Responses to the Anonymous Referee 2 comments

Reviewer #2 Evaluations

The authors present the results of the chemical composition of organic aerosol in South Korea with a focus on primary organic compounds and biogenic secondary organic aerosol tracers. Seasonal variations and sources of studied compounds were analysed. The paper is suitable for publication in the journal Atmospheric Chemistry and Physics, however, several comments reported below should be addressed before acceptance for publication. Minor revisions of the paper are requested.

Response: We thank the reviewer for the positive assessment of this work. We have carefully revised the manuscript following the reviewer's comments and suggestions. Our responses to all comments made by the reviewer are given below. Please refer to the revised MS, in which changes are highlighted in yellow.

Comments:

Comment: Lines 277-281: Glucose and other saccharides may be partly formed also during biomass burning, which explains their contribution during the winter period.

Response: Following the reviewer's comment, we have added the following sentence in the revised MS as: "Since glucose, fructose, and sucrose showed moderately significant correlations (R^2 = 0.44-0.48, $p<0.01$) with levoglucosan in winter, it is somewhat possible that BB source emission could also influence the concentrations of these saccharides in this season (Haque et al., 2019; Fu et al., 2008)." Please see lines 279-283.

It can be noted that levoglucosan showed a poor/negative correlation with other saccharides except xylose (lines 404-405) and inositol in winter (discussed in the main text). Please see lines 302-305 in the revised MS.

Comment: Line 283-294: Sources of inositol and other polyols are only perfunctorily characterized focusing on prevailing sources. Sources of inositol are entirely missing.

Response: Following the reviewer's suggestion, more discussion on sources of polyols along with inositol has been added in the revised MS as: "The major sources of arabitol and mannitol are airborne fungal spores (Bauer et al., 2008), accompanying detritus from mature leaves (Pashynska et al., 2002). Heald and Spracklen (2009) reported that mannitol and arabitol are considerably associated with terrestrial biosphere activity. Inositol is largely derived from the developing leaves in summer (Pashynska et al., 2002) and BB in winter (Fu et al., 2010b). Zhu et al. (2015b) found similar seasonal behavior of inositol with those of other sugar alcohols with the predominance in summer, associated with microbial activities in local forests from Okinawa. Inositol showed a moderately significant correlation with levoglucosan (R^2 = 0.33, $p< 0.01$) in winter; however, there were no positive linear relationships between levoglucosan and other sugar alcohols, implying a partial emission of inositol from the BB during winter in Gosan aerosols." Please see lines 296-305. More information regarding the sources of polyols are already interpreted in section 3.4 (lines 409-419).

Comment: Line 306-307: Unlike other studies, the concentration of mannosan in this study is surprisingly lower than those of galactosan, do you have an explanation of this fact?

Response: Following the reviewer's comment, we have added the following sentences in the revised MS as: "Galactosan is more abundant in crop-residue burning emissions than mannosan (Engling et al., 2009; Sheesley et al., 2003). It is very much likely that the impact of crop-residue burning emissions in East Asia over Gosan is more prominent in winter/spring. Such high abundances of galactosan over mannosan were found in the North China Plain (Fu et al., 2008) and in the Indo-Gangetic Plain outflow sampled over the Bay of Bengal (Bikkina et al., 2019)." Please see lines 320-325.

Comment: Line 400-404: Ratios levoglucosan/mannosan and levoglucosan/(mannosan + galactosan) also allow to distinguish biomass burning and lignite combustion as the source of these anhydrosugars. In addition, the empirical equation using levoglucosan and mannosan data allows you to calculate the contribution of softwood and hardwood to the total amount of combusted wood.

Response: Based on the reviewer's comment, we have added the results of these diagnostic ratios in the revised MS as "Ratios of *Lev*/*Man* and *Lev*/(*Man* + *Gal*) can be useful to distinguish BB and coal combustion contributions. The average ratios of *Lev*/*Man* (15.1 ± 6.76) and *Lev*/(*Man* + *Gal*) (4.27 ± 1.23) in Gosan aerosols are much closer to those from wood burning and coal combustion sources emissions, respectively (Yan et al., 2018). It reveals that *Lev* could originate from both biomass and coal burning source emissions, which is consistent with the linear relationship between *Lev*-C and fossil-/nonfossil carbon fraction (section 3.7). Please see lines 422-427 in the main text. Unfortunately, we are not familiar with the empirical equation to calculate the contribution of softwood and hardwood.

Comment: Line 426: Add references to levoglucosan degradation.

Response: Added. Please see line 453 in the revised MS.

Comment: Line 536: Add missing information into Table 3, such as analysed PM fraction and studied season.

Response: Added. Please see Table 3 in the revised MS.

Comment: Line 562: Another key factor is a higher concentration of ozone and other oxidation agents in summer.

Response: Added. Please see lines 591-592 in the revised MS.