

## ***Interactive comment on “Lidar observations of Cirrus clouds at Palau island (7°33' N, 134°48' E)” by Francesco Cairo et al.***

**Anonymous Referee #2**

Received and published: 25 November 2020

The paper of Cairo et al. presents one month of lidar observations of the characteristics of cirrus clouds in one of the most important tropical regions for troposphere – stratosphere exchange. As available atmosphere data from that area is sparse, this paper is a very valuable contribution to our knowledge about clouds in that region. So, the paper is scientifically significant and it is also well suited for publication within ACP. The scientific as well as the presentation quality of the paper is very good, therefore I recommend a publication after minor revisions.

In general, the paper can be improved in two ways. Not all of the results and figures of the lidar data analysis need to be in the main text, but some could rather be moved to the supplementary material. This specifically holds for figures 6, 9, 10, 11. The result of fig. 6 is related to the Ice Water Content (IWC), but without having such data

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available, the discussion related to fig. 6 is a bit speculative. In a similar manner, figs 9 – 11 can be discussed in a much shorter and more concise way and the figures moved to the supplement. The paper cannot give no solid links between Lidar Ratio (LR) and cloud properties, last not least as the LR is not directly measured by this instrument. Therefore, I recommend to move this part to the supplement, too.

The other suggested improvement to the paper is a discussion about the relevance of this observational data set with respect to clouds above the tropics in general. It is great that the observational time spans a whole Madden-Julian cycle. However, it is still just one month of a particular year, so any more general conclusions should be related (and limited?) to this. One possibility would be referring the Feb.-March 2016 observations to longer records of satellite observations. This aspect should be covered at least in the discussion part of the paper and would help to corroborate the conclusions.

The supplementary material as compiled at the moment is mainly a collection of plots of point clouds, which rarely allow to draw substantial conclusions. It shows the high amount of work put into the analyses, but I do not find the results enlightening, as they mainly reflect a very high variability and little correlations. The authors need to present (explain in the supplement) what can be learnt from these plots, otherwise they are not helpful and could be part of a dedicated data paper.

Some detailed suggestions for improvements as follow:

Abstract, line 13: “SVC” needs to be defined here

Introduction, line 83-84: this sentence is not well written: “with a Lagrangian trajectory analysis of tropospheric air masses entering the stratosphere.” What do you want to express?

Instrument, line 122: should read: A characterization OF cross-talk . . .

Line 166: “We set here . . . BR to 1.02” not “tot”

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Line 176: first appearance of tau, needs to be defined here, not in line 192

Line 191: "BR > 1.15" not "R > 1.15"

Line 209 "theair" is missing a space

Measurements: Line 224: which wind data is used here? Is this from local radio soundings or from a reanalysis model? Please specify.

Line 254: Figure 4 shows one vertical line not several horizontal lines.

Line 298: "particularly" instead of "particulary"

Conclusions, line 377: "of of"

Figures: In general, many figures have a quite small lettering on the axes' labels, these most likely need to be enlarged before publication. This is particularly necessary for fig. 2 axes labels.

Fig. 3 caption: "bee" Fig. 6 caption: "mdcloud"

I look forward to a revised publication of this paper!

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