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Geoscientific
Model Development
Discussions

Interactive comment on "Evaluation of the sectional aerosol microphysics module SALSA implementation in ECHAM5-HAM aerosol-climate model" *by* T. Bergman et al.

Anonymous Referee #1

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General comments

In this study an aerosol microphysics model, SALSA, is incorporated into a global aerosol-climate model, ECHAM5-HAM. This manuscript focuses on comparisons of simulated aerosol transport cycle and size distributions with those from observations as well as model description. This model also have the potential to simulate cloud droplet nucleation explicitly. I suggest that this manuscript will be able to be published if the authors fully address specific comments indicted below.

Specific comments

P3624, L7-8: “The aerosol size distribution is described using 20 size sections with 10 size sections in size space”. It can be understood by seeing Fig. 1. However it is difficult to understand this sentence only in Abstract.

P3624, L11-27: These two paragraphs simply describe comparison between simulated results and measurements. However the primary aim of this manuscript is to incorporate the microphysical model into the GCM. Therefore the authors should write how to incorporate the SALSA module into the ECHAM model in half, and in the other half about comparisons with measurements.

P3626, L15-17: It is difficult to understand why it is a result of the previous sentence.

Figure 1: It is difficult to understand section c (insoluble, cloud activation). Please describe more clearly in section 2.3. Does the section c means an insoluble particle with soluble material by internal mixing? If so, why doesn’t the section 2c exist?

P3630, L1-7: Please describe “analytical predictor of condensation”, “collision scheme”, and “operator splitting technique”, even if in appendix.

P3632, L25-26: “the growth of particles over the boundary between 2nd and 3rd subrange has to be treated separately”. I cannot understand it. What is treated separately?

P3632, L26 - P3633, L1: Why isn’t 2a4 transferred to 3a1?

P3633, L4: Why isn’t 2b4 transferred to 3b1?

P3636, L8-10: After all, which is the mode radius, 0.075 or 0.04, and the standard deviation, 1.59 or 1.8?

P3636, L24: Does “biomass burning” include vegetation fire and biofuel? If so, what is ratios of 1a and 2a to 2b for biogenic and fossil fuel?

P3636, L24: How is it different between wildfire and biomass burning? Be clear the differences among vegetation fire, biofuel , wild fire, and biomass burning.

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Interactive Comment

P3640, L8, L9: Is Liu et al. (2001) a right reference?

Figure 5: Describe why there are two or three size modes in M7 in section 4.2. Readers cannot understand it because there are any description on M7 in this manuscript. Also the authors have to confirm the observed size distributions appropriately measure nano particles between 1 to 10 nm shown in Fig. 5. Moreover, is it right in axis of the size? Why don't the authors compare and discuss the size distribution over 1 μm although this model treat from 3 nm to 10 μm?

Figure 8: As same as Fig. 5, why don't the authors compare and discuss the size distribution over 1 μm although this model treat from 3 nm to 10 μm?

P3652, L26-27: "SALSA shows much better agreement with observed concentrations than M7." I cannot agree it. I think from Fig. 8 that M7 is in much agreement with observations during 10 to 100 nm, which also have a peak in this size range. The authors have to evaluate objectively.

P3652, L29 - P3653, L1: "Moreover, SALSA reproduces the magnitude of the observed concentrations quite accurately." Again I cannot agree it from Fig. 8.

P3653, L13: Is Martonchik et al. (1998) a appropriate reference? Probably Kahn et al. (2005) is more appropriate for MISR aerosol retrieval.

Kahn, R., B. Gaitley, J. Martonchik, D. Diner, K. Crean, and B. Holben (2005), MISR global aerosol optical depth validation based on two years of coincident AERONET observations, J. Geophys. Res., 110, D10S04, doi:10.1029/2004JD004706.

P3654, L10-11: Do you have any specific data and references that emission in the old emission inventory used in this study is lower than that in new ones?

P3654, L16-23: A few parts of the contents in this paragraph is same as in the previous paragraph. Integrate two paragraphs.

Figure 10: Why isn't this figure a simple scatter plot between AERONET and the mod-

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els? It is difficult to evaluate the performance of the models by readers.

Figure 11: Why isn't Ångström exponent from MISR used as same as AOD?

Technical corrections

P3639, L26: Correct "assymmetry" to "asymmetry".

P3656, L25: Add comma after "black carbon"".

Table 7: Add horizontal lines before and after the line "Organic carbon".

Figure 3: Write unit in this figure (cm^{-3}).

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