The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2018-203-RC1, 2018

The Cryosphere Discussions
Open Access
EGU

Interactive comment on "Brief communication: Analysis of organic matter in surface snow by PTR-MS – implications for dry deposition dynamics in the Alps" *by* Dušan Materić et al.

Anonymous Referee #1

Received and published: 28 November 2018

The manuscript by Materić and colleagues deals with the deposition of organic matter/VOCs in alpine snow over a short period. They use PTR-MS, coupled with a new sample preparation method to directly analyse the dissolved organic compounds in snow. As someone who doesn't work in the field of snow/ice, I must say that I did enjoy reading the manuscript. For the most part I followed it, and the results generally back up the authors' conclusions. The paper contains a wealth of information which the authors use to make inferences about organic matter sources and weather variables.

The paper falls within the remit of The Cryosphere. Graphs are mostly well presented and easy to follow, as are tables. The purpose of the work is articulated well, the

Printer-friendly version

Discussion paper

methods seem suitable. Some additional references are probably needed.

As a non-expert I cannot comment in any great detail on some parts of the paper, particularly the mass balance approach in section 3.1. I recommend publishing the paper after various, mostly minor, comments have been addressed.

L19. VOCs needs defining on first use

L45. On L19 you say that OM originates from anthropogenic sources, biomass burning, and biogenic sources. On L45 you discuss VOC deposition. Coming to this as a non-expert, are there reasons to believe that LMW OM is an important component of the emissions from anthropogenic sources, biomass burning, and biogenic sources. Perhaps the authors could add a few references and maybe a sentence or two for the general reader.

L54. I believe that the standard for TC submissions is to use SI brochure 8 (https://www.bipm.org/utils/common/pdf/si_brochure_8_en.pdf) which would suggest either a space or no space between the 3 and 1 in 3106 m, but certainly not a comma or period.

L75. For section 2.2 there is no detail of how many or how often samples were taken. Reading into the results and it seems one (?) sample was taken every three days, but this information needs including in section 2.2.

L81. "Samples were melted." Were they melted (i.e. actively) or were they simply allowed to melt (i.e. at room temperature). Please clarify.

L81. Were filters pre-rinsed? PTFE filters can cause DOM contamination. Eg. Yoro et al, 1999, Water Research, 33, 1956-1959. https://www.sciencedirect.com/science/article/pii/S0043135498004072

L83. Sample were analysed in triplicate, but no detail is given about what happened with them. Were means taken for each ion for each set of triplicates? Additionally, whilst the authors provide a LoD, they provide no detail on the replicates. Have the

Printer-friendly version

Discussion paper

authors done analysis showing variation between replicates? This seems important.

L107. Ions m/z < 100 were excluded as the authors suggest these are mainly thermal byproducts. What evidence is there for this assumption?

L116, eq 1. What is “d”? Is it delta?

L131. 5 DPs for the R2 value is too many to be of any meaningful use, surely. The same for Table A1. My preference would be 2DPs for sufficient information.

L156 and L159. The authors make a comparison between their VOC burden (833 ng m3) and that from Zhao et al (0.6 μg m3). Please amend one of these values so the units are the same, to help the reader immediately see the comparison.

L177. The authors say they use Pearson correlation but then report R2. Technically, Pearson correlation would be R. But I wonder if a Spearman correlation might be better than Pearson. Certainly Fig. 3A would seem to follow a Spearman (i.e. monotonic increase) better than a Pearson (i.e. linear increase). Was there any reason for using Pearson?

L185 – L192. The statements concerning pinonic acid and levoglucosan origins (forests and burning) need some references added.

L193 – L201. It may not be possible, but do the authors have any suggestions for group 3? i.e. can any of the compounds be identified, thus suggesting what sort of pollution event occurred?

L208. Amenability is a slightly unusual word choice. Maybe “susceptibility” might be better.

L214 – L215. Please add a reference for “longer sVOC are in general less volatile”

L217 – L222. The authors look at changes that occurred on the 29th. Specifically, the observed increase in pinonic acid stalled. They also claim that levoglucosan was elevated, but as this was increasing anyway it seems difficult to attribute it to the same

cause? Anyway, a halt in the rise of pinonic acid would suggest (according to the earlier hypothesis involving conifer forests) that the wind has switched direction and is coming from an area less dominated by forests. Did the authors consider this? The rise in levoglucosan might suggest the wind comes from an area with more biomass burning. Again, was this considered? Fig 1 also suggests quite a pronounced humidity change on this date. What are the implications of this?

L236. Reading on I see the authors discuss biomass burning in relation to my above comment, but it still needs elaborating on.

L241. The authors suggest there is lower total OM on the 29th (fig 2A). Considering the error bars, I would say there is no difference in total OM between the 26th and the 29th.

L262. Biomass burning is mentioned previously, but here, for the first time in the paper we have mention that the source of this is residential fires. This should be mentioned earlier in the paper.

Fig 3. The labels could be increased in size, especially on the y axes, as they are difficult to read. Also, the four panels of Fig 3 and Table A1 should follow the same order. That is, Fig 3 shows pinonic (A), levoglucosan (B), decreasing trend (C), then increasing trend (D). However, in Table A1 the order is pinonic, levoglucosan, increasing, decreasing. Maybe easiest to swap columns 3 and 4 around in table A1 so the orders are the same. Also, for the legend of Fig 3, it would help the reader to note that panel C is increasing (then decreasing), and panel D is increasing (then saturating). Also, what do the weather symbols mean on panel A?

Table A1. The authors say "Note that different thresholds of R values are used to isolate the groups." This needs expanding on. Looking at Fig 3, ions that fit into panels A, B and C must all correlate with ions from other panels (they all increase to some extent). I.e. it is possible for an ion in the pinonic acid group to probably correlate with an ion in the D/increasing group. I assume that the authors are trying to say is that they used

R2 cutoffs to decide which ions went into each group. Perhaps this could be clarified.

Acknowledgements. There is a typo: “tis”

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2018-203, 2018.