

Interactive comment on “Global simulations of aerosol processing in clouds” by C. Hoose et al.

Anonymous Referee #2

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This is a very interesting paper that examines effects of including in-droplet and in-crystal variables in stratiform clouds and how that may affect nucleation and cloud cycling of aerosols. This topic is important for analysis of how aerosols may affect clouds and what terms or processes need to be considered. The paper is also comprehensive in its description of processes treated and comparison to a wide variety of observations. As such, I think the paper is acceptable with some changes that would be needed to make it more presentable. These are listed below.

Overall, the grammar needs improvement. Page 13557: Line 2: Sentence needs to be rewritten: use larger instead of bigger and I suggest you modify it as “Hygroscopic particles and those that are large (give size) act...”; Page 13558: Toss et al. (2007) explicitly “compute”..... Page 13559: Line 14: “represent” Page 13560: Line 16: How sensitive would your results be to this assumption of 50 μm per rain droplet? Page 13561: Eq. 4 and 5 are not clear. Page 13563: Line 25.

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Change the sentence "investigate in how far" to something like to "investigate the extent to which the" Page 13565: Line 18: Remove a before too What does mis-predicted and incorrect parameterization of optical properties mean? Page 13566: Line 22: Is it possible to quantify what this change in model weather due to aerosol feedback on clouds is? What is the difference in average wind speeds? Page 13570: Line 12: Missing "on" before their. Use "of" instead of "on" before global. Line 19: use "of" instead of "to". Line 25: Use forms and not forming Page 13571: Line 14: How reliable is it to scale the LWP? Page 13573: Line 11: Sentence is odd. Please rephrase. Page 13575: Line 11: "to a too". Please rephrase Page 13578: Why do you use this assumption " Only grid- points with more than 10 days with a low cloud fraction higher than 80% are considered in the analysis"?

1. Table 5: Remove the last 2 columns 2. Fig 12 should come before 10 and 11
3. Figure 13: Differences between simulations and observations are strikingly large? Were simulations analyzed similar to the way satellite data was processed? More details should be provided in the text. 4. I don't understand Fig. 15. 2 different sets of regions are indicated in Fig. 15, off the coast and over remote oceans. Fig. 14 shows ocean regions only, with and without drizzle. The legend in Fig. 15 does not match what is shown in Fig. 14. It is better described in the text. Please improve the legend description. In that sense, in Fig. 14, it might have been better to show the values separately for the off-coast and remote ocean regions.

5. Fig. 17 a looks too busy and is not useful as presented. Please redo it so it makes more sense to understand what is depicted there.

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