

## ***Interactive comment on “Vertical distribution of the phase state of particles in tropical deep-convective clouds as derived from cloud-side reflected solar radiation measurements” by Evelyn Jäkel et al.***

**Anonymous Referee #3**

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### General comments

Aerosols may alter cold-rain evolution leading to an invigoration of the DCC development. This paper presents observational results of vertical profiles of the cloud particle phase state in tropical deep-convective clouds (DCCs) using airborne solar radiation data taken in a field campaign held in Amazon. Spectral signature in cloud side reflection in the spectrum of wavelengths between 1.55 and 1.7  $\mu\text{m}$  is used to deduce the mix phase zone in DCC. The altitude assignment is done by stereo-photogrammetric measurement using a commercial camera onboard the aircraft. Results show that depth

C1

and vertical position of the mixed phase layer can vary by different stages of cloud development. The lower and upper boundaries of the mixed phase layer are higher in polluted aerosol conditions than in moderate conditions, although the number of samples is limited to draw a concrete conclusion. Observational evidence for shift of the liquid-to-ice phase transition zone is a key for better understanding of the aerosol effect. I think this paper is an important contribution even with a limited number of samples. The manuscript is generally well written. Results are clearly presented. I recommend that this paper is published with minor revisions. There are several suggestions for revisions as described below.

### Specific comments

P4, L14: Is humidity variation small for selected 14 flight cases? If not, influence on the conclusions of this paper should be discussed.

Subsection 2.2.2 (MODIS) should be moved to after Subsection 2.2.4 (CAS-DPOL. . .) because Subsections 2.2.1, 2.2.3 and 2.2.4 describe the aircraft measurements.

P5, L25: The MODIS thermodynamic phase algorithm should be explained in more detail for better discussion (around P12, bottom) on the comparison of aircraft measurement results with the MODIS phase results.

P6, L24, “The aspherical fraction is the ratio of aspherical particles. . .”: Is this a ratio of number concentration? Other definitions (area, volume, or mass) of the ratio are possible. Please clarify the definition.

P14, L4, the last sentence of this Subsection, “Also strong downdrafts can. . .”: The last part of this sentence, “whereas in situ measurements inside the cloud only reveal liquid phase particles”, is confusing to me. Why do cloud side observation and in situ measurements show different results?

### Typographic corrections

P9, L32, “140 x 40 x 99”: The “x” character should be replaced by the times symbol.

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P9, L20, “get”: Should be replaced by “become” or something.

P12, L22, “m s<sup>-1</sup>”: Make the “-1” superscript.

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