

***Interactive comment on “Uptake selectivity of Methanesulfonic Acid (MSA) on fine particles over polynya regions of the Ross Sea, Antarctica” by Jinpei Yan et al.***

**Anonymous Referee #1**

Received and published: 17 December 2019

**Summary:**

The manuscript “Uptake selectivity of Methanesulfonic Acid (MSA) on fine particles over polynya regions of the Ross Sea, Antarctica” presents results from a field campaign undertaken in 2017/2018. The focus of this study is to investigate the uptake of MSA on different particle types. For this purpose MSA mass concentrations and total aerosol population, coupled with size resolved data, were collected simultaneously. The results of this study provide a clear characterisation of MSA uptake in the presence of different pre-existing particles, which I believe is of high interest for the aerosol community. Therefore, I recommend the paper for publication after the following comments

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have been addressed:

**Major comment:**

I think the results are described in a very clear and precise way. The only thing I was wondering about is the probability of the source of certain particles. It is discussed that Na and Mg are typically associated with sea spray aerosols, while EC and OC are more associated with primary emissions from combustion processes and K with biomass burning. Did the authors try to check where the air-masses were originating from during the campaigns to assess whether biomass-burning or in general combustion processes would have been expected during this period? If there were no known sources of such processes during this time – could this indicate that the pre-existing particles originated from long-range transport? I would recommend to include a discussion on this in the revised manuscript.

**Minor comments:**

1. The manuscript currently presents data described in a mixture of present and past tense. I recommend sticking to one tense throughout the manuscript.
2. The manuscript contains several mistakes regarding singular/plural expressions that should be revised.
3. It is stated in the manuscript that sea spray aerosols generated by bursting bubbles are generally in the course mode (page 15, lines 322-323). This is not correct as the majority of particles from bubble busting (considering number concentrations) peak at diameters around 100 nm. See for example De Leeuw et al. (2011) or Prather et al. (2013).

**Specific comments:**

Page 2, line 38: replace “have showed” with “have shown”

Page 2, line 43: replace “were” with “are”

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Page 3, line 64: replace “intensity” with “intense”

Page 3, lines 71-72: replace “ices” with “ice” Line 72: As an example of the “minor comment 1”: replace “have” with “had”

Page 5, line 104: use a capital “W” for the unit “Watt”

Page 6, line 139: remove the “the” in front of “leg I”.

Page 6, line 414: replace “following” with “followed”

Page 7, line 158: replace “were presented” with “were present”; this mistake occurs more often in the manuscript.

Page 8, line 180: I am not sure I would call a  $R^2=65$  a “strong positive correlation”, rather just a “positive correlation”

Page 10, line 232: Rephrase the beginning of the sentence – “The simultaneous. . .”

Page 11, line 234: Replace “suggesting” with “suggest”

Page 11, line 235: Add “c,d” to the citation of the figure 5

Page 11, line 251: rephrase “a few signals of..”

Page 12, line 257: example of “minor comment 2”: replace “were” with “was”

Page 14: line 299: replace “conforming” with “confirming”

Page 17: line 350: rephrase sentence starting with “The other one halogen radicals. . .”

Page 17: line 364: rephrase sentence starting with “Following by the MSA-Na. . .”

Page 17: lines 369-371: Delete last sentence as it is repeated in the conclusion.

References:

de Leeuw, G., Andreas, E. L., Anguelova, M. D., Fairall, C. W., Lewis, E. R., O'Dowd, C., Schulz, M., and Schwartz, S. E. (2011), Production flux of sea spray aerosol, *Rev.*

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*Geophys.*, 49, RG2001, doi:10.1029/2010RG000349.

Prather, K.A., T.H. Bertram, V.H. Grassian, G.B. Deane, M.D. Stokes, P.J. DeMott, L.I. Aluwihare, B.P. Palenik, F. Azam, J.H. Seinfeld, R.C. Moffet, M.J. Molina, C.D. Cappa, F.M. Geiger, G.C. Roberts, L.M. Russell, A.P. Ault, J. Baltrusaitis, D.B. Collins, C.E. Corrigan, L.A. Cuadra-Rodriguez, C.J. Ebben, S.D. Forestieri, T.L. Guasco, S.P. Hersey, M.J. Kim, W.F. Lambert, R.L. Modini, W. Mui, B.E. Pedler, M.J. Ruppel, O.S. Ryder, N.G. Schoepp, R.C. Sullivan, and D. Zhao (2013). Bringing the ocean into the laboratory to probe the chemical complexity of sea spray aerosol. *PNAS*, 110(19):7550–7555.

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