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Interactive
comment

# *Interactive comment on* "Impact of organic acids on chloride depletion of inland transported sea spray aerosols" *by* Bojiang Su et al.

## Anonymous Referee #1

Received and published: 7 July 2020

General comments

This paper discusses the depletion of chloride in sea spray aerosol (SSA) particles based on a field observation of atmospheric aerosol during the East Asian summer monsoon using a single particle aerosol mass spectrometer. The authors claim that up to 34% of chloride depression could be explained by organic acids. They also claim that SSA of biogenic origin exhibits chloride depression that is distinctly different from that of commonly observed aged SSA, and infer that organic coatings on SSA could influence on the heterogeneous reactivity of SSA particles. The subject of this study is important to understand the chemical processes of SSA and also their role in the atmosphere.

Although the findings from this study are potentially significant, the conclusions are

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Discussion paper

not fully supported by the experimental evidence provided in the current version of the manuscript. For example, in the quantitative analysis of the contributions of inorganic and organic acids on chloride depression, no explanation is provided about possible different sensitivity of the mass spectral analysis to different compounds. Further, the comparison of Cl/Na from mass spectra and that from mass concentrations was performed by omitting a substantial fraction of data points, without an adequate explanation on the rationale of the omission. To draw a solid conclusion from the data set presented in this paper, a thorough revision is necessary. More specific comments are listed below.

Specific comments

Page 3, lines 25-26: For nitrogen and sulfur, the explanation here sounds an overstatement. Page 6, line 80: Is there any experimental/theoretical evidence to support reaction R5? Page 9, lines 146-151: If both types of particles were subjected to the analysis, it should be explained explicitly. Page 10, line 163: What is the exact number of groups? Page 10, line 166: To justify the identification of SSA particles, a brief explanation on the differences between SSA particles and other types of particles should be provided. Page 13, line 222: What can crystallize? The meaning of "precipitation" is not clear. Page 13, lines 228-229: The definition of hourly-mean peak areas in Fig. 2 is unclear. Page 13, lines 232-233: This explanation is reasonable if nitrate was observed less frequently for non-SSA particles. Page 13, lines 236-238: It is difficult for readers to follow this part without an explanation about the mechanism of the suppression. Isn't it also possible that nitric acid and other acids have different reactivity to sea salts? Page 14, lines 245-246: The expression is misleading because the result in Fig. S4 is on number basis and may not relate to the mass concentrations of different organic salts in SSA particles. Page 14, lines 246-258: In the absence of an appropriate explanation on possible different sensitivities of this mass spectrometry to different types of chemical components (sulfate/nitrate/organics), the discussion here is questionable. Page 14, lines 258-261: Are the peak areas here hourly mean values?

Page 15, lines 264-265: Isn't there any possibility that matrix substances in the particles affect the relative sensitivity to detect Na and Cl? Page 15, lines 272-275: The mass concentrations of Na+ and Cl- seem to be from ion chromatography but there is no explanation about the methodology in the main manuscript. Page 15, line 280: Two assessment methods should be explained explicitly. Page 15, line 281-283: The analysis of the correlation is problematic because 7 among 22 set of data were omitted from the analysis without an appropriate assessment. Page 33, line 623: Which part of data shows a normal distribution? Why it is obtained by the logarithmic transformation? Page 35, lines 632-635: An explanation on the box and whisker plots should be given. Page 36, lines 637-639: Isn't it more reasonable to write Cl/Na as a function of peak areas of phosphate and organic nitrogen? Page 2, lines 7-11 (supplement): The association between trajectories on the map and C1-C4 should be explained. The graph superimposed on the map should also be explained. Page 4, lines 19-20 (supplement): If the detection efficiency for small particles was low, the peak shapes may be skewed. The possibility that similar peak shapes were obtained as a result of this bias needs to be discussed.

Technical corrections

Page 3, line 35: "may be associated"?

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-443, 2020.