

## ***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.***

### **Anonymous Referee #1**

Received and published: 3 November 2017

#### General Comments

This work proposes very interesting records of two aromatic acids in an Arctic ice core on millennial time scales. The comparison between Svalbard and Siberian ice cores of these two compounds underlines dramatic differences for the most of the past millennium, underlining the extreme need to have several records to better define the past atmospheric circulation and post-depositional processes. The investigation about the past changes of fire regimes can help to better understand how climate change may influence fire and its impact on the carbon cycle in the future. I saw that you have evaluated the charcoal records on the supplementary information, but I think that this

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part should be reported in the main manuscript with other considerations. 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. In literature, some authors (for example Zangrando et al., 2016) suggested that vanillic acid can have other sources beyond biomass burning. I think that this new paragraph could enhance the reliability of the proposed proxies. 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. The paper is generally well-written and clear, but I have suggested some corrections. Therefore, I recommend this paper for publication with major revisions.

#### Specific comments

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.

Specific comments Title. The use of “methoxy” in the title is wrong because p-hydroxybenzoic acid is not a methoxy phenol. I suggest to remove “methoxy”.

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.

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

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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.

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?

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”.

#### Technical comments

Abstract. Line 5. Please correct “1,000 ng/l” with “1,000 ng L-1) Page 5. Line 10. Please add “limit” after “detection”. Page 5. Line 10. Please add “0” before of “.006”. Figures 6 and 8. Please can you specify the period that you consider to calculate the back trajectories.

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2017-121>, 2017.