Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-811-AC2, 2019

Atmospheric Chemistry and Physics
Discussions

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.

Jinpei Yan et al.

jpyan@tio.org.cn

Received and published: 30 December 2019

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. It is true that aerosol particles would be impacted by the long-rang transport sources. The back trajectories along the cruise tracks in Ross Sea are given in Fig. SS1. The major air masses originated from the local sources during the cruise. The aerosol particle chemical compositions did not reveal an obvious correlation with air back trajectories in this study (Fig. 4 and Fig. SS1). Hence, in this study, particles are mainly associated with the local sources but not the long-range transport. We have added the discussion in the manuscript. OC particles are often associated with anthropogenic sources, such as vehicle and coal combustion (Silva et al., 2000; Stiaras et al., 2008), marine biogenic sources (Quinn et al., 2014) and secondary sources (Horne et al., 2018). It is the case that OC particles are mainly derived from fossil fuel combustion and secondary sources in the coastal and urban regions. But in the marine atmosphere, OC particles are often determined by the marine biogenic sources (Quinn et al., 2014, Yan et al., 2018). EC particles are typically associated with primary emissions from fossil fuel combustion, such as ship emissions in the ocean area. K is often used as a marker of biomass burning in the continent, but K can also be derived from other sources, such as coal combustion, biological materials. In this study, the signature of K is very different from the K signature from biomass burning, indicating that K particles are not associated with the biomass burning. Na and Mg are often associated with sea salt particles in the marine atmosphere. Positive corrections between Na, Mg and wind speeds are present in the Fig. SS2, indicating that those particles are derived from sea spray aerosols. We have added the discussion in the 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. Thanks for the suggestion, present tense is accepted. We have revised throughout the manuscript.

2. The manuscript contains several mistakes regarding singular/plural expressions that

should be revised. We have revised in the manuscript.

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 form bubble busting (considering number concentrations) peak at diameters around 100 nm. See for example De Leeuw et al. (2011) or Prather et al. (2013). It is the case that sea spray aerosols peak at diameters around 100 nm in some studies (De Leeuw et al. (2011) or Prather et al. (2013)), and the major sea spray aerosols are in submicron size (number concentrations). But the sea salt particles have a wide size distribution, ranging from 0.01-8 μm (Clarke et al., 2006). The expression is ambiguous here. We have revised in the manuscript. Thanks for the suggestion.

SpeciïňĄc comments: Page 2, line 38: replace "have showed" with "have shown" We have revised in the manuscript.

Page 2, line 43: replace "were" with "are" We have revised in the manuscript.

Page 3, line 64: replace "intensity" with "intense" "intense" is accepted in the manuscript.

Page 3, lines 71-72: replace "ices" with "ice" Line 72: As an example of the "minor comment 1": replace "have" with "had" We have revised in the manuscript.

Page 5, line 104: use a capital "W" for the unit "Watt" We have revised in the manuscript.

Page 6, line 139: remove the "the" in front of "leg I". "the" has been removed in the manuscript.

Page 6, line 414: replace "following" with "followed" "followed" is accepted in the manuscript.

Page 7, line 158: replace "were presented" with "were present"; this mistake occurs more often in the manuscript. We have revised throughout the manuscript.

Page 8, line 180: I am not sure I would call a R2=65 a "strong positive correlation", rather just a "positive correlation" "positive correlation" is appropriate here.

Page 10, line 232: Rephrase the beginning of the sentence – "The simultaneous..." We have rephrased in the manuscript.

Page 11, line 234: Replace "suggesting" with "suggest" We have revised in the manuscript.

Page 11, line 235: Add "c,d" to the citation of the ïňĄgure 5 We have added "c,d" to the citation of the Figure 5.

Page 11, line 251: rephrase "a few signals of.." We have revised in the manuscript.

Page 12, line 257: example of "minor comment 2": replace "were" with "was" We have revised in the manuscript.

Page 14: line 299: replace "conforming" with "conïňĄrming" We have revised in the manuscript. Page 17: line 350: rephrase sentence starting with "The other one halogen radicals..." We have revised in the manuscript.

Page 17: line 364: rephrase sentence starting with "Following by the MSA-Na..." We have rephrased in the manuscript.

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

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 ïňĆux of sea spray aerosol, Rev 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. Clarke, A. D., Owens, S. R. Zhou, J. An ultrafine sea-salt flux from breaking waves: implications for cloud condensation nuclei in the remote marine atmosphere. J. Geophys. Res. 111, D06202. (doi:10.1029/2005JD006565), 2006. Silva, P. J., Carlin, R. A., Prather, K. A. Single particles analysis of suspended soil dust from Southern California. Atmos. Environ. 34, 1811-1820, 2000. Sitaras, I. E., Siskos, P. A. The role of primary and secondary air pollutants in atmospheric pollution: Athens urban area as a case study. Environ. Chem. Lett. 6, 59-69, 2008. Horne, J.R., Zhu, S., Montoya-Aguilera, J., Hinks, M.L., Wingen, L.M., Nizkorodov, S.A., Dabdub,D. Reactive uptake of ammonia by secondary organic aerosols: Implications for air quality. Atmos. Environ. 189, 1-8, 2018. Quinn, P.K., Bates, T.S., Schulz, K.S., Coffman, D.J., Frossard, A.A., Russell, L.M., Keene, W.C., Kieber, D.J. Contribution of sea surface carbon pool to organic matter enrichment in sea spry aerosol. Nature Geos. 7, 228-232, 2014. Yan, J., Lin, Q., Zhao, S., Chen, L., Li, L. Impact of marine and continental sources on aerosol characteristics using an on-board SPAMS over Southeast Sea, China. Environ. Sci. Pollution Res. 25, 30659-30670, 2018.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-811, 2019.

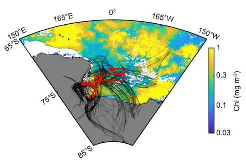

Fig. SS1 The back trajectories along the cruise tracks in Ross Sea

Fig. 1.

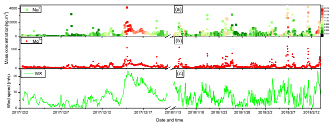

Fig. SS2 Time series of Na and Mg concentrations and wind speeds during the cruise.

Fig. 2.