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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigation of aerosol indirect effects on monsoon clouds using ground-based measurements over a high-altitude site in Western Ghats" *by* V. Anil Kumar et al.

Anonymous Referee #1

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Overall summary:

This manuscript used ground-based measurements at a high-altitude site over Western Ghats to estimate the aerosol effect on cloud droplet number concentration (AIEn) and droplet effective radius (AIEs). For a given LWC, they found the AIEn is larger than AIEs, which could be explained by the cloud droplet dispersion effect. And then they finally demonstrated that. This work presents valuable information to compare or calculate the AIE from different methods. Some minor questions/suggestions need to be solved are listed in the following:

Comment and Question:

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1. Page 2, Line 3: Authors should define the parameter (herein, ε) or acronyms when it firstly appeared in the article.

2. Page 2, Line 5: 'They also noticed that this small difference can be noticed ' This sentence should be modified.

3. Page2, Line 8: 'shows' should be changed to 'show'

4. Page2, Line 9: 'slight' should be changed to 'slightly'. There are English editorial issues throughout the paper. Authors should pay more attention on it.

5. Page 2, Line 30: The unit of average rainfall should be 'cm/yr'.

6. Authors should give a brief introduction about sources and types of aerosols in this site. And the size range of aerosol instrument, ranging from 5nm to 30μm, is very broad. Details about quality of surface instruments and calibration should be added.

7. Define of $\alpha\beta$ in equation 6

8. For Figure 1 and 2, the LWC is fixed about 0.15g/m-3, while in Figure 3 the LWC is fixed from 0.20g/m-3 to 0.22g/m-3. Why don't use the consistent LWC bin?

9. .Page 8, Line 9: explain the calculation step from 0.07 to 21

10. Cloud effective radius going down with aerosol concentration increasing might be due to the aerosol indirect effect as the author discussed in this article. It might also be due to the aerosol semi-direct effect (Huang et al., 2006a, 2006b, 2008 and 2010, 2014), which is very popular over the Asia region. Author should clarify this problem in the article.

Huang, J., P. Minnis, B. Lin, T. Wang, Y. Yi, Y. Hu, S. Sun-Mack, and K. Ayers, Possible influences of Asian dust aerosols on cloud properties and radiative forcing observed from MODIS and CERES, Geophysical Research Letters, 33 (6) (2006a), L06824, doi:10.1029/2005GL024724.

Huang, J., B. Lin, P. Minnis, T. Wang, X. Wang, Y. Hu, Y. Yi, and J. Ayers, Satellite-based assessment of possible dust aerosols semi-direct effect on cloud water path over East Asia, Geophysical Research Letters, 33 (19) (2006b), L19802, doi:10.1029/2006GL026561.

Huang, J., P. Minnis, B. Chen, Z. Huang, Z. Liu, Q. Zhao, Y. Yi, and J. Ayers, Long-range transport and vertical structure of Asian dust from CALIPSO and surface measurements during PACDEX, Journal of Geophysical Research, 113 (D23) (2008), D23212, doi:10.1029/2008JD010620.

Huang, J., P. Minnis, Yan, H., Yi, Y., Chen, B., Zhang, L., and J. K. Ayers, Dust aerosol effect on semi-arid climate over Northwest China detected from A-Train satellite measurements, Atmos. Chem. Phys., 10 (2010), 6863-6872.

Huang, J., T. Wang, W. Wang, Z. Li, and H. Yan, Climate effects of dust aerosols over East Asian arid and semiarid regions, Journal of Geophysical Research: Atmospheres, 119 (2014), 11398–11416, doi:10.1002/2014JD021796.

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