Response to referee #2

We thank the referee for the recognition on our work and the constructive review.

General comments:

Wan et al reports a study of organic aerosols in Lumbini, a site of northern Indo-Gangetic Plain (IGP) with the emphases on the influence of biomass burning. They found that organic aerosols in Lumbini was not only related to the local agricultural activities and residential biomass usage, but also impacted by the regional emission. Although some previous work has reported organic aerosols in this region (mostly in India), this study does add valuable knowledge for the scientific community to better understand the abundance, composition and sources of organic aerosols in north IGP. Such information is useful for adapting proper mitigation measures, and thereby reducing the air pollution in South Asia. Generally, this paper is well written and logically ordered. The statement is convincing since it is based on a comprehensive dataset and appropriate discussion. Therefore, I recommend this paper to be published after a revision.

Specific comments:

1.The English writing needs to be improved. Some sentences and description are redundant. For example, the sentence of Lines 53-58 is too long, which is hard to follow.

Response: Now we carefully checked the English writing. The changes have been marked in the text using red color.

2. Line 177, do you have any idea about the low recovery of malic acid?

Response: The exact reason for the low recovery of D_3-malic acid is not clear. One possible reason is the loss when spiking the D_3-malic acid on the pre-combusted quartz filters. The other potential reason may be due to the low extraction efficiency of D_3-malic acid through the mixed of DCM:MeOH (v:v=2:1), which needs to do a further research in the future. Similarly, the low recovery of malic acid (69±6.3%) was also reported by other group using the similar method (Fu et al., 2009).

3. Line 190. K^+ should be replaced by major ions, because in the following section, Ca^{2+} and Mg^{2+} were also included in the IC analysis.

Response: Changed according to your suggestion**.** Please see Line 191.

4. Line 200, as stated by the authors, the concentrations of OC, EC and major ions reported in this work were corrected by their field blank values. So, the levels of such constituents in the field blank filters should be presented.

Response: Thank you for pointing out. Now we added the field blank values of OC, EC, K^+, Mg^{2+} and Ca^{2+} in Line 203 as "which was 0.40 μg m^{-3}, 0.01 μg m^{-3}, 0.04 μg m^{-3}, 0.02 μg m^{-3} and 0.37 μg m^{-3}, respectively".

5. Lines 248-259, in general, relatively high OC/EC ratio represents a high contribution of secondary organic aerosol (SOC) as mentioned in many publications. According to your current dataset of OC, EC as well as the tracers, is it possible to estimate the importance of secondary organic aerosols? Considering the emissions and meteorological conditions in this region, SOC maybe also very important, but now little is discussed inside the manuscript.

Response: It is difficult to estimate the SOC based on the present organic molecular tracers we analyzed. We agree that SOC may also be important in Lumbini aerosols. We roughly estimate the SOC based on the primary OC/EC ratio (EC-tracer method) (OCpri = EC × (OC/EC)min, OCsoc = OCtot – OCpri) (Turpin and Huntzicker, 1995). According to the EC-tracer method, the annual average concentration of SOC in Lumbini was 14.5±14.0 μg m^{-3}, accounting for 37.2%±20.0% of OC. Please see in Line 420 to 423 with "According to the EC-tracer method (OCpri = EC ×(OC/EC)min, OCsoc = OCtot – OCpri) (Turpin and Huntzicker, 1995), we roughly calculated that the annual average concentration of SOC was 14.5±14.0 μg m^{-3}, accounting for 37.2%±20.0% of OC in Lumbini aerosols ".

6. Line 470, due to the low PBL height in the winter, could you provide its average value, instead of the current subjective description?

Response: We enhanced the description about the PBL height (with an average of 267.8±63.2 m) in winter and provided the average value in Line 478.

7. Line 505, clear or clean?

Response: We changed the "clear" to "clean".

8. I suggested the authors to move the Fig S6, regarding the MODIS image of the regional emission and transport of smoke plume in the fall, to the main text.

Response: Thanks for your suggestion. Now we moved the Fig. S6 to the main text as Fig. 10.

9. As highlighted by the authors, the BrC in the organic aerosols deserve more research in the future. Actually, in the paper by Stockwell et al (2016, ACP), some optical properties of BrC in biomass-burning aerosols have already been determined. So, such new progress should be reflected in this manuscript.

Response: Now the work of Stockwell et al. (2016) and Pokhrel et al. (2017) were cited in Line 523 and Line 524 to 525.

10. In Figure 5: Fu et al. (2010) was missed in the Section of References.

Response: We added the missed reference in Line 581 to 583 in the Section of References.

References:

Fu, P., Kawamura, K., Chen, J., and Barrie, L. A.: Isoprene, Monoterpene, and Sesquiterpene Oxidation Products in the High Arctic Aerosols during Late Winter to Early Summer, Environmental Science & Technology, 43, 4022-4028, 10.1021/es803669a, 2009.

Pokhrel, R. P., Beamesderfer, E. R., Wagner, N. L., Langridge, J. M., Lack, D. A., Jayarathne, T., Stone, E. A., Stockwell, C. E., Yokelson, R. J., and Murphy, S. M.: Relative importance of black carbon, brown carbon, and absorption enhancement from clear coatings in biomass burning emissions, Atmos. Chem. Phys., 17, 5063-5078, 10.5194/acp-17-5063-2017, 2017.

Stockwell, C. E., Christian, T. J., Goetz, J. D., Jayarathne, T., Bhave, P. V., Praveen, P. S., Adhikari, S., Maharjan, R., DeCarlo, P. F., Stone, E. A., Saikawa, E., Blake, D. R., Simpson, I. J., Yokelson, R. J., and Panday, A. K.: Nepal Ambient Monitoring and Source Testing Experiment (NAMaSTE): emissions of trace gases and light-absorbing carbon from wood and dung cooking fires, garbage and crop residue burning, brick kilns, and other sources, Atmospheric Chemistry and Physics, 16, 11043-11081, 10.5194/acp-16-11043-2016, 2016.

Turpin, B. J., and Huntzicker, J. J.: Identification of secondary organic aerosol episodes and quantitation of primary and secondary organic aerosol concentrations during SCAQS, Atmospheric Environment, 29, 3527-3544, 10.1016/1352-2310(94)00276-q, 1995.