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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global statistics of liquid water content and effective number density of water clouds over ocean derived from combined CALIPSO and MODIS measurements" *by* Y. Hu et al.

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I find the topic of this paper very important since it presents a technique to retrieve two urgently needed cloud properties: liquid water content and number concentration using lidar depolarization from CALIPSO and effective droplet radius from MODIS. It could be a very valuable contribution if more details are given for the derivation of the critical equation of the technique and attention is paid to some of the caveat in the retrieved droplet size at backscattering direction.

Specific comments:

1. The statement of negligible impact of the size distribution width is not comvincing. Note that what Hu and Stamnes (1993) found was the impact on asymmetry factor, not phase function (especially at the back scattering direction) that is important in the lidar application.

2. In Fig.1 , why use different r_e (9 and 10 μm), which apparently compromised the impact of size distribution width.

3. Equation (1) is the basis of the technique described. In order to evaluate the performance and the limit of this equation, details of how this equation is been derived should be given.

4. Is the paragraph after equation (1) necessary since it does not give more details of the deconvolution method, which is finally dropped anyway? If the authors would like to keep this paragraph, more details of the method is needed because it leaves an impression that deriving extinction coefficient by COLIPSO data alone is not reliable.

5. It has been found that the results of retrieved cloud properties using the technique of Minnis et al. strongly depends on scattering angle due to the cloud 3-D impact and the error is most significant in the backscattering direction (Ayers et al. 2006). Interestingly, they partially attributed this error to the width of size distribution, which is claimed not important here.

6. Equations (6) and (7) imply that extinction coefficient is dependent on the width of size distributon, contrary to the previous statement. Combine (6) and (7), one gets $\beta = 2Nr_m r_e \gamma(\gamma+1)/(\gamma+2)$. For fixed values of N, r_m and r_e, the β values corresponding to the γ values used in this paper (2 and 6) lead to a ratio of β 2:7.

7. What is the "mean square of gamma distribution"?. An equation between γ and effective variance is in order here for the discussion.

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