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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Open burning of rice, corn and wheat straws: primary emissions, photochemical aging, and secondary organic aerosol formation" *by* Zheng Fang et al.

Anonymous Referee #2

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Open burning of agricultural residues is a large source of both primary and secondary air pollutants in Asia and in China. Although many studies have been carried out, emission factors reported in previous study vary substantially due to differences in fuel types and combustion conditions. In addition, few studies have been performed to investigate the SOA formation from agricultural residues. To better understanding the effects of biomass burning on both primary and secondary pollution, this study comprehensively characterizes the primary emissions and determines SOA formation potential of emissions from the major agricultural residues in China, including corn, rice and wheat straws. Results from study would significantly improve our understanding the effects of agricultural residues on air quality. In addition, the results from this

study also provide constraints on estimation of the contributions of other sources to air pollution. Publication is recommended after the following comments and concerns are addressed.

General comments: Discussion is needed about why only a small fraction of observed SOA in this study was explained by the same set of speciated NMHCs which explain the majority of SOA in Bruns et al. (2016).

If the unexplained SOA is due to additional precursors, not quantified in this study, do these additional precursors substantially contribute to ozone formation? Based on the mass enhancement factor of 2.4-76 and the fact that similar emission factors for both measured NMHCs and PM, the amount of unmeasured NMHCs could be dramatically larger than the measured ones. Is there any study measuring both total NMHCs and speciated NMHCs from biomass burning? The difference between total NMHCs and speciated NMHCs is a useful indicator of additional precursors.

This study has covered a wide range of measurements and compared with measurements in past studies. However, what we can learn from this study, other than emissions factors and OA enhancement factors, is not clearly stated. In other works, what makes this paper significant is not clearly stated.

Specific comments: Line 136: define "purified dry air" Line 141-142: How was the water content determined? Line 152: change "diluted" to "dilute" Line 155: change "correct" to "determine" Line 161: The section of "Instrumentation" is actually "Characterization of primary emissions and secondary organic aerosol". In this section, I'd like to separate the description of the analysis of VOCs from other gases. Line 188: change "this instrument alternated" to "the HR-tof-AMS was operated by alternating" Line 188: change "one" to "other". Line 195: What is the AMS CE? Line 217: Is the denominator of the equation (2) the same as the numerator? Why do you need two equations to calculate this fuel based emission factor? Line 232: "NMHCs" should be "speciated NMHCs". In this study, the total NMHCs were not determined. Only a por-

tion of them was speciated. Line 243: I suppose that the particle size evolves through the course of photo-oxidation experiments. Discussion is needed about whether the particle loss during the experiments can be corrected for using post measurements. Line 255: change “identified” to “quantified” Line 283: NMHCs were measured by two instruments: PTR-MS and GC-MS. Efforts are need to make sure readers can tell these measurements and follow the discussion. Line 297: Not all organic vapors were measured in this study. Do authors have an estimate of the unmeasured vapors across the three fuels and their ozone formation potential?

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