Atmospheric
Chemistry
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Discussions

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Interactive comment on "A review of sea spray aerosol source functions using a large global set of sea salt aerosol concentration measurements" *by* H. Grythe et al.

H. Grythe et al.

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Answers are in bold

General comments This paper provides a thorough and well-argued evaluation of existing sea spray aerosol source functions and a discussion on dependencies of wind speed and temperature. It does not evaluate sea state, surfactants or other parameters which can have an effect on the sea spray source, however the parameters are mentioned in the paper, and the author is aware that these parameters can also be important. Additionally the authors suggest a new sea spray source function taking

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temperature dependency into account. The scientific methods used for this analysis seems very sound and the conclusions are solid. The authors have made a comprehensive literature study and the reference s listed are adequate.

We would like to thank reviewer for the positive overall assessment of our paper and the constructive responses.

Introduction:
1. (p3, line 10) a reference on SSA residence time is needed.
A proper reference for this is added to the text (Gong and Bartie 1997)

2. (P4, line 13) I suggest to use a reference more specific on ocean stress like "Garratt, 1977, Review of Drag Coefficients over Oceans and Continents, Mon. Wea. Rev., 105, 915–929."
The previously cited article was replaced by the suggested citation.

Ocean salinity:
4.(p9, line 28 – p10. Line 3) It is not clear to me what you mean, but I guess that you basically mean that the oceans do not have a salinity dependence because the salinity always is > 18 o/oo. Could that be rephrased?
These sentences has been rephrased and referenced to world ocean atlas: Based on this, most ocean water may be considered saturated with salts with respect to the amount of SSA produced, since the ocean bodies' salinity seldom is lower than 30 permil (Antonov et al 2006).

4. (P10, line 10-12) A reference about the relation between water depth and wave breaking is lacking.
Massel, S. R: Ocean waves breaking and marine aerosol fluxes. Vol. 38. Springer, 2007.

Observations:
5.(p11, line 8-10) either a reference is needed or an explanation of why Na+ is sufficient

to quantify the sea salt mass.
We have added a reference to Prospero et al. (2004).

6. (p12,line 10) Even though an open-face filter is used, there is still a cut-off depending on the flow. This needs to be discussed. Do you have knowledge of cut-off ranges for the different TSM samples?

This section has been extended to better describe the possible effects of the difference between cut-off and open face filters. For the EMEP stations some comparisons have been made between the PM10 measurements and open face filters. Results from this comparison have not been published, but in most conditions particulate matter concentrations did not differ significantly (W. Aas priv. com.). For this particular test it was not established whether this was due to an actual cut-off for the open faced filters (due to the flow conditions, as suggested by the reviewer) or whether the station (Birkenes) simply did not receive a large fraction of particle matter above PM10. In any case, the difference did not exceed 10%. For the non-EMEP open face filters we have not found any such comparison in the literature.

Based on the flow rate and filter diameter (47mm) an approximate cut off for the EMEP stations can be calculated for aerosol with Dp depending on the density of the particle. For RH=80% this theoretical cut off would be approx 11-14 μm, For the high volume samplers used in SEAREX, DOE and AEROCE the cut-off is more uncertain since we were not able to obtain any accurate sampling information. An additional factor which can play a role is wind speed, however, the sampling time ranged from days up to a week and this makes the estimates of wind speed on sampling efficiency very complex and any number we might provide will be at best case a rough estimate.

Global correlations:
7. (p23, line 20-21) It is not clear to me if FLEXPART has been used to simulate the

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global sea spray source using all 21 source functions....Could you write clearer where FLEXPART has been used? It is clear that it was used to study footprint areas for the sensitivity of the sources. 5.4. Aerosol production biases and an estimate for the global SSA production

In all result sections (5.1 -5.6) we have adjusted the text to clarify what was used to obtain the presented results. The only estimates that have not been derived with FLEXPART are the 5.2 global production estimates, since for this no dispersion modeling is needed.

8. (p24, line 3-4) You write: "This can be considered as our best estimate of the annual global SSA PM10 mass production" Why?
The sentence has been re-written to: 'Because it has the least bias of all estimates, this can be considered as our best estimate of the annual global SSA PM10 mass production '

Technical corrections:
Page 18, line 18. FLEXPART is spelled wrong.
This has been corrected, and it now reads FLEXPART.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20729, 2013.

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