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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A comparison of sea salt emission parameterizations in Northwestern Europe using a chemistry transport model setup" *by* Daniel Neumann et al.

Anonymous Referee #2

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Review to the paper "A comparison of sea salt emission parameterizations in Northwestern Europe using a chemistry transport model setup" by Neumann Daniel, Matthias Volker, Bieser Johannes, Aulinger Armin and Quante Markus

In the paper, the comparison of three parameterizations of sea salt emission within the framework of CMAQ chemical transport model is presented. The source functions tested here are those formulated in the works of Gong (2003), Spada et al. (2013) and Ovadnevaite et al. (2014), which calculate sea salt particle production depending on different combinations of wind speed, salinity, sea surface temperature and wave conditions. To evaluate the accuracy of those source functions model calculated sodium concentrations are compared with observations, focusing on North-Western European

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regions.

The paper includes ample discussions of the results, thus making a nice contribution to sea salt modelling regarding the choice of parametrizations and demonstrating the uncertainties. Regretfully, the studied period is rather short, being limited to just a few months, January-February and June-August 2008, which makes the conclusions less robust. Moreover, there is significant inter-annual variability in sea salt production related to meteorological variability, and it'd be worth testing the parameterizations for a broader set of conditions. Regarding evaluation of the results for sea salt size distribution, much more measurements are available for later years than 2008, which would facilitate making more founded conclusions. I think that the limited character of the study should be pointed out in relevant places in the paper (abstract, study aim, conclusions). Then, why would not the authors also look at sodium concentration in precipitation, for which much more measurements are available.

Furthermore, I cannot see that the authors manage to achieve the stated aim, namely "to improve modeled atmospheric sea salt concentrations..", but rather "to contribute" to this improvement through testing some of the available source functions, pointing to their strength/weaknesses and recommending certain improvements to the parameterizations (though without priorly testing them) .

Despite the above comments, I consider the paper to be an interesting study and support its publication in ACP after some minor revisions and editing are performed.

1. Does the paper address relevant scientific questions within the scope of ACP? Yes. Accurate modelling of sea salt is important for models' ability to adequately describe atmospheric heterogeneous chemistry and pollutants' residence time, and thus important for assessments of air quality, acidification and eutrophication especially in the coastal regions. The

2. Does the paper present novel concepts, ideas, tools, or data? Partly. The novel piece of work is testing the recently published parameterization by Ovadnevaite et al.

(2014) in comparison with the the other ones commonly used in CTMs and observation.

3. Are substantial conclusions reached? The paper presents findings and discussions regarding comparative performance of the three sea salt parametrizations at different distances from the coasts based on the rather limited observational dataset. Also, some recommendations are made (but not tested in practice) to improve the sea salt source functions.

4. Are the scientific methods and assumptions valid and clearly outlined? Yes

5. Are the results sufficient to support the interpretations and conclusions? Partly. No model experiments were conducted to trial some statements, like hypotheses of discrepancies between the parameterization and observations etc.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes 8. Does the title clearly reflect the contents of the paper? Yes

9. Does the abstract provide a concise and complete summary? Yes. I'd recommend to include in the abstract the time period for which the comparisons were performed.

10. Is the overall presentation well structured and clear? Yes

11. Is the language fluent and precise? Yes, mostly. In several cases, it's better to use "close to each other" or "similar" instead of "similar to each other"

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Largely Yes. Please, explain SST and SAL line 126.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? I'd recommend to a bit shorten section 3.2, perhaps skipping describing all small details and rather offering more summarized findings.

14. Are the number and quality of references appropriate? Yes 15. Is the amount and

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quality of supplementary material appropriate? Yes

Other comments:

1. Please, be consistent in using “Na in PMx” instead of just Pmx to avoid misunderstandings.

2. Check the sentence starting p. 1 line 23 (The parameterization of sea salt emissions has a long history..because..because..)

3. P.2 repetition in lines 1-3 and 12-13; lines 15-30 – relevance to PM pollution/ air quality?

4. In sec. 2 (model description), it’d be useful to explain how sea salt dry and wet deposition is calculated in the model. In what heights/model layers the emitted sea salt is distributed? Also, what was the upper cut-off size in the modelled sea salt?

5. Section 2.3: given the strong dependence of sea salt production on wind speed, could the authors say something about the accuracy of the wind data?

6. P. 10 line 5: explain the choice of Spearman’s correlation (not Pearson’s)

7. P. 12 line 14: change “least highest” to e.g. lowest

8. P. 13 line 1-2: positive/negative bias already means over/under-estimation – no need for repetition

9. P. 15 line 3: similar to; or similar as....

16-22: the obvious stuff; I’d recommend to edit: The analysis REVEALS...

29: at the station Westerland

33: dry deposition rate (instead of behaviour), perhaps

10. P. 17 lines 8-9: this difference of OV14 treatment of surf zone should probably be noted before, while comparing/evaluating the results

line 31: partially over/under-estimate??? maybe better to say “on average”? Or “in general”? 11. P. 18 lines 5-8: it’s somewhat unclear to me what the authors are trying to say here

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