

Interactive comment on “Updating sea spray aerosol emissions in the Community Multiscale Air Quality (CMAQ) model version 5.0.2” by B. Gantt et al.

Anonymous Referee #1

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This paper presents results of a model-measurement comparison that was done in order to improve sea spray aerosol emissions in coastal and near-coastal regions. It is a valuable paper in that measurements were used to improve model output. It should be publishable in GMD once the concerns below have been addressed.

The title and abstract should state that the paper focuses on updating SSA emissions in coastal regions.

Throughout – use Revised and Baseline in text and figure captions to describe v5.0.2h vs. v5.0.2a. That will make it much easier for the reader to track which model version is being referred to.

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p. 3907, line 3: The Pierce and Adams (2006) paper estimates emissions of sea salt using a global model. Papers that report the sea salt fraction of CCN based on measurements should also be cited here.

p. 3911, Lines 9 – 17: Were all measurements (and, therefore, cut-off diameters) at ambient RH?

p. 3911, last paragraph: Why were the shipboard measurements made during CalNex not included in the analysis?

p. 3913, line 25: “expected to result in increasingly large fine mode SSA emissions”. Does this refer to quantitatively large emissions or the fine mode emitted SSA is larger in size?

p.3914: Lines15 – 19: In the text and in Table 1 it is unclear how the SST dependence was calculated in CMAQv5.0.2h. Was the third-order dependence of Jaegle, the linear dependence of Ovadnevaite, or a hybrid used?

Table 2: What is the “Corr” term shown? Is it the coefficient of determination, i.e., r^2 ? Also, what are the size ranges of the predicted Aitken and accumulation modes?

p. 3915, lines 13-14: An Aitken and accumulation mode of $D_{p,dry}$ ranging (together) from 10 nm to 1 μm would not result in a direct comparisons with observed concentrations for aerosol with $D_p < 1.8 \mu\text{m}$. In other words, the observations include a significant fraction of the coarse mode not included in the modeled values. At what RH are the diameters that are referred to here?

p. 3916, line 15: What is the peak diameter for a value of 8? This should be stated in the text. For additional clarity, Figure S1 should be moved to the main paper.

Figure 2: It would help guide the eye and compare model and observation results if the observed data were presented as line and markers.

Figures 2 and 3: Label the modeled lines as “Revised” and “Baseline” in the figure

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legend.

Figure 3: Both model versions overpredict the observed fine + accumulation mode mass concentration of Na. Why? This is not commented on in the text.

p. 3917, lines 18 – 20: It is stated that “the Revised simulation well predicted the coarse mode sodium at both the coastal and inland sites.” Based on Figure 3, the Revised simulation over predicts coarse mode Na at the Gandy Bridge site.

p. 3917, Lines 21 – 23: “Fine mode sodium concentrations increased throughout the BRACE domain in the Revised simulation...”. It should be clarified here that the change that is referred to is the difference between the v5.0.2h and v5.0.2a models (at least that is how I interpreted it).

p. 3918, lines 22 – 23: Change to “predicted PM2.5 sodium surface concentrations were SLIGHTLY improved in the Revised simulation...”

p. 3919, lines 9 – 11: Impacts on sodium from what? Sentence needs to be fixed for clarity.

Figures 5 and 6 (and text): Were modeled PM2.5 concentrations used for the comparison with the measurements? Or was the sum of the fine and accumulation modes used? Use of the latter would result in a large underestimation of both sodium and nitrate concentrations.

p. 3920, lines 2 – 5: It is not surprising that the nitrate underpredictions were not resolved by improved sodium predictions since the sodium concentrations were severely underpredicted even in the Revised simulations.

Interactive comment on Geosci. Model Dev. Discuss., 8, 3905, 2015.

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