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Atmospheric Chemistry and Physics Discussions

Interactive comment on "What does reflection from cloud sides tell us about vertical distribution of cloud droplet sizes?" *by* A. Marshak et al.

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General Comments: The authors present a clear and straight-forward radiative transfer study to explore the potential of remote sensing of cloud particle size from solar radiation reflected from cloud sides which would enable a passive vertical profiling of cumulus cloud microphysical properties. In order to relate the modelled radiances to the input cloud a number of simplification have been made. As the manuscript is rather short there might be room to further investigate, e.g. 3d radiative transfer in the thermal to simulate the thermal radiance for height allocation or the influence of horizontal variability of drope size on the retrieval scheme. Nevertheless, the paper appears self-contained as it is and suitable for puplication in ACP-D. I leave it to the authors/editor/open discussion wether the specific points listed below should be ad-

dressed or not.

Specific comments (in order of occurance in the manuscript)

1) Section 2.2: What surface albedo has been used and does a white vs black surface has an effect on the algorithm?

2) End of section 2.3: I understand that thermal IR radiance can be used to distinguish between cold cloud tops and increasingly warmer cloud sides. However, cold downdrafts along the vertical cloud boundaries may disturb this temperature-height allocation. Is there any literature about 3d temperature fields (i.e. from LES model results) in convective systems? With SHDOM it should be possible to simulate the thermal signal from the very same cloud with a realistic 3d temperature distribution.

3) eq. (3) to (5): Concerning the microphysicyal model I would not assume a vertically constant extinction coefficient (which together with the assumed effective radius profile forces a certain vertical profile of number concentration) but rather a constant number concentration profile (which than would lead to an increasing extinction coefficient with height). That also correponds more to results from aircraft measurements in convective clouds, if I remember correctly.

4) page 7219: "... assumption of mild fluctuations of droplet effective radius along a horizontal plane...". Fast-FSSP measurements from aircraft should provide very accurate informations on the variability in microphysics along the horizontal plane. Putting these into a Monte-Carlo radiative transfer model. e.g. for a box cloud discussed in Figs. 1 + 2 would provide some numbers to quantify the effect of these fluctuations on the radiance fields.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 7207, 2006.

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Interactive Comment