

## ***Interactive comment on “Lidar studies on microphysical influences on the structure and lifetime of tropical cirrus clouds” by G. S. Motty et al.***

**Anonymous Referee #2**

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General: The manuscript of Motty et al aims at the presentation of statistical properties of cirrus clouds over the tropical site of Gadanki . The paper reports cirrus observations performed within six years. The data are compared to CALIOP observations. For about 140-160 days (within 6 years!) cirrus properties are derived. All the data provide the impression that only random, snapshot-like observations are presented.

Because of the following reasons, the paper must be rejected:

Although of importance for lidar-derived cirrus studies the authors do not provide information whether or not the lidar is vertically pointing (yes it is vertically pointing, many data points are strongly corrupted by specular reflection, without stating that clearly), and what about multiple scattering effects: corrected or not corrected? Yes, the data

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are not corrected, the reviewer noticed. So, all in all, the results are of rather limited use.

The spaceborne lidar CALIOP is not pointing nadir, so no specular reflection effects here? Comparison of results from zenith-pointing lidar and titled spaceborne lidar . . . , does that make any sense?

The extinction retrieval method is not explained? Just one sentence, to provide a reference for the retrieval, is simply not sufficient. Do you use backward and forward mode of the Fernald retrieval, to obtain the cirrus mean lidar ratio? Because the lidar ratios are not multiple-scattering-corrected, what is then the value of the data for further studies. . . ?

Depolarisation characterization is simply not up-to-date. The molecular depolarization is defined by the interference filter width of the individual lidar. It is not stated whether the particle depolarization ratio or the volume depolarization ratio is used here, neither for the ground-based lidar nor for CALIOP .

Why are the depolarization results shown in Figure 7 different to those already shown in the publication of Motty et al. [2015]? In addition, in the current manuscript there is no reference given to the already published depolarization dataset of Motty et al. [2015].

All the correlations show almost no tendency, and are based on only 20-30 data points (measured within 6 years). Depolarization ratios are corrupted by specular reflection and lidar ratios, optical depth and extinction coefficients by multiple scattering effects. So, almost useless for further studies!

All the color plots are snapshots, and the results (ground-based versus spaceborne lidar) are sometimes rather different, because of the viewing geometry (from space the cirrus is in a distance of several 100 km, extremely large multiple scattering effects, from ground, cirrus is just 10-15 km away. . . , less strong, but still significant multiple

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scattering), . . . and . . . zenith pointing at ground, near-nadir from space. . .).

Last point, although published (and thus this lidar-based method to estimate the vertical velocity can be used), I do not trust vertical (terminal) velocity observations based on just elastic backscatter lidars (i.e., if no vertically pointing Doppler lidar is used). All the structures (virga) you see with lidar at a given fixed site depends on the vertical profiles of horizontal wind velocity and wind direction at cirrus and virga height level, gravity waves have an impact, and of course sedimentation speed. So too many impacts to obtain the terminal velocity of ice crystals with sufficient accuracy.

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