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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The relationship between cloud condensation nuclei (CCN) concentration and light extinction of dried particles: indications of underlying aerosol processes and implications for satellite-based CCN estimates" *by* Y. Shinozuka et al.

Anonymous Referee #2

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In this manuscript, the authors examined the relationship between the number concentration of boundary-layer cloud condensation nuclei (CCN) and light extinction by dried particles to analyze underlying aerosol processes influencing CCN-AOD relationship and satellite-based CCN estimates. Using airborne and ground-based observations of aerosols at about one kilometer horizontal resolutions, the authors derived a new parameterization between the CCN concentration and light extinction of dried particles.

They found that the slope of the logCCN–log(ExtCoef) relationship, to be 0.75±0.25, is smaller than existing parameterizations. This is a well-written paper with useful in-depth analysis of processes and uncertainties associated with CCN-AOD relationship. The content of this manuscript is within the scope of ACP. I recommend the publication of this manuscript after the following comments are addressed.

1. Abstract. I think that the abstract should be enhanced by providing more information. It will be helpful to summarize the data analyzed under this study. The authors should also describe briefly the main difference of their approach to those of previous studies. In the last sentence, please spell out what is the "common assumptions".

2. The major finding of this study is that CCN-AOD slope is smaller than those derived in previous studies. Fig. 6a provides a good illustration of possible reason – data aggregation over space. I think that it will be useful to see what the slope (of CCN vs dry ext. coef.) you can get to aggregate together all data in eight panels of Fig. 2.

3. Figure 6a is interesting but the number of data points is small. Any way to add more data points to make it more convincing?

4. Page 2749, line 15. Please use one sentence or two to summarize what Quaas et al. found out with regard to the magnitude of "effects".

5. Page 2753, last sentence. Why? Please illustrate. Is this true for specific conditions?

6. Page 2754, first paragraph. What are the kapa values for other sites listed in Table 1?

7. Page 2757, lines 16-17. What about in other locations?

8. Page 2771, line 25. Please provide a few references to this. Satellite-based estimation of aerosol indirect radiative forcing appears to be smaller than those derived from model (e.g., Ma et al., JGR, 2014JD021670, 2014). It would be useful to discuss in more specific the implications of your findings.

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