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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling of sea salt pollution over Europe: key uncertainties and comparison with observations" *by* S. Tsyro et al.

Anonymous Referee #1

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Review of "Modelling of sea salt pollution over Europe: key uncertainties and comparison with observations", S. Tsyro et al.

In this paper, simulations of sea salt aerosol from the EMEP regional model are compared with measured sodium concentrations in air and precipitation. The sensitivity of modeled sea salt aerosol concentrations to changes in the aerosol source and deposition is examined and the EMEP model output is further compared to output from the SILAM model. The scientific content is relevant and interesting and this paper could provide a useful contribution to the field however some significant changes are required before I can recommend publication in ACP.

Major comments:

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Points that should be considered by the authors: 1. This is a long paper that I believe could be greatly improved by being made more concise, primarily by removing redundant material. In particular, Sections 2.1 and 2.2 could be removed without compromising the paper. Although most of this material is not important for this paper, some (for example a shortened discussion of previous model/observation comparisons of sea salt aerosol concentrations – Section 2.2) could be folded into Section 3.2, particularly to justify the use of the M&M source parameterization. Section 5.1 (including Figs 1&2) should also be removed as the results are not important for the stated aims of the paper and in the end this is simply an intercomparison of source functions without any recourse to measurements. The effects of changes in sea salt source function in the EMEP model itself are covered in Section 7.1 so what real additional and important information is contained Section 5.1?

Other redundancies and repetitions:

Page 11159, lines 21-24: Repetition

Page 11160, lines 16-20: Repetition

Page 11168, line 26: Remove sentence starting 'The results of sensitivity ...'. Not required.

Section 8.1: This description of the sea salt aerosol in the SILAM model is too detailed, particularly as you state on Page 11174, line 3 that a full description of the parameterization can be found in an alternative paper (albeit unpublished at this time).

Page 11174, lines 22-24: Repetition

Page 11176, lines 15-25 & page 11177, lines 1-9: Redundant

2. The last line of the abstract and the last sentence of the conclusions mention the improvement in insight gained with regard specifically to the EMEP model. If the results shown here are only relevant for the EMEP model then it is hard to justify their publication in an international journal like ACP. Although this paper is part of the EMEP

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modeling special issue, more emphasis should be placed on the contribution this work makes to regional sea salt aerosol modeling in general. This would then widen the group of interested readers and increase the paper's impact. I would like to see a greater emphasis placed on how these insights can be generalized to other, similar models which as discussed in Section 2.2, suffer from similar problems of inconsistent biases in sea salt concentrations (in air and precipitation). For example the sensitivity of the precipitation concentrations to the scavenging efficiency (in cloud and below) is interesting and I would anticipate this result is not specific to the EMEP model.

3. Instantaneously mixing emitted coarse mode aerosols through an approximately 90m layer may not be very realistic (e.g. Blanchard et al. Tellus B, 34, 118-125, 1984). This is a difficult modeling issue but given that you mention this point on Page 11155, line 14, should this also be discussed in Section 7.7?

General comments:

1. The use of 'pollution' in the title is interesting, not strictly incorrect (I believe) but perhaps it would be more appropriate to use 'concentration'.

2. Care should be taken when using of the term 'sea spray' (e.g. Abstract line 1, p11145 line 14, p11146 line 4 etc.) particularly given the recent publication of sea spray source functions that include both sea salt and organic components.

3. Sometimes Corr is used to indicate the correlation between observations and modeled output. At other times R is used. It would be helpful to keep consistency.

4. Figures 8 and 9 essentially shown the same information, which is also listed in Table A3. One of these figures (I suggest Figure 9) can be removed.

Specific comments:

There are numerous grammatical errors throughout the manuscript, and although in most cases they do not detract from the scientific content I would suggest that after revisions have been completed, a through proof reading is undertaken by a native

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English speaker. Only errors which are likely to confuse of misinform the reader are addressed below in the specific comments.

Page 11145, lines 22-24: 'Since measurements . . .'. This sentence is unclear. Please rewrite to clarify your point.

Page 11151, line 14: 'transport models have to date, compared . . .'

Page 11153, line 4: If the ECMWF data are from 1996. how can you make the comparison shown in Table 7? Do you mean 2006?

Page 11156, line 20: '. . . areas where road salting is carried out in winter, however a study . . .'. Is the 90% value mentioned on line 21 referring specifically to salt deposition?

Page 11156, line 22: Be clear here that you are referring to the size distribution of sea salt mass. The number distributions are very different (e.g. Heintzenberg et al. Tellus B, 52, 1104-1122, 2000).

Page 11161, lines 14-15: Please specify that these correlations are also listed in Table 2.

Page 11168, lines 15-17: Is there a reference for this wind speed verification?

Page 11169, lines 3-6: These statements require some justification and/or references.

Tables 3-7 & A2-A3: Include units for Obs, Model and bias

Figure 5, please label the x-axis in addition to the explanation given in the caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 11143, 2011.