

Interactive comment on “Airborne measurements of particulate organic matter by PTR-MS: a pilot study” by Felix Piel et al.

Anonymous Referee #1

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Authors present flight measurements of biomass burning and industry derived plumes observed using the CHARON+ PTRMS, each of which has been characterized on the ground and reported on by previous studies. The authors note there were some issues with the technique on its first flight deployment (notably, the high background count and the less than optimal CHARON enrichment factor), but it serves as a starting point from which further improvements can be made. There are a few areas of concern that need to be addressed before publication.

I am dubious of the aromaticity calculation given the two rather big assumptions made. Do you understand the fragmentation patterns of BB derived compounds well enough? And how do justify assumption that oxygen atoms are mostly hydroxy or carboxyl groups? The authors note that they tested fragmentation patterns on 19 acids+4 sac-

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charides+2polyols, and refer details to a yet to be published article. These functional groups do not represent well the types of compounds largely found in BB plumes. How do furans fragment? How would furans alter the aromaticity calculations? How about aromatics with methoxy groups? Nitro, nitroxy or hydroperoxy groups? There is a C5 compound that is identified as a monoaromatic compound (figure S5). Is the fragmentation from the heating in the CHARON or from the PTRMS?

That is quite a bit of tailing (~6 to 20 seconds depending on I'm assuming volatility of the compound) following the interception of the BB plume (figure 1). Yes, emission ratios can still be salvaged if you sum the signal over time until signal is back to outside of plume values, if you assume these compounds interact reversibly with instrument surfaces. But this is not possible to do when you encounter numerous plumes occurring in close proximity of distinct sources. This is quite typical in biomass burning flights. What is the instrument surface that gives rise to the tailing, CHARON or PTRMS? What are your plans to mitigate this issue in the future? How much slower is the response time of nitrate compared to ammonium? More details and figures are needed characterizing the sampling performance. Suitability for flight deployment is in question.

It is surprising that organic nitrates (CHON) compose such a small fraction of the BB derived OA. Authors note that this is because plume was fresh so did not undergo much photochemistry. Please show a map as you did for the industry plume. Do you know the source of the fire? Using measured wind speed, can you estimate plume travel time or reaction time from emission to observation? Was the plume shown in figure 1 sampled when figure S2 was taken? Does not look "fresh". ON during biomass combustion can also be directly emitted, so no photochemistry needed. Please do a literature search citing range of ON fraction in OA or even total (gas + particle) carbon in fresh BB plumes (Koss et al. <https://www.atmos-chem-phys.net/18/3299/2018/> comes to mind).

What is the effect of CHARON temperature? The Eichler 2015 paper (<https://www.atmos-meas-tech.net/8/1353/2015/>) states temperature test will be done

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in future. Has that been done? Kostendiou et al (<https://www.atmos-chem-phys.net/18/5799/2018/>) found that BB derived OA required higher temperature than other OA types to evaporate, likely higher than 150 C. How efficiently do you suppose BB derived OA are sampled with CHARON?

What is the response time of the CO instrument? It records at 10 Hz, but the residence time in the instrument is much longer. As such, the plumes presented in figure 1 may be even sharper than what CO measurements indicate.

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