

Interactive comment on “OCEANFILMS sea-spray organic aerosol emissions – Part 1: implementation and impacts on clouds” by Susannah M. Burrows et al.

Anonymous Referee #1

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In this article, Burrows and coauthors describe the implementation of sea-spray organic aerosol emissions into the Energy Exascale Earth Systems Model and the subsequent impact on marine organic aerosol concentrations and cloud properties. While not the first global modeling study to estimate the cloud impacts of marine organic aerosols, this article is one of the most comprehensive to date incorporating an advanced emission parameterization into a state-of-the-science global model. I recommend acceptance of the article to ACP after addressing the minor comments below:

1) After several sensitivity tests, the authors recommend an internally-mixed marine organic aerosol emission sources that is added on top of sea-salt aerosol emissions.

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Based on the statistics presented, I don't see how the authors differentiated the performance between the internal and external mixture of sea-salt and organics. While the "ADD" vs. "REPLACE" difference seems more clear, I think that the authors need to do a better job justifying that choice.

2) Another issue that I have with the sensitivity tests is that they seem too dependent on the choice of sea spray emission function. I'd recommend that the author include some evaluation of the sea-salt concentrations; if the predicted sea-salt concentrations agree well with observations at Mace Head and Amsterdam Island, it gives confidence that the sea spray emission function can be used to evaluate the sensitivity tests of the marine organic aerosol emissions.

3) I'd suggest additional description of the mode implementation of the marine organic aerosols. Specifically, I was wondering whether the "REPLACE" and "ADD" sensitivity tests have marine organic aerosols replace/add both number and mass relative to the sea-salt number and mass? A similar question for the "EXT" and "INT" simulation; when you add the marine organics to the primary carbon mode is it really being considered an external mixture in the model. I'm also unclear about the "EXT_REPLACE" simulation, are you adding the same quantities of number and mass to the primary carbon mode as you're removing from the accumulation mode? Does the hygroscopicity of the primary carbon mode change as a function of the amount of marine organic aerosols?

4) Typos: Page 2-Line 27; "ina", Page 5-Lines 7-8; should be "Mårtensson", Page 19-Line 28; "spary", Page 24-Lines 7-11-29; remove bracket from reference, Page 24-Line 18; fix reference, Page 25-Line 20; should be "Nenes, A.,"

5) Figures 3 and 4: consider making them colorblind accessible, especially the red and green lines.

6) Table 5: clarify whether the units are absolute or percentages.

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7) Figure 6 and 7: some of the areas have a green color that is not part of the color scale.

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