

***Interactive comment on* “Extinction coefficients retrieved in deep tropical ice clouds from lidar observations using a CALIPSO-like algorithm compared to in-situ measurements from the Cloud Integrated Nephelometer during CRYSTAL-FACE” by V. Noel et al.**

Anonymous Referee #3

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The authors provide a comparison of cirrus cloud extinction coefficients from two independent types of observation: active remote sensing and in situ measurements. Both methods have their pros and cons, e.g. the (non-Raman) lidar retrieval depends on assumptions about the lidar ratio; the CIN probe measurements may have problems with undetected or artificially created small particles. Sampling problems may be an issue as well, depending on the small scale variability of the cloud microphysical properties.

Still, such kind of comparisons can provide valuable insight in the accuracy of the retrieval techniques provided that the retrieval errors and the variability of the observed system are taken into account. While the manuscript gives a sound intercomparison of the retrieval products it somewhat lacks discussion of the above mentioned errors. This is most obvious in the discussion section, where a CIN error of a factor of 2 is mentioned. Since the main conclusions of the manuscript "...the CALIPSO Deep Convection algorithm can be trusted..." is quite important I recommend publication in ACPD but strongly suggest to add some error estimates (not just standard deviation of measurements) of both extinction coefficient retrievals.

Specific comments:

- 1) page 10650, line 24: "The dominant effect is globally unknown..." because it is very close to zero, isn't it?
- 2) 10650, 26: "...reflected sunlight reflected..." -> "...sunlight reflected..."
- 3) 10651, 24: "...upcoming launch ... of CALIPSO...": When I received this manuscript the CALIPSO launch was 7 months ago :)
- 4) 10653, 11: What is the basis/reference for this S(T) parameterization?
- 5) 10654, 20: Should this lidar ratio be regarded as a mean lidar ratio for the whole profile. If so, what (qualitative) effect has this on the extinction coefficient retrieval given the fact that the ice particle sizes/shapes have a strong vertical variability (smaller and more spherical particles at higher levels, larger and more hexagonal shaped particles below).
- 6) 10659, 5: "...suggesting the WB-57 moved in a cloud free region." Are there no flight protocols, videos, or other auxiliary data to check for cloud or cloud free conditions during the measurements?
- 7) Is there a way to estimate the differences in extinction coefficients due to spatial/temporal dislocation of both methods, e.g. by using the variability pattern of the

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time series of the aircraft measurements?

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 10649, 2006.

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