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

1. Checking the ammonium profile (Figures 3 and 4 in Wendl et al.), I see three time periods with elevated ammonium levels (around 1370, 1545, and 1900) but nothing in 1300. Can we conclude from that ammonium is not an adequate biomass burning tracer in this region? Is this difference for ammonium between Arctic and Greenland sites related to difference of altitude of plumes (more scavenging at the low elevated

marine site of Svalbard???).

In an effort to answer this question, we attempted a quantitative examination of the co-variability of Lomonosovfonna VA, p-HBA, and ammonium. The results are reported in section 3.4.

2. Abstract: Please specify for which season air mass back trajectories were computed and for how many days.

Page 1, line 9 was changed to "Air mass back trajectories for a decade of fire seasons (March-November, 2006-2015) indicate that Siberia and Europe are the principle source regions for wildfire emissions reaching the Lomonosovfonna site."

3. Page 4, Line 5-8: Please specify for how many days air mass back trajectories were computed.

Page 4, Lines 5-8 were changed to: "The 10-day back trajectories were started at 100 m above the ice surface at 12:00 AM and 12:00 PM local time for three separate 10-year periods, 1948-1957, 1970-1979, and 2006-2015 CE."

4. Page 2, line 9: Please clarify the reference Rubino et al. (2015): In my record the paper had appeared in 2016:

Corrected.

5. Page 6, Line 30-33: Please specify for how many days air mass back trajectories were computed for both sites (5 days ?, 10 days ?).

Page 6, Lines 30-33 were changed to "10-day back trajectories were computed for the Akademii Nauk site using the same methods as those described above from 2006-2015 CE (section 2.2; Grieman et al., 2017). The 10-day back trajectories show that both Lomonosovfonna and Akademii Nauk sites are influenced by air masses transecting Eurasian forested regions (Fig. 7; Table S1).

6. Figure 7: Sodium at GISP 2: This figure will not really convince the reader that the

NAO influences the sodium record in central Greenland.

These data did not add much to the discussion and have been removed from figure 8.

7. By the way, what tell us the sodium record at the Svalbard site (available in Wendl et al., 2015) in Figure 3 and 4.

The sodium record for this core published by Wendl et al. (2015) shows a long term declining trend, with centennial variability that is generally similar in character to VA, p-HBA and other parameters in this core. The Wendl et al. (2015) paper provided little discussion about the causes of the sodium variability. Presumably, the seasalt record reflects changes in the frequency of air mass trajectories from the North Atlantic, as well as the intensity of storms and one might speculate that both could be related to changes in the phase of the NAO. A serious analysis of seasalt data covering the period of satellite era would be worthwhile, but outside the scope of this paper.

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