Clim. Past Discuss.,
https://doi.org/10.5194/cp-2017-121-AC1, 2018

Climate of the Past Discussions

Interactive comment on "Methoxy aromatic acids in an Arctic ice core from Svalbard: a proxy record of biomass burning" *by* Mackenzie M. Grieman et al.

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Received and published: 30 January 2018

The referee raised several good points and we appreciate the comments. The manuscript has been modified as described below to take them into account. Referee comments are numbered and our responses follow.

1. I saw that you have evaluated the charcoal records on the supplementary information, but I think that this part should be reported in the main manuscript with other considerations.

As recommended, the comparison to charcoal records has been moved into the Re-

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Discussion paper

sults and Discussion section of the main manuscript as Section 3.5.

2. I suggest to insert a new paragraph in the main manuscript with the comparison with other biomass burning proxy records. For example, Rubino et al (2015) reported that ammonium and nss -K can be used as biomass burning proxies, and these data are available in the same ice core (Wendl, ACP, 2015). Some authors of this paper have collaborated to publish the paper of aromatic acids in the Akademii Nauk ice core, in which a good comparison with other proxies (for example with levoglucosan) is reported. Introduction. Page 2. Lines 1-10. You reported only a list of possible biomass burning tracers, but I suggested to better describe the advantages and the disadvantages of each marker. I recommend to improve this part of the introduction.

The text in the introduction has been expanded as suggested.

3. In the manuscript (and also in the title), the authors consider p-hydroxybenzoic acid as a methoxy aromatic acid but p-HBA does not have the methoxy moiety. Please check and correct. Specific comments Title. The use of “methoxy” in the title is wrong because phydroxybenzoic acid is not a methoxy phenol. I suggest to remove “methoxy”.

We greatly appreciate the reviewer catching this obvious (and embarrassing) mistake! “Methoxy” is now removed from the title and the rest of the manuscript.

4. Page 4. Line 32. You detected VA using two different transitions (167>108 and 167>152) while p-HBA with only one transition (137>93). The quantitative method using HPLC-MS/MS or IC-MS/MS requires the monitoring of two transitions where the most intense transition was used to quantify the compound and the other one was used to confirm the identity of compound.

Unfortunately, p-HBA has only one mass transition representing a significant fraction of the total signal (137→93). It was therefore not possible to confirm identity using another mass transition. We have seen no evidence in terms of peak shape or retention time

to cast doubt on the identity of the peak.

5. Page. 5. Line 5. Have you evaluated the contamination during the proceeding? Have you subtract the blank values?

For this study, full procedural blanks covering field collection and sample melting were not available. We did routinely analyze laboratory blanks along with samples. These did not exhibit detectable peaks at the mass transitions for VA or p-HBA. During this and previous studies, we have not experienced contamination of these compounds at significant levels.

As noted in the Methods section, the limits of detection were calculated using 3x the standard deviations of the blank. Measurements at or below the detection limit were reported as $\frac{1}{2}$ of the limits of detection.

6. Page 5. Line 8. You reported that you analyzed 993 samples, but in page 4-line 26 you wrote that you had 997 samples. Please correct this discrepancy.

We collected 997 samples but analyzed only 993. The text has been modified to refer only to the number analyzed.

7. Page 7. Lines 25-31 and figure 7. Why you have reported two different NAO indexes from two different references? Which is the difference between two records?

We agree that the two NAO records were similar and removed the shorter of the two records.

8. Page 10. Paragraph 3.6. In this paragraph you described the behavior of proxies and their possible modification occurred due to atmosphere/snow interactions. I think that the discussion about “potential for post depositional modification of VA and p- HBA” should be reported before of “Relationship to atmospheric circulation and climate”.

Agreed. The discussion of postdepositional modification is now Section 3.3.

9. Abstract. Line 5. Please correct “1,000 ng/l” with “1,000 ng L-1)

Done

10. Page 5. Line 10. Please add “limit” after “detection”.

“Below detection” was changed to “below the limits of detection.”

11. Page 5. Line 10. Please add “0” before of “.006”.

Done

12. Figures 6 and 8. Please can you specify the period that you consider to calculate the back trajectories.

These figures are now figures 7 and 9. The figure 7 caption was revised as follows: Figure 7. “. . .10-day back trajectories from 2006-2015 reaching the boreal ecosystems starting from the Lomonosovfonna and Akademii Nauk ice core locations. . .”

Figure 9 has been removed and replaced with a different figure.

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