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Interactive comment on “A pathway analysis of global aerosol processes” by N. A. J. Schutgens and P. Stier

Anonymous Referee #1

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Schutgens and Stier present an examination of the global aerosol mass and number budget using the ECHAM-HAM model with M7 aerosol microphysics. They present in great detail the sources and sinks of aerosol mass and number for each of their 7 aerosol modes on a global, regional, annual, and seasonal basis. I find the paper to be very informative and an excellent addition to the literature and thus recommend it to be accepted to ACP. I have only a few minor suggestions and corrections.

Pg 15047, line 19-21. Include Adams and Seinfeld (2002) in JGR (TOMAS model) in list of global aerosol microphysics model references

Pg 15051 final paragraph re: SOA. Based on this paragraph and not much mention of organic condensation elsewhere, is it only sulfuric acid condensation that is included

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in the pathway analysis? Organic condensation is known to dominate atmospheric nanoparticle growth (see for example, Riipinen et al. 2012, Nature Geoscience). Will this omission cause underestimation in the particle growth tendencies? I suggest discussing in more detail the impacts of organic condensation.

Pg 15052 line 7: "looses" should be "loses"

Pg 15052, line 25 and beyond. Might be worth mentioning what exactly the emitted sulfate size distribution is quantitatively (e.g. what fraction is distributed to what mode).

Pg 15056 and elsewhere. Make sure you are consistent with your spelling. "Ageing" is mostly used in the text but Fig. 10 uses "aging".

Pg 15059 line 13: I suggest giving the degree by degree resolution of T31L19 for those who might not be familiar with the ECHAM naming conventions.

Sect. 4.1 and Fig. 2: Any particular reason $1/m^3$ is used as the unit instead of $1/cm^3$? The latter is more universal for CCN, and would lower the magnitude of your numbers a bit in the legend.

Sect. 4.3 and Fig 4: Is it possible to include percentages of the total budget for the mass and number tendencies? The thickness of the arrows already gives a rough idea, but something quantitative would be useful.

Sect 4.4: Some issues here with Figure numbering. On line 14 of page 15063, I believe the correct reference is to Fig. 5, not 6. Similarly, the references to that figure in Sect 4.4.1 should be changed to Fig 5a, 5b, etc. There are some things listed as "Fig ???" which I believe should read Fig. 6 as it is presented in the list of figures. After that the figure numbering seems correct.

Fig 5, 8, 11... : in each of the 6 panel figures, there is a number in between the two columns in the last row (in Fig. 5, "45"). What is this? Explain or delete if a typo.

Sect 4.5: Can the correlation coefficient values for Fig 24 (and perhaps for some of the

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other regions) be reported? Yes the correlations look good, but best to be quantitative.

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