Reply to Comments of Co-Editor

Thank you very much for the careful revision of your manuscript. However, further improvements are needed before being accepted for publication in ACP. In addition the use of English language has to be checked throughout the text. Please perform these changes and resubmit your manuscript as a track changes document.

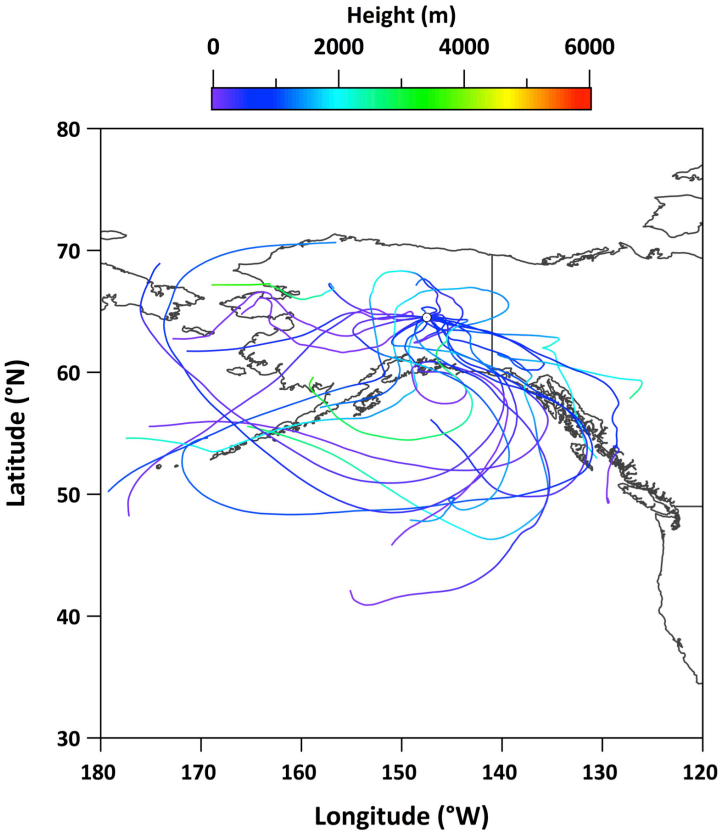
Reply: Thanks for the decision letter on our manuscript. We appreciate the useful comments to improve the quality of our manuscript. We have taken all of them into account in the revised version of the manuscript. Please refer to the revised manuscript where we highlighted the changes in yellow.

Line 29-30: 'have a serious impact' replace by 'significantly impact'

Reply: Corrected. Please see line 30 in the revised manuscript.

Lines 193-194: What was the origin of these air masses?

Reply: We separately made backward air mass trajectories as given below for the last three samples in which we detected an ample amount of sugar alcohols.



The above figure displays that the air masses originated mostly from the ocean. However, the altitude of most of the air masses dropped at several places and went on to Fairbanks by maintaining low height. Therefore, we believe an insignificant contribution of marine sources to sugar alcohols in Alaskan fine particles. The source of sugar alcohols in Alaskan samples is

fungi in the surface soil of Fairbanks that was activated during and after the rainfall event. This conclusion is strongly supported by the fact that we found high levels of arabitol and mannitol during and after the rainfall in central Alaska. The rain increases the moisture contents in surface soil and thus fungal and microbial activities are enhanced in central Alaska.

Figure 3 in the revised manuscript already includes the air mass backward trajectories for the last three samples. The impact of rainfall on the level of sugar alcohols has also previously been discussed in the revised manuscript. However, we have included the following sentence at the appropriate place (Section 3.4) in the revised manuscript.

"Although air masses mostly originated from the ocean (Figure 3), the altitude of most of the air masses dropped at several places and went on to Fairbanks by maintaining low height. Therefore, we presume a negligible input of marine sources to sugar alcohols in Alaskan fine aerosol samples."

Please see lines 472-475 in the revised manuscript.

Line 236: The chemical reaction of anhydrosugars with OH radicals

Reply: Corrected. Please see line 247 in the revised manuscript.

Line 249: 'under different variables' what do you mean?

Reply: We deleted "under different variables" and revised the sentence as follows.

"Nevertheless, Bai et al. (2013) reported an atmospheric lifetime of levoglucosan to be 26 days when exposed with OH level of 2 × 106 molecules cm^{-3} that is much longer than other predictions."

Please see lines 259-261 in the revised manuscript.

Line 252: induced by photochemical aging via oxidation by OH radicals

Reply: Corrected. Please see line 263 in the revised manuscript.

Line 255: remove 'were'

Reply: Removed.

Line 256: 'to contribute' do you mean 'to explain'

Reply: We replaced 'to contribute' to 'to explain'. Please see line 267 in the revised manuscript.

Line 260: Wet deposition may be another cause.

Reply: Corrected. Please see lines 270 and 271 in the revised manuscript.

Line 354: remove ‘were’

Reply: Removed.

Line 392: They are released into the atmosphere

Reply: Corrected. Please see line 402 in the revised manuscript.

Line 408-409: in which sugar alcohols contributed more to the total sugars (ave. 54.2%) than primary sugars (ave. 25.8%) in Alaskan aerosols

Reply: Corrected. Please see lines 418 and 419 in the revised manuscript.

Line 422: as major sources

Reply: Corrected. Please see line 432 in the revised manuscript.

Line 435: the same sample showed

Reply: Corrected. Please see line 445 in the revised manuscript.

Line 449 replace ‘implication’ by ‘finding’

Reply: Corrected. Please see line 459 in the revised manuscript.

Line 454: mannitol concentrations were higher during
Reply: Corrected. Please see line 464 in the revised manuscript.

Line 461: contributes

Reply: Corrected. Please see line 471 in the revised manuscript.

Line 483: is also produced

Reply: Corrected. Please see line 495 in the revised manuscript.

Line 564: that can be further

Reply: Corrected. Please see lines 576 and 577 in the revised manuscript.

Line 643: replace ‘SOA tracers that contribute very less’ to SOA tracers with minor contribution

Reply: Corrected. Please see line 655 in the revised manuscript.

Line 648: replace ‘portion’ by ‘fraction’

Reply: Corrected. Please see line 660 in the revised manuscript.

Line 659: burning of softwood is common source

Reply: Corrected. Please see line 671 in the revised manuscript.

Lines 674 to 686 belong to the introduction and not here, please move appropriately

Reply: Moved. Please see lines 100-104 and 107-113 in the revised manuscript.

Lines 679: replace ‘were more than double’ by ‘more than doubled’

Reply: Corrected. Please see line 104 in the revised manuscript.

Table 2: the 3rd column with the P values is not needed because the necessary information is already in column 4.

Reply: We deleted the 3rd column of Table 2. Please see Table 2 in the revised manuscript.