

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2022-261

Anonymous Referee #1

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Referee comment on "Measurement report: Atmospheric new particle formation in a coastal agricultural site explained with binPMF analysis of nitrate CI-APi-TOF spectra" by Miska Olin et al., Atmos. Chem. Phys. Discuss.,  
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General comment:

In this measurement report, "Measurement report: Atmospheric new particle formation in a coastal agricultural site explained with binPMF analysis of nitrate CI-APi-TOF spectra" Olin et al. performed nitrate-CIMS measurement at a coastal site. BinPMF was applied to the CIMS data, reporting two factors- F7 and F8, with high mass-to-charge ratios factor, which explained the NPF events well. It is an interesting study, and the results appear to support the conclusion. I have some minor comments the authors may want to consider before publication. My biggest concern is the uncertainties of the measurement as it can lead to some problems when comparing the intensities of different factors.

Specifics:

Abstract. You may want to associate F7 or F8 with a more physically meaningful name, as it is hard to comprehend what is the chemistry behind F7/F8.

Line 73. Provide more details about how the instrument works in principle. E.g., how the agent ion was produced, and at what rate? What is the flow rate being sampled into the CIMS?

Line 79. Any specific reason for averaging to 600 s? Is the code open-sourced, available at what site?

Line 80. What are the errors for the m/z calibration?

Line 85-90. I assume the C value is obtained by your calibration, while P is from the literature? Just wondering if the C and P values would vary a lot over different times and with different instruments.

Line 90. I am not familiar with nitrate CIMS calibration, can you explicitly explain what "penetration efficiency" is?

Line 105. Elaborate on the uncertainties for the determination of H<sub>2</sub>SO<sub>4</sub>, HIO<sub>3</sub>, and CH<sub>4</sub>SO<sub>3</sub>.

Line 108, "Ions smaller than 169 Th were omitted because there are many organic compounds that are unlikely the key compounds in NPF and have relatively high signals possibly causing issues in the binPMF analysis" It is not clear why many organic compounds are unlikely the key compounds in NPF.

Line 121. It is not clear why X needs to be normalized and how it is normalized? Is the signal used to calculate H<sub>2</sub>SO<sub>4</sub> concentrations normalized?

Line 125. I am slightly confused as it seems S<sub>ij</sub> is associated with moving median, but in equation (4) no median values were used. Is the a value of 1.35 a reference value from literature? Or determined by what method specifically.

Line 137. Define "substantially". A low Q/Q<sub>exp</sub> is not necessarily the best PMF solution.

Line 145. Again, what is the uncertainty for the assumptions of similar calibration coefficient and penetration efficiency?

Line 155. Define "strong" and "weaker". Do you mean particle number concentration?

Line 157. How was CS determined? Maybe explain it in the Method section.

Line 175. It is hard to comprehend this sentence. Define "smallest particles" and rephrase

“simultaneously not elevated”

Line 193. Any data to support the statement of “(3 factor profiles having organic patterns with  $p = 6$  or  $p = 7$ )”.

Line 280. Has NetRad been mentioned before?

Line 353. F8 and F7 may have different sensitivity in CIMS. You may need to discuss the uncertainties when comparing their intensities.

Line 354. I don't see why it confirms the transformation from F8 to F7 as F8 decreases while F7 increases. There are other possibilities e.g., transport of pollutants with different intensities, and changes in air masses.

Line 379. “...temperature to disfavoring them...” do you specifically mean high or low temperatures?

Conclusion. You may want to make the conclusion section short, highlighting the new findings in this study.

Figure 1. What is the red ban between Dp 3-8 nm?

Figure7. The label/legends in this figure are small, you may want to make it visible at a font size of at least 8.