

***Interactive comment on* “The distribution of sea-salt aerosol in the global troposphere” by Daniel M. Murphy et al.**

Anonymous Referee #2

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ACPD Manuscript "" The distribution of sea salt aerosol in the global troposphere“, by D.M. Murphy et al.

The manuscript describes results of sea salt aerosol measurements from the ATom aircraft campaigns. The ATom campaigns provided unique datasets on many aspects of the properties and composition of the Troposphere that are particularly well suited for model evaluation purposes. Systematic measurements of sea salt particle concentrations in the Troposphere are rare. Therefore this dataset provides important information about the 3D distribution of this aerosol type. The authors speculate about the reasons for particular distributions within the observed vertical sea salt concentration profiles. The manuscript is well written and the results are useful. However, some comments should be taken into account by the authors before this manuscript should be consid-

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ered for publication in ACP.

A large part of the manuscript deals with the technical aspects of the measurements. I cannot comment on the methods, as this topic is beyond my expertise. Instead my remarks are about the science and interpretation of the measurement data.

Specific remarks:

- The ATom campaign should already be mentioned in the Abstract.
- The presentation of the results in the manuscript is mostly descriptive; at some places more detail would be helpful. The interpretations of the measurements remain quite speculative. E.g., on page 10 of the manuscript, the authors connect lesser large particle concentration in the upper troposphere to washout processes. This assumption is not supported by additional information – e.g. is there reason to assume gravitational settling cannot also play a role? Also, would cloud drying not lead to smaller particle sizes?
- Page 9, top: The authors describe the correlation of boundary layer sea salt with local wind speeds. For which height is the comparison performed? The authors claim that these variables are only weakly correlated, but do not provide any numbers or a figure to support this finding. Instead, they reference another earlier publication unrelated to the ATom measurements. Please clarify if this lack of correlation also is valid for the ATom data, and, if that is the case, a figure or correlation numbers would be appreciated. The weak correlation can be interpreted due to other influence factors controlling the sea salt concentrations such as relative that is mentioned here. However these are not shown either.
- Page 11: Are any correlations between sea salt aerosol and surface winds or humidity found over land?
- In subsection 3.2 the sea salt correlation with humidity is taken as indicator for wet removal of the particles. In contrast, on page 9 the correlation is explained as indicator

for mixing of air masses. Please clarify.

- The authors refer to model results shown in Figure 7 partly from submitted or 'in preparation' publications. This should be avoided.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1013>, 2018.

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