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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Unveiling aerosol-cloud interactions Part 2: Minimizing the effects of aerosol swelling and wet scavenging in ECHAM6-HAM2 for comparison to satellite data" *by* David Neubauer et al.

Anonymous Referee #1

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This illuminating study helps to resolve previous disparities between simulated and observed relationships between clouds and aerosols. I particularly appreciate the physical mechanisms put forth to explain the different relationships under different assumptions. The combination of results for different model configurations is very helpful, and tells a compelling story.

Page 4, line 12. Eqs. (7) and (10) should be Eqs. (6) and (9).

Page 6 line 12. Replace "divided by to" with "divided by".

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Discussion paper

Page 6 line 20. Move “multiple linear regression could be used in principle” to the front of the sentence.

Page 6, line 31. How is AODaerosol water calculated? A better way would be to calculate AOD of the dry aerosol given its size and dry composition. It would help the reader to know how AOD is determined from the aerosol components.

Page 8, lines 22-25. Should note here the lower bound on droplet number.

Page 9, lines 1-7. Please explain how the aerosol processing scheme differs from configurations without it. Surely all configurations treat aqueous chemistry and nucleation scavenging in some manner, right?

Page 10, line 8. Relative to what? Why not be quantitative? Say, “exceeds 0.8 in many areas”.

Page 11, line 15. Make it clear that figure 2g is without aerosol processing.

Page 11, lines 15-16. How is this statement support by the results? CCN depends on particles that do not contribute much to AOD, so why should AOD be better than AI? I think what you mean to say is AI includes the effects of aerosol processing, while AOD isolates CCN effects on cloud before cloud processing (line 14). I don’t agree with that statement; you can’t isolate processes when interactions are strong; you have to look at relationships between the variables that control the processes, which is why CCN is best.

Page 11, line 27. Insert “averaged” before “over”. Figure 3 caption should make this clear.

Page 11, lines 27-32. Why not discuss AATSR-CAPA and MODIS-CERES results here?

Page 12, line 1. Make it clear this is averaged over the oceans.

Page 12 lines 34-35. “Also” used twice.

Page 13, line 24. New paragraph.

Page 16, lines 8-11. Again, I question this conclusion. Aerosol processing is an important part of cloud-aerosol interactions.

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