

## ***Interactive comment on “Sensitivity of Arctic sulfate aerosol and clouds to changes in future surface seawater dimethylsulfide concentrations” by Rashed Mahmood et al.***

### **Anonymous Referee #1**

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This study concerns the impact of Arctic DMS emission on sulfate aerosol concentrations and cloud formation under present and future sea-ice conditions. The authors use a model nudged to winds and temperature for year 2000 and 2050 with various assumptions for DMS concentrations. DMS emissions are highly uncertain and modeling studies of the impact of DMS emissions are still few, and I think this study makes a useful contribution to the field. The perturbations of DMS concentrations are quite high, but the authors argue well that such high perturbations are needed. The conclusion about the negative feedback loop along with figure 8 are interesting findings. I would recommend this manuscript for publication after some clarifications given below sorted by line number:

C1

L40: Could you give examples of such favorable conditions in the atmosphere and ocean?

L51: Could you add why there is little evidence under present climate conditions?

L52: Which important feedback loops exists in the Arctic?

L57: Again, why would the emissions be enhanced particularly in the Arctic?

L63: How is this shown to be problematic?

L71: How do the Arctic DMS concentrations from Lara et al. 2011 differ from previous studies?

L111: I am a little confused about these sensitivity tests: are they linked to your study or are they different? If the latter; what did they show and how is your study different from them?

L158: Testdal/Tesdal reference

L160: Would the nudging to temperature and winds influence how the perturbed DMS emissions impact clouds compared to running with free meteorology?

L185: ‘good agreement’: a bit vague; could you add a number here?

L231: Why did you choose this number (16.9nM)?

L247: Can you also add that you are using the sulfur emissions from RCP8.5 as well for year 2050? (if that is what you are using?)

Figure 4-8: it is a bit difficult to separate the lines for the different runs in the panel which shows the zonal means. Also; why do you show 60N-90N for fig 4, and NH for the others? As far as I can see, you don’t discuss the results south of the Arctic, so I suggest only showing the Arctic latitudes -and make the plots larger, the lines thicker and/or different colors to make it easier to distinguish the lines.

L274: Can you add the numbers for increased precipitation and wet removal?

C2

L281: How large are the reductions?

L290: Do you think you would get a significant signal if the run was longer?

L307: Could you remind us of what the condensation sink is in the model?

L382: 'However, in the future': change to 'for year 2050 simulations' or similar?

L399: Can you add a couple of sentences about the main uncertainties in your model + set-up and link this to the last sentence?

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-876>, 2018.