for BBOA is around 8pm, which is usually characteristic of domestic burning, so as mentioned in an earlier comment could this not indicate local emissions?

10. Page 19, line 447-451. "As shown in Figure S4, for the BB-emissions related OA (including BBOA and OOA-BB), they show a very similar wind rose pattern with high concentration from southeasterly wind during the summer harvest, and from northerly wind during the autumn harvest. This further supports that the production of OOA-BB is related to the BB plumes."

From Figure S1, the main concentration of agricultural fires appear to be to the NW of Nanjing during the summer, how does corroborate with highest concentrations coming from the SE, particularly for BBOA? A similar trend is also observed in the autumn, with the highest BBOA and OOA-BB concentrations coming from SE whereas the fires mainly appear to be concentrated in the west (Fig S1). How
A more useful analysis may be to also include wind speed, such as a polar plot (where concentrations are plotted as a function of both wind direction and speed), which could indicate the whether local or regional emissions were contributing and their direction.

11. Page 20, line 475. "This is also corresponding to some contention discussed in section3.2.3." Please re-word, to what contention are you referring?

12. Page 20, line 489. ". Therefore, these findings indicate that BB contributes more fractions on organics than that on the secondary inorganic aerosols in the transported pollution air masses." Please re-word, not quite sure what you are trying to say.

13. Page 21, line 496. I am not sure what Fig 8 adds to the analysis based on the discussion that it not already shown in Fig 7 and so Fig 8 could perhaps be removed but will leave that for the authors to decide.

14. Page 23, line 5559-562. How is a higher Δf_{44} a factor for the observed higher oxidation levels during summer? Is not the f_{44} a measure of OA oxidation and so how can the f_{44} be a factor for the observed higher oxidation levels during summer?

15. Page 25, line 616, "The contributions of BC, HOA + COA, and BB related OA (BBOA and OOA-BB) to PM_1 are rather high in the WC BTs". However, my understanding of Fig 13 is that the % contributions for these species did not change that much during the summer harvest and perhaps the authors may wish to clarify this statement.
Overall, I found the discussion in Section 3.6 a little hard to follow and would recommend that the authors review this section.

16. Page 27, line 659-661. "This suggests that OOA-BB may be quickly oxidized a bit and condensed on the particle phase during the nighttime with the high RH and low T conditions." Please re-word.

17. Figure 3. Why have you used results by Crippa at al. (2013) from Paris as reference mass spectra and not those obtained locally such as He et al. (2010) or Huang et al. (2013)?

18. Included in Fig 9 are measurements taken during July 2013, as they are considered to have no biomass burning influence. However, I found no mention of these measurements in the Methods. Were these taken at the same location and with the same instrument? Please include a brief description in the

methods. Furthermore, to give some context to the measured PM masses during the harvest season in Nanjing, it may be worth including a comparison of the measured PM_1 masses during the July measurements.

References

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