

Interactive comment on “Observationally constrained analysis of sea salt aerosol in the marine atmosphere” by Huisheng Bian et al.

Anonymous Referee #2

Received and published: 24 March 2019

General comment:

This manuscript examines the vertical profile of sea salt aerosol concentrations obtained during the NASA Atom campaign, and evaluate the model's capability in reproducing the observations. The Atom observations offer unique vertical distributions of sea salt aerosols over the ocean, and thus provide some critical insight on the source function of sea salt aerosols. In this work, they chose a source function based on the surface friction velocity and sea surface temperature, and found that the model overestimates the observed sea salt aerosol mass concentrations, but underestimates the AOD over the sea salt dominated area. They suggest that it can be due to the discrepancy in modeled size distribution or relative humidity, pointing the necessity for further investigation to improve the sea salt parameterization. Overall, this work provides in-

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sightful information on improving parameterization of sea salt aerosols, and I support the publication of this work in ACP if they can address the following specific comments

Specific comment:

Line 114: How well is the surface friction velocity being represented in the model? For example, what is the range of error when compared to observations?

Line 161: How is the cut-off diameter of SAGA measurement? How does that compared to PALMS? Figure 2ab shows that the modeled SS seems to be underestimated when compared to the SAGA data, and overestimated while compared to the PALMS? Is it potentially due to the different cut-off diameter? What are the measurement uncertainties of SS in PALMS and SAGA?

Line 211: Although the sea salt between two instruments shows high correlations, is it possible that one of the measurements is consistently higher than the other one?

Line229: What is the vertical resolution of PALMS, and how does that compared to GEOS5? It seems that the model had a hard time catching some of the features in the higher troposphere.

Line 269: Just curious, what is the most abundant aerosol over the Arctic Ocean, as sea salt only contribute to 10-50% as shown in Figure 4 bottom?

Line 270: What is the cut-off diameter for the sea salt aerosols in the modeled AOD?

Line 276: Is the underestimate of AOD consistent around the globe? Or certain latitudes/SSTs have relatively smaller underestimates?

Which factor(s) do you think is/are most critical for improving the sea salt parameterization?

What measurement would you suggest to improve the sea salt parameterization?

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Table 1ab: Please write out the words or explain in the captions the abbreviation (such as SV deposition).

Figure 1ab: Please explain in the figure captions that what is r (correlation?) and b (bias?).

Figure 3. Please provide the vertical metric in height (km or m) if possible.

Figure 4. Please explain what is fss in the caption.

Comment for Supplement

Line 55: Could you please provides some details on how 2.41 is derived here (or the related reference)?

Line 65: Do you mean the correction factor, $T(SST)$, ranges from 0.0 to 7 here? I tried to calculate it, and it shows that at 36degreeC, the correction factor is 10.63. Also, at -0.1 degree C, it is 0.36? Is this due to rounding? Please double check. Also, please provide a plot of $T(SST)$ versus SST, if possible. And please provide details on how these correction factors are derived (or the related reference).

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-18>, 2019.

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