

## ***Interactive comment on “Characterization of carbonaceous aerosols in Singapore: insight from black carbon fragments and trace metal ions detected by a soot-particle aerosol mass spectrometer” by Laura-Hélène Rivellini et al.***

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Rivellini et al made ambient measurements of aerosol chemical composition with an SP-AMS on the campus of the National University of Singapore. PMF analysis was performed on the data and the authors investigated how the inclusion of rBC and metals into the PMF affected the interpretation of the PMF results. Overall, this is an interesting data set that highlights how rBC and metal measurements can enhance our understanding of aerosol sources.

### C1

Major comments 1) The SP-AMS calibrations and data analysis need to be described in more detail. In particular, CE needs to be considered/discussed in more detail. Is there evidence for the morphology and coating of the rBC particles varying at all over the course of the measurements (and consequently a varying CE)? How would a varying CE affect the interpretation of the measurements and the PMF results?

2) In Sect. 3.4, the C1/C3 analysis should include a discussion about how uncertainty in the contribution of C1+ from non-refractory organic aerosol affects the interpretation of the ratio, particularly since a constant C1/C3 ratio was used to as a correction factor (Sect. 2.2). It may be beneficial to investigate the ratio of other Cx ions (e.g., C4/C3) to provide insight into the possible contribution of organics to C1.

3) Sect. 3.5.1 would be strengthened by a more detailed discussion regarding urban sources of metals and including more metals in the analysis. Additionally, the potential contribution of oceanic sources to Na+ should be discussed in more detail. While the authors state that Na+ and Cl- exhibit poor temporal correlation, I assume this is for the whole data set. If one filters by wind direction (and thus sea breeze) does this still hold? Additionally, is there an interpretation for the large contribution of Na+ in LO-OOA? Finally, does the fact that different C1/C3 ratios were seen for LO-OOA and HOA (the factors with the strongest Na+ contribution) tell us anything about the different sources of Na+?

4) To me, it seems that the last sentence of the introduction and the last paragraph of the conclusions overstate the implications and applications of the manuscript. Optical properties of aerosols were not discussed in the manuscript, so the inclusion in the introduction and conclusion seems out of place. Moreover, the work of Kasthuriarachchi et al (2019) is under review so the inclusion here is somewhat misleading. I suggest that the authors consider revising this paragraph and the last sentence of the introduction to better reflect the material covered in this study.

Minor Comments -It would be helpful to explicitly pinpoint some of the main industrial

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sources (such as the oil refinery discussed in the introduction and shipping ports) in Figure S1a.

-Page 7 lines 12-15: Regarding the production of organo-sulfur compounds in acidic sulfate plumes – this seems rather poorly supported at the moment. As it does not advance the main focus of the paper, I suggest removing.

-Figure S4a the legend (colors based on CH<sub>2</sub>SO) doesn't match the caption (data originating from SW and other directions).

-Figure S4d needs a color scale. The 2 modes (discussed at the end of page 6) are also not apparent from this figure, perhaps due to the color scale used. Currently it looks to me more like the distribution broadens when the concentration increases in the middle of the day.

-Discuss figures in order (e.g., Fig. S6 is currently referenced before S5). Cite panels of figures in order (for instance, the panels of Fig. S4 are cited out of order).

-Figure S5: The wording in the caption is unclear, specifically "... both filtered from 25th to 28th of May, over the campaign." Is "both" just COA and HOA? Does it mean that only the 25th to 28th was included?

-In Sect 3.5.2, why use m/z 60 rather than the HR ion (C<sub>2</sub>H<sub>4</sub>O<sub>2</sub><sup>+</sup>)?

-Page 10 line 27: rather than "inferior" use "smaller than"

-Page 12 line 23: I do not find the similar size distributions for m/z 39 and 60 to be convincing evidence for a BBOA source. m/z 60 is the only individual organic ion shown in Fig. S8b. How unique is the size distribution for m/z 60 compared to other individual organic ions?

-Page 12 line 19: should this be Figure 5d rather than 3c and 4b?

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C3

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C4