

Review of “Primary emissions versus secondary formation of fine particulate matter in the top polluted city, Shijiazhuang, in North China” by Huang et al.

This manuscript reports the measurements of non-refractory fine particulate matter (NR-PM<sub>1</sub>) in Shijiazhuang, China, using a quadrupole aerosol chemical speciation monitor (Q-ACSM). Positive matrix factorization (PMF) analysis is performed for source apportionment of organic aerosol (OA). It is found that on average primary emissions are the major source of NR-PM<sub>1</sub>, but secondary pollutants via aqueous phase reactions play a more important role in polluted events. The data analysis is routine and the conclusions are broadly consistent with many previous studies in the same region. Overall, I recommend publication after major revisions.

#### Major Comments

1. Page 11 Line 4-5. The coal combustion OA (CCOA) is identified based on PAH-related ion peaks in its mass spectrum and the assumption that PAH is mainly from coal combustion. So it is problematic to draw the conclusion that “the major source of PAHs was coal combustion”.

2. Page 11 Line 5-6. As the CCOA concentration is similar between Beijing and Shijiazhuang, does it suggest that the major source of CCOA in Beijing is from local emissions? In the introduction (Page 4 Line 5-15), it is mentioned that previous studies estimate a large fraction of PM in Beijing arising from regional transport. If so, one would imagine that the CCOA concentration is higher in surrounding area, like Hebei, than Beijing.

3. Section 3.4. The increase in SO<sub>4</sub>/POA and OOA/POA is largely due to the decrease in POA at high RH (90-100% bin). What causes the decrease in POA concentration? Precipitation? Have the precipitation events been excluded from the analysis?

In Figure 7, the light blue should be COA, instead of CCOA.

4. Could the authors provide more explanations regarding why POA is important in low RH polluted days, but SOA is important in high RH polluted days? I would imagine that the POA emissions do not vary with RH. Then where does the POA go in high RH polluted days?

According to Figures 1 and 8, there is larger variation in the OA concentration between the six high RH events than the variation between four low RH events. H3, H5, and L3 seem to be outliers.

## Minor Comments

1. Page 2 Line 21. "Concentration" should be plural.
2. Page 4 Line 21. What's the diurnal trend of delta\_CO? Are there rush hour peaks?
3. Page 9 Line 5-24. From my understanding, these paragraphs discuss results from unconstrained PMF, right? If so, please be more specific.
4. Page 12 Line 27. Change "compounded" to "confounded".