

Referee 1:

Thank you for addressing the comments, the revised manuscript is well improved to understand and read, and story structure/quality is better.

I want to add just one comment here;

Line 6 in abstract, you mentioned the 4 distinct scenarios as potential variability. It is a bit difficult to follow the length (I guess you describe it in lines 8-15?), so I suggest that you describe shorter sentence to be clear the 4 distinct scenarios with the characterization of the air mass/regional differences (based on Fig. 5 and Fig. A1), if my understanding is correct. i.e., (1) the predominance of polluted air mass in the Mozambique Channel, with the weakly hydrophilic aerosols,... (2) the predominance of pristine marine in xx, ... (3) with precipitation/storm events in xx, ...(4) with NPF events in xx, etc.

Thank you for your comment. We have modified the abstract (L8-15) as suggested to describe more clearly and concisely the distinct scenarios. Thank you for your help.

The paragraph has been modified in the paper as follows (L6-11):

“Four distinct scenarios are examined to elucidate some of these variations. (1) the predominance of pristine air mass in the eastern regions of the subtropical Indian Ocean, with highly variable κ values sensitive to the low aerosol concentration measured in this area (2) the predominance of polluted air mass in the Mozambique Channel, with weakly hydrophilic aerosols (3) a precipitation and storm event in the southern Indian Ocean, with highly variable κ values (4) a NPF event in the open ocean, with an increase in κ values as the new particles formed grow to Aitken mode particles.”

Editor:

Public justification (visible to the public if the article is accepted and published):

Editor comments for Dournaux et al. paper entitled “Origin, size distribution and hygroscopic properties of marine aerosols in the south-western Indian Ocean: report of 6 campaigns of shipborne observations” submitted for Atmos. Chem. Phys.

Thank you for responding to the reviewer comments. There are few more comments by the reviewer 1. Please respond to them.

In addition to the reviewer comments, I have few editorial comments regarding the structure and wording in the paper.

The title should reflect a bit better the content of the paper. I suggest to change the word “report” to “results” in this way: “Origin, size distribution and hygroscopic properties of marine aerosols in the south-western Indian Ocean: results of 6 campaigns of shipborne observations”.

The name of the sections and their order should be improved.

I provide a suggestion below. The content can stay almost the same. In the Results and Discussion section I suggest to first present the general results (properties, size distribution, relationships) and only then present the case studies. The figure numbering would change as the consequence as well as the order of paragraphs in the conclusions section.

2. Overview of the campaigns and observations

2.1 Campaigns

2.2 Geographical and meteorological context

2.3 Instrumentation

3. Data processing

3.1 Data filtering

3.2 Activation diameter and hygroscopicity parameter

3.3 Air mass classification

4. Results and discussion

4.1 Spatial and temporal variability of marine aerosols properties

4.2 Size distribution of marine aerosol particles

4.3 Relationship between marine aerosol hygroscopicity, wind speed, and nanophytoplankton abundance

4.4 Case studies

(please write a short justification of the selected case studies, 1-2 paragraphs)

4.4.1 Pristine case (OBSAUSTRAL)

4.4.2 Polluted case (SCRATCH)

4.4.3 Storm and rain case (SWINGS)

4.4.4 Nucleation case (OP3)

5. Conclusions

End of the conclusions, I suggest to edit the last paragraph (integrate with the previous paragraph):

“This paper highlights the need to incorporate the variability of marine aerosol CCN properties into meteorological models, emphasizing the complexity of their characterization due to various coupled processes involving emissions, transport, aging, and chemical composition.”

Please provide few sentences of the impacts that could be reached after doing this.

Figure 1. Please explain AC, SIC, NEMC, SEMC, SEC acronyms in the figure caption.

Yours,
Tuukka Petäjä

Thank you for your comments. As suggested, we have modified the title of the manuscript, the titles of the sections and subsections. We find them clearer and more concise. We have explained the acronyms in the caption of Figure 1. We have also edited the last paragraph of the conclusion, added a concluding sentence, and modified the abstract as recommended. Thank you for your help.

The reorganization of the outline you propose is the same as the one we had initially proposed in the first submission. However, one of the main comments made by both reviewers was to reorganize this outline to better explain the variability of the observations made during the campaigns. We therefore proposed that the case studies (section 5) be used to understand the spatial and temporal variability and heterogeneity of the observations in Figure 4.

Section 7 is then a generalization of the observations by region, but does not include the temporal dimension of the observations along the ship's route.

Objectively, we agree with the reviewers and believe that this new organization is clearer in the presentation of the results.

We therefore prefer to keep this outline.

We also corrected the sentence L390 as there was a mistake:

“The κ at 0.2% of SS increases at 0.46.”

Here we are describing the increase of κ at 0.2% SS and not at 0.4% SS.